

WIRELESS TELEGRAPH



Medical

Modern "Flying Doctors"

Automotive

GPS and GLONASS hybrid positioning

Power

Full power without cooling

Wireless

Bright future for ultra low power RF

Embedded

Family Concept Solution for variable visualisations

Microcontroller

MCUs go wireless

Industrial

IPv6 for increased interoperability

Securing supply

Competitive advantage from logistics systems



tower flashing light 1575MHz (GPS)

heating valve 868MHz (Wireless M-Bus)

climate control panel 2412MHz (WiFi)

street light 2100MHz (HSPA)

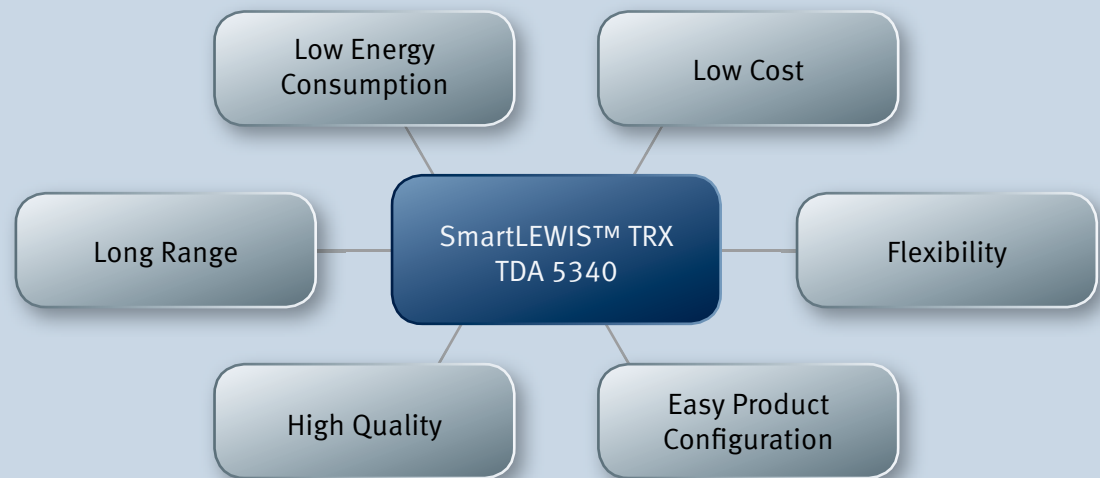


Smart Wireless Control at Very Low Energy Consumption

SmartLEWIS™ TRX – TDA 5340 Multi-Channel Wireless Transceiver



Infineon's TDA 5340 is an intelligent multi-band, multi-channel transceiver for applications in the major sub 1 GHz frequency bands such as smart meters, security systems, home automation and automotive. Smart signal processing features reduce the system current consumption by more than 80% in crowded environment and offload the microprocessor. So, low energy consumption combined with long range and high quality is no longer a contradiction – this is smart technology. This is SmartLEWIS™.





» Editorial

It's all about wireless

Willem Ongena
E-Mail: Wongena@markt-technik.de

Prediction is very difficult – particularly if it's about the future. Whether this witticism was uttered by Kurt Tucholsky, Mark Twain, Karl Valentin, Winston Churchill or someone else, these days we are constantly reminded by events on the world's stock exchanges, political stages or at the scenes of disasters of how much truth there is in it and how difficult it remains for humanity to reliably predict its own future.

Despite this, most people would like to know how the world of the future will look. The easiest thing is probably to answer who knows what will change. And in order to get to find the answer to this, we can again ask what or who has what it takes to change this world.

You don't have to be a technology geek to suspect that, above all, it may be the rapid to breathtaking technological development which also shapes our world in the future. And as has been the case in recent decades, in the future so-called 'enabling technologies' will in particular also play a leading role here. Simply put, these are all the groundbreaking technologies which introduce new trends, which simplify our everyday lives, making them more convenient or safer, reducing costs and so on.

They certainly include genetic engineering as well as pharmaceutical and medical innovations. And when talking about enabling technologies, it's impossible not to include technologies for the wireless transmission of data, images and audio. How would the world be without wireless technologies such as DECT, GSM, 3G, LTE, WiFi, Bluetooth, ZigBee, GPS, RFID or NFC? There would be no mobile phones and there would probably have been less interest in other mobile devices.

I venture the prediction here that the world of the future will also be heavily based on wireless technology. Wireless communications will certainly continue to play a dominant role. But just as many 'things' as possible will be wirelessly networked to each other or to a central control room. I am thinking here about the 'in-

telligent house', but by no means am I saying that all electrical household appliances will be or must be networked. But, wouldn't it be a blessing if, in the future, senior citizens could remain in their own homes for considerably longer thanks to intelligent wireless networks? And what a relief it would be if, when a beloved pet runs off or escapes, it would always be possible to track it down quickly in an emergency, thanks to wireless technology.

And intelligent networking would enable battle to be declared against energy wastage by many small energy guzzlers. And it would also be practical if the millions of heating, gas or water meters could be read remotely via wireless communication. To some extent, such applications have already been realised. And there are no limits to the imagination.

However, my imagination is certainly not sufficient for the diversity of application options wireless technologies will present us with in decades to come. With just a little imagination, however, I can forecast that constantly updated wireless expertise will be key to market success. Meanwhile, not all application developers will be able to acquire this specialist knowledge. But they don't have to, as long as there are specialists and committed suppliers of wireless solutions such as Rutronik, who maintain a wide product portfolio and who understand both customer requirements and applications as well as the wireless technology and its many characteristics. Then one step would be taken into a bright future, even if despite everything (and probably fortunately) we will still be surprised about how things develop in individual cases.

Best regards
Willem Ongena

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iDTRONIC GmbH
 Donnersbergweg 1
 67059 Ludwigshafen
 Tel. +49 621 6690094-0
 readers@idtronic.de
 www.idtronic.de

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The right connection for wireless

Every new piece of wireless technology brings with it new application options, but also new pitfalls. Bernd Hantsche, Product Area Manager Wireless Competence Center, explains how to get the best technology and how Rutronik can help you do this.

Markt&Technik: What tip can you offer developers who are interested in wireless technology?

Bernd Hantsche: Talk to us! It is often the case that someone has read or heard something somewhere and wants to get started straight away. Often only one side of the coin was represented and many factors were not considered or thought through. Only seldom is it the all-singing, all-dancing solution people initially think. All the advantages and disadvantages should be gathered together in order to be able to make a decision in all conscience. The first step is to examine the basic technology. Only one you have obtained an overview of all the technological alternatives, should you apply the same decision-making to the product selection. I therefore recommend that you enquire about making an appointment for a consultation with a specialist from our wireless team. This is free, without obligation and can be carried out via telephone or in an online conference room, if an on-site visit is not desired.

How does Rutronik differ from other providers in the wireless arena?

Rutronik has many strong manufacturers in its portfolio – we have at least one leading supplier in each technology sector. Our product

they offer everything, but without the trained staff to call upon.

In what areas or for what standards does Rutronik supply components?

Rutronik has divided the Wireless sector into three departments: Cellular wireless technology including satellite navigation as well as short-distance wireless communication and RFID. Cellular wireless technology is also referred to as mobile communication, but the days are gone where GSM, GPRS, UMTS and HSPA are used exclusively in mobile applications. The largest market segments are still telemetry and telematics. Virtually all telematic applications are based both on mobile communication technology and satellite navigation technology, so for us both product areas are very closely linked. Our solutions for satellite navigation comprise receivers for active GPS, Glonass and QZSS systems, as well as receivers already prepared for future Galileo and Compass satellites.

And over shorter distances?

Short-distance wireless communication covers all technologies with a range of up to around 16 km. This limit is the result of the statutory power limitation of 500 mW in the 868 MHz ISM band. In addition, WLAN/WiFi, Bluetooth, Bluetooth LE, ZigBee, ANT and various proprietary wireless solutions not subject to any recognised standard are also found here. These can be both narrowband and broadband modulations as well as transceivers for all current ISM bands in the world.

What does Rutronik offer in the RFID sector?

Primarily, our RFID segment comprises passive and active RFID, NFC and dual interface memories. The latter are memory chips with an interface to the microcontroller and a direct antenna connection. This enables the EEPROMs or FRAMs to be written either by RFID or by controller. This

technology in just one chip is still really new and differs from conventional RFID transponders which are isolated like an island and do not connect directly with other controllers. NFC is a type of bidirectional RFID – often mentioned in the media in connection with payment systems. However, it actually addresses significantly more applications as this technology is already integrated into many



Bernd Hantsche, Product Area Manager Wireless Competence Center, Rutronik

» Only seldom is it the all-singing, all-dancing solution people initially think. All the advantages and disadvantages should be gathered together in order to be able to make a decision in all conscience. I therefore recommend that you enquire about making an appointment for a consultation with a specialist from our wireless team. This is free, without obligation and can be carried out via telephone or in an online conference room. «

smartphones. The upcoming iPhone 5 is also equipped with NFC.

And what about accessories?

Our Wireless Accessories Group comprises internal and external antennas, as well as various adapter cables, extension cables, SIM card holders and connectors suitable for our wireless modules. Our wireless accessories therefore complement our transceivers from all the named product areas so that these have complete functionality. Without an antenna, there is fundamentally no wireless transmission. The importance of these accessories should not be underestimated – with the wrong antenna, the best transceiver is good for nothing. So this range of accessories is close to our hearts.

How many products and manufacturers do you have in total?

Our largest focus lines are Telit, Fastrax, Redpine Signals, Nordic Semiconductor and Infineon – overall, we can officially call 27 manufacturers franchise partners, and unofficially there are a few more. This portfolio enables us to meet an estimated 99% of all technical tasks on the market. There are, of course, also some requirements which we can't currently meet as the market is not yet attractive to us. Such areas include DECT, Tetra, → page 8

» **Despite the high quality and depth of our specific technological expertise, we are still able to offer an enormous breadth. We cover around 99% of all wireless applications.**

and application specialists are very well trained and keep abreast of the latest knowledge thanks to regular training courses. Despite the high quality and depth of our specific technological expertise, we are still able to offer an enormous breadth – we cover around 99% of all wireless applications. Other distributors limit themselves just to GSM, RFID or short-distance wireless communication – or

STM32W: IEEE802.15.4 System-on-Chip



System Power supply 1.25/1.8 V regulator POR Xtal oscillators 32 kHz + 24 MHz Internal RC oscillators 10 kHz + 12 MHz Clock control Sleep timer Up to 24 I/Os Watchdogs (independent and window) 4 external interrupts AES 128 encryption accelerator Event manager	ARM Cortex-M3 CPU 24 MHz Nested vector interrupt controller (NVIC) JTAG S/W debug Embedded trace macrocell (ETM) Memory protection unit 1x SysTick timer	128-Kbyte Flash memory 8-Kbyte SRAM
Control 2x 16-bit timers	Wireless connectivity Lower MAC and baseband IEEE 802.15.4	Wired connectivity UART Up to 2x SPI Up to 2x PC
		Analog 12-bit ADC 6 channels/188 kHz

Rutronik & STMicroelectronics offers a complete product portfolio for IEEE802.15.4 @ 2.4GHz Wireless sensor applications including:

System-on-Chip
Wireless Modules
Application, Firmware and Software Support



Customer application Code						
Profile application	Customized protocol 	HID 	Home Automation 	Smart Energy 	Smart Light 	IP
Upper Layer Stack	Network layer	RF4CE Stack	ZigBee PRO	ZigBee IP	ZigBee PRO	IPv6 6LoWPAN IEEE 802.15.4
Data Link Layer	15.4 MAC					
Physical Layer	IEEE 802.15.4 @ 2.4GHz					
Tools & Modules						

satellite communication and conventional long-distance wireless communication. But even for these technologies we stock at least the appropriate antennae and, with the aid of our other specialist departments, we offer discrete components, filters and amplifiers, enabling our customers to develop their own transceivers.

Can we expect to see expansions to your range of products?

In the mobile communication sector, it is likely that over the course of the next year, the first long-term evolution modules will appear on the market. Whether these will be 3.9th generation, or already true 4G modules with LTE Advanced, I still dare not predict today.

What services does Rutronik offer in addition to the products?

As a rule, our work begins with an individual consultation. Often the initial focus is on fin-

are able to call on Rutronik's full range of services: We supply almost all types of components – semiconductors, passive, electromechanical, displays, boards, storage media, etc. Larger customers also like to use our logistics concepts to optimise process costs and increase reliability of supply – from consignment warehouse, kanban through to kitting.

What do you see as the highlights of the product portfolio?

Redpine Signals is still quite unknown in Europe. The Californian/Indian company focuses on WLAN solutions. Redpine supplies its own chips, modules, firmware and drivers as well as reference designs and development kits. It is quite unusual for a WLAN module manufacturer to be able to provide its own chips. Other manufacturers have to rely on chips from third-party suppliers, giving them little control or influence over functions and performance. The same can be said for Redpine's software – TCP/IP stacks, drivers and analysis tools – it is all produced in-house. As a pan-European partner, we are proud that we are now also permitted to establish Redpine in Europe. Our largest partner Telit has integrated Motorola's M2M business into its portfolio, thereby making it the world no. 1 in the M2M sector. It has

enjoyed a close partnership with Rutronik since 2006. The spotlight is currently on Telit 3G modules such as UMTS and HSPA+. The portfolio is expanded by Wireless M-Bus, Zig-Bee, GPS up to in-house local meshed network protocols.

What products have been most in demand recently?

We are currently receiving many enquiries about the Fastrax IT600. It offers the option to receive and process both GPS and Galileo, QZSS and Glonass signals. For one thing, it has become common knowledge that the positional accuracy is significantly better than a pure GPS module, and also the punitive tariffs for export of the terminals to Russia have been removed. However, the new legislation on the use of Glonass in Russia plays only a minor role – the main argument is the better performance, completely irrespective of its location.

What price developments can be expected in the near future?

The situation will vary for different product groups. Bluetooth modules are already retailed at levels where it is sometimes impossible to see how manufacturers are able to recoup their material, development and certification costs. With regards to GSM modules, we have ob-

served an ongoing fall in prices over the last five years. This is, of course, due both to the mature market and the constant development of new technologies. Demand for HSPA+ modules has increased significantly as the availability of the infrastructure is not endangered in the coming years with 3G. Simple 2G modules are now retailing at very favourable prices with their prices of five years ago now applicable to 3G modules.

And what about delivery times?

Luckily for us, delivery times are not an issue. Due to HF technology, software and certifications, our customers' development phases are always significantly longer than the supply chain for raw material into our logistics centre. We always keep a wide range of samples available in the warehouse so that our customers can immediately begin the design of their prototypes. In order not to endanger larger pilot series or mass production, we maintain a close working relationship with our customers, ensuring that goods are available on time and in sufficient volumes. This contact arises automatically during the development period. This is because technical issues are always arising that must be addressed in person, despite the best documentation literature, because they are so specific to individual customers, or because the answer demands diverse historical experience.

What is going to be the next wireless trend?

Smartphones currently support Bluetooth and WiFi – the next generation will also support NFC, Bluetooth LE and ANT. This will make many local wireless interfaces available which will make life move convenient and safer. In addition, the number of additional displays and buttons required on different devices can be reduced as these can be controlled or operated via smartphone apps. We already offer both wireless chips and wireless modules for all smartphone technology. This trend is just beginning. We Europeans will have to get used to the fact that our telephone will automatically turn on the lights in the stairwell when we enter, that the contents of our fridge can be viewed via webcam and that our GP can constantly monitor our blood pressure.

You give the impression that you are truly committed to the wireless sector.

Yes, and that goes for the entire team. And our customers have obviously noticed because we are experiencing strong growth. And we are always looking to strengthen our workforce with the addition of engineers with high-frequency experience or wireless protocol developers.

The interview was carried out by Manne Kreuzer

We are currently receiving many enquiries about the Fastrax IT600. It offers the option to receive and process both GPS and Galileo, QZSS and Glonass signals

ding the technology, before we even think about specific components. Frequently there are questions regarding certifications, compatibility, longevity and formalities regarding transmission power, modulations and duty cycles. Only when the customer is certain which technology it would like to use in its products will we introduce our suppliers and their products in detail. Once the transceiver has also been found, and if requested, we can provide an introduction to the development kits with the aid of our FAEs. This saves our customers a great deal of time in the initial familiarisation period and, ultimately, this means a reduced development time and therefore faster turnover.

And once the design is complete?

As soon as our customers have drafted a layout, we have it examined by high-frequency engineers and send the customer an official inspection report from which it can take recommendations, improvements and instructions. If this report contains no instructions and the customer has produced a prototype, we can also have this checked free of charge in the laboratories of our partners. In no way does this replace the measurements of a certification body, but it does enable costly and time-consuming complaints to be ruled out almost completely. In addition, our customers

Diverse portfolio of high-quality components

Multilayer inductors and ferrite beads for all industrial applications

Samsung Electro-Mechanics (SEMCO) is the technology leader in MLCCs (Multilayer Ceramic Capacitor) with proven expertise in the printing process and the material characteristics of ferrite, silver and other materials. SEMCO markets low-loss ferrite beads with low DC resistance, high-Q HF inductors and power inductors with a high rated power capacity.

Ferrite beads – the all-rounder for filtering

The CIB/CIM ranges already have a higher impedance in the low frequency range, giving them excellent suppression properties over a wide frequency range. The CIM range is suitable for use with control signal wires, RS232, RS422 and DC/DC converters. Particularly in high-speed data transfer via USB, IEEE1394 and LVDS, the low impedances of the CIM-F range in the low frequency range are crucial for good filtering properties and a fast signal transmission.

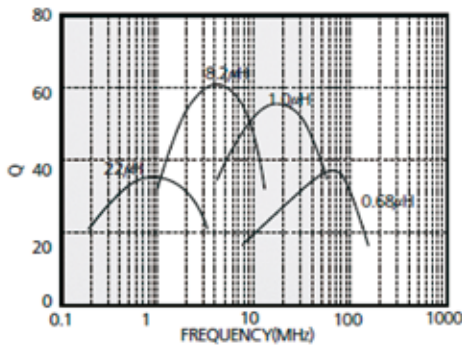
In the power line sector, the ferrite beads must withstand currents of up to 6 A. The CIC range achieves this capacity in the 0805 model, the CIS range as early as the 0603.

In the GHz range, the products in the CIV range have an even

greater impedance of interference at higher frequencies with applications in the mobile wireless segment or with bus signals.

Filter inductors for suppressing crosstalk

The CIL range from SEMCO comprises a ferrite core and an internal silver coil. This magnetically shielded design prevents



crosstalk very effectively. The CIL models are suitable for the discrete design of T or π filters as well as for filter and oscillator circuits.

High-Q inductors also at high frequencies

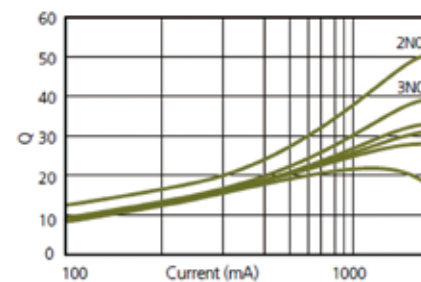
The two most important criteria for high-frequency inductors are the Q characteristics and the



Housing	Inductor (μH)	Rated power (mA)	GDC resistance (Ω)	Model
0402	2.2	10	1.7	CIH05
0603	0.047 to 33	1 bis 50	0.3 to 2.95	CIH10
0805	0.047 to 33	5 bis 300	0.2 to 1.25	CIH21
1206	0.047 to 33	5 bis 300	0.15 to 1.05	CIH31

For use above 100 MHz, the CIH range is available with an SRF of up to 13 GHz

self-resonant frequency. This is because, in simple terms, they define the loss factor and the operating frequency of the inductor. For use above 100 MHz, the CIH range is available with an SRF of up to 13 GHz. A special dielectric ceramic permits excellent Q characteristics even at high frequencies of several MHz. Areas



of application for the CIH range include SAW filter circuits, VCO circuits, Bluetooth, WLAN, filter circuits, digital TV tuners and other high-frequency circuits.

Power inductors with high current capacity

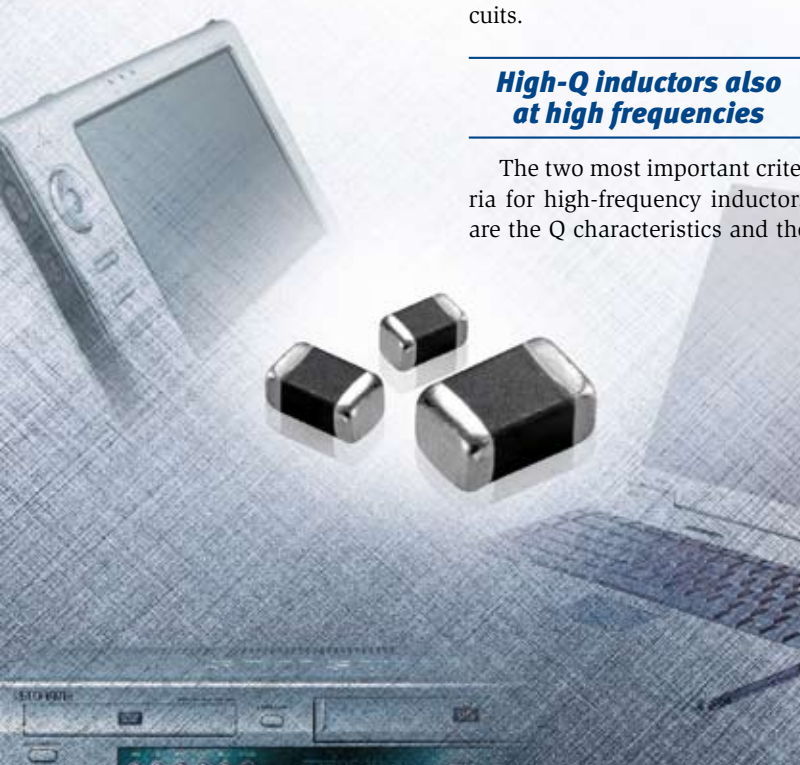
With a high current capacity of 0.5 A to 3.3 A and DC resistance values of 0.04 Ω to 0.5 Ω , the power inductors of Samsung's CIG

range are ideal for use in DC-DC converters. Particularly at high switching frequencies, the electrical properties of the CIG range equal those of the wire-wound coils. Inductance values of 0.27 μH to 10 μH ($\pm 20\%$) are available. The advantages offered

by the power inductors are particularly evident in DC-DC converters for energy storage, EMI suppression and the smoothing of the current in power supplies. Primary areas of application for the CIG range are

predominantly mobile devices such as POS systems, battery-operated sensors (smoke detectors, light sensors etc.) and e-bikes or cost-critical applications with high PCB packing densities such as LED drivers, set-top boxes and industrial PCs. ■

Samsung Electro-Mechanics
 Marc Sauer – Field Application Engineer
 E-Mail: info.sem@samsung.com



Online wireless support

Webg@te, webinars, websites, etc.

When it comes to wireless technology applications, a detailed discussion between developer and product specialist is indispensable. The variety of different parameters make selection using data sheets alone impossible, instead it should already have begun during the requirements analysis of the software protocol. And frequently, it only becomes evident during licensing and EMC measurements that another product

would have been much more suitable or that the technology was completely wrongly dimensioned. Another decision-making criterion: In addition to technology organisations such as the Bluetooth Special Interest Group, ZigBee or WI-FI Alliance, vertical interest groups such as Continua Health Alliance are increasingly deciding on compatibilities to market competitors. In this complex and innovation-inten-



sive area, personal discussions are supported with Internet offers readily available at any time, providing current information, research and exchange options.

Rutronik's Webg@te eCommerce platform combines convenient eProcurement and online services with interfaces to the 'offline' world. It contains almost one million products, including well over one thousand wireless components.

The key to efficient procurement is the sophisticated search function which enables you to find all available identical or similar products. It does not require the customer to enter product names; instead they can select a term such as 'RFID'. The labelling of recommended products, highlighted items, discontinued and demand-driven products



also makes selection easier. In addition, each component is always displayed with its current Product Change Notifications (PCN) and the relevant data sheets. This provides the user with a clear overview, enabling them to decide which component best fulfils the parameters most important to them. If the ideal component is found, the customer can place an order or sample order directly online, view their orders on hand at any time, transfer the data into its own EDP system via Excel, balancing its books by a very simple means. A high level of technical support is

also provided: Questions can be posed via an online form. These are then answered immediately via e-mail by the relevant product manager.

Webinars from chip manufacturers

Working in conjunction with the inventors and developers of the next generation of high-tech chips and components, Rutronik arranges free, live, online seminars. They focus on basic technological knowledge, the functions and features of the newest products, present product road maps, explain market research, disclose future trends and offer introductions to the programming and integration of the products into customer-specific applications. Participants can put individual questions directly to the relevant specialists. You will find a schedule of dates at www.rutronik.com/events – all that is required is you complete a simple registration form and that you have Internet access.

Keep up-to-date with the newsletter

Updates and product news from around 150 manufacturers are summarised every Friday in the Rutronik Newsletter. This also provides direct contact with Rutronik's wireless specialists, who are happy to offer provide details and answer any questions. Simply sign up at www.rutronik.com/newsletter to keep your finger on the pulse! If once a week is not often enough for

you, then simply follow Rutronik's micro blogs at twitter.com/rutronik. You'll find all the news here, brief, to the point and without delay.

Website provides panoramic view

The most comprehensive information on the product portfolio and all partner companies, on trade fairs, seminars, webinars and other exciting events as well as Rutronik itself can be found at www.rutronik.com. Current news on the most recent chip developments, component-specific environmental issues and logistical innovations can all be found on the homepage, along with direct contact details for all Ruto-

nik subsidiaries worldwide, including extension numbers for the technical product specialists. And anyone wanting to become a member of the Rutronik team will find all the current job opportunities in the 'Careers' section – everything from product manager and field application engineer to sales representative.

What's new?

Really Simple Syndication (RSS) feeds notify interested parties immediately when something new appears on the Rutronik website. The focus here is notification of new products. You can subscribe quickly and easily at www.rutronik.com/rss0.html.

www.rutronik.com/events

Webinars in 2012

Fastrax Multi-GNSS receiver IT600

27.01.2012 14:00 - 15:00 CET, moderator: Daniel Barth, Rutronik; speaker: Pasi Alajoki, Fastrax

Intel Embedded Bluetooth products efficient data transfer for multiple applications

08.02.2012 10:00-11.00 CET, moderator: Bernd Hantsche; speaker: Intel Mobile Communications

Transceiver Solutions from Infineon – lowest power meets long range

28.02.2012 10:00 - 11:00 CET, moderator: Bernd Hantsche, Rutronik; speaker: Anton Brückler, Infineon

Funknetzwerke – Technologie und Parameterübersicht

06.03.2012 14:00 - 15:00 CET; speaker: Bernd Hantsche

Designing for BT-Low Energy applications

07.03.2012 10:00 - 11:00 CET, moderator: Bernd Hantsche; speaker: Nordic Semiconductor

Dare to Design Embedded 3G/HSPA+ Module in a Commercial 4G World

14.03.2012 14:00 - 15:00 CET, moderator: Daniel Barth, Rutronik; speaker: Vikas Sahota, Telit

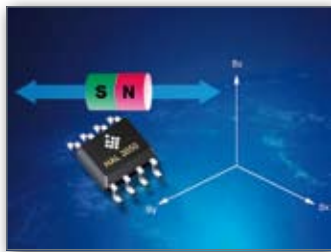
Wi-Fi in Embedded Systems

20.03/2012 10:00 - 11:00 CET, moderator: Bernd Hantsche; speaker: Redpine Signals

Leading Semiconductor Solutions for Automotive and Industrial Electronics

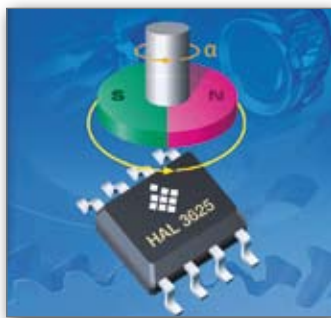


Linear Movement Detection: HAL 3855

3D|HAL
by Micronas


- ◆ Detection range up to 40 mm
- ◆ Customer programmable
- ◆ Magnetic range: ± 30 mT to ± 100 mT
- ◆ 32 setpoints for output characteristic adaption
- ◆ 12 bit ratiometric analog output
- ◆ Diagnostic features
- ◆ Wide temperature range $T_J = -40$ °C to 170 °C

Direct Angle Detection: HAL 3625

3D|HAL
by Micronas


Highly precise angular measurement up to 360°

- ◆ Advantages over conventional linear sensors
 - Insensitivity against air gap and temperature variation
 - No influence by magnetic aging
 - Simpler magnetic circuits
- ◆ Typical angle accuracy: 180° range: $\pm 0.9^\circ$, 360° range: $\pm 1.2^\circ$ (30 mT)
- ◆ 12 bit ratiometric analog output
- ◆ Wide temperature range from $T_J = -40$ °C to 170 °C

Gas Sensing: GAS 85xyB Platform

mySENS
Technology
by Micronas


The GAS 85xyB is the first member of Micronas' family of multi-parametric ambient sensors based on the mySENS[®] gas sensing technology:

- ◆ Two integrated CCFET gas detection elements
- ◆ Integrated temperature sensor
- ◆ Integrated relative humidity sensor
- ◆ Electronic components such as A/D converters and signal processing
- ◆ Digital SPI interface

Complete WLAN Solutions

New partnership: Rutronik and Redpine Signals

Starting immediately, Rutronik is selling semiconductor and wireless system solutions from Redpine Signals. The Redpine portfolio consists not only of 802.11n modules and systems, but also its own chipsets.

The ultra-low-power and high performance products are ideally suited to applications in the Medical, Industrial, Automotive, Smart Energy, and Building Automation markets as well as in the High End Consumer area. Furthermore, this American company offers firmware, drivers, reference designs and development kits. "The fact that a module manufacturer develops its own chips is practically unique," says Bernd Hantsche, Product

Division Manager Wireless Competence Center at Rutronik. "By doing so, Redpine clearly gains more influence over the functions and performance of the chips than other providers, and can offer extremely innovative products with a high level of integration. For customers, this means that they can quickly bring leading edge solutions with real USPs on to the market."

65Mbps with low power consumption

The n-Link™ Wi-Fi modules are amongst the current range of products in focus. They enable a high data throughput rate of 65Mbps with low power consumption. The modules have an integrated MAC, a basic band processor, an RF transceiver and

a power amplifier. Thanks to their small form factor, they can also be used in hand-held devices and other portable consumer products. In contrast, for higher transmission rates of 150Mbps, later up to 600Mbps, there is the Maxi-Fi chip family. The Redpine Connect-io-nTM family fulfils the highest demands on integration level. The Single Stream 802.11n modules contain all functions required by a WLAN Client, and extend embedded solutions by future-oriented 'plug-and-play' Wi-Fi connectivity. Furthermore, they also contain a complete Networking Stack, which enables connection to numerous existing embedded systems without loading their microcontroller.

"Our future-oriented 802.11n Wi-Fi components complement many current products in Rutronik's portfolio exceptionally well.



In addition, there is Rutronik's first-class wireless expertise and its strong presence in markets that are relevant to us, in which our partnership will open up a variety of synergies," according to Dhiraj Sogani, General Manager and Senior Vice President of the System Business Unit of Redpine Signals. "We are happy to expand our business in Europe together with Rutronik." ■

Outstanding!

Rutronik receives Telit 'Sales Excellence Award'

At its international sales and distributor conference in Kitzbühel, Telit Wireless Solutions presented its 'Sales Excellence Award' to Rutronik.

By doing so, one of the world's leading manufacturers of M2M communication is honouring Rutronik as the distributor recording the greatest growth in the DACH region (Germany, Austria, Switzerland) during the previous year: In comparison with 2009, Rutronik was able to more than double its turnover in Telit modules.

Telit believes one reason for this success to be the acquisition of an extraordinarily high number of new customers. "The expertise of the Rutronik Wireless Team has also contributed significantly to this dramatic increase," explains Felix Marchal, Global VP Sales at Telit. "After

all, our products are purely design-in products which cannot be sold without the benefit of sound advice and support. This is why we work so closely with Rutronik in this area."

Rutronik has been Telit's franchise partner throughout most of Europe since 2006.

The GSM, UMTS, HSPA, CDMA, GPS, ZigBee and Wireless M-Bus modules as well as the proprietary short-range radio modules are aimed primarily at industrial customers, particularly for telemetry applications as well as the automotive market.

"Because Telit does not just develop the modules but also the



From left to right: Dietmar Staps, Technical Sales Manager at Telit, and Lars Mistander, Head of the Wireless Competence Centre at Rutronik.

internal software stacks itself, its products always have a technical edge over the competition," says Lars Mistander, Head of the Wireless Competence Centre at Ru-

tronik. "In addition, there are useful additional functions which our customers really value, as well as high quality and absolute reliability." ■

Wireless technologies for telemedicine

Modern 'flying doctors'

According to elektroniknet, around 500 million people will be using wireless medical applications and turning to health or medical apps by 2015. A number of technologies are already available for this.

Smartphones can provide a display and input interface for external devices, as they have integrated Bluetooth, WLAN and UMTS.

UMTS, used here as an umbrella term for cellular connectivity, is suitable for any large communication distances as long as there is a base station of a mobile phone provider in the area.

Medical data can therefore be stored, evaluated and analysed at any location. The chips used are backwards-compatible to GPRS and EDGE. This does mean a slower data connection, but also virtually seamless network coverage. Most smartphones also support the faster standards HSDPA, HSUPA or HSPA + .

Unfortunately, the UMTS network expansion is only really good in highly populated areas of Germany, but the development of LTE and LTE Advanced has already started and should soon achieve the widest possible population coverage here. This Internet connectivity for smartphones is par-

transmits the data packets to the service provider by DSL. However, the complex frequency modulation (mainly 10 MHz and ± 10 MHz scattering) as well as large Internet protocols, most of which are used with IEEE802.11, causes the power consumption to increase. WLAN is therefore unsuitable as a permanent wireless solution without a fixed energy supply. Bluetooth is more economical: The channel bandwidth here is only 1 MHz and the profiles require considerably fewer overheads due to a lack of network capacity.

There are clear benefits offered by the integration of Bluetooth and WLAN in medical devices: An app for the smartphone and a Bluetooth or WLAN-compatible wireless module for the medical devices is sufficient, the machine to machine (M2M) wireless connection is complete.

This compatibility is thanks to the integration of interest groups which establish appropriate standards. "However, the downside to

this is that such standards have compromises of different requirements," explains Bernd Hantsche, Product Area Manager Wireless Competence Center at Rutronik. "This means that neither WLAN nor Bluetooth was specifically

designed for use in blood-pressure monitors.

The addressing, security mechanisms and other overheads must be accepted as standard, even if these are overdimensioned for the actual task in question." A significantly better power balance is demonstrated by proprietary wireless solutions such as the Gazell protocol from Nordic Semiconductor or the MiWi protocol from Microchip. "When making a choice, the technical advantages



Foto: Fotolia

and higher energy efficiency must be weighed against the compatibility."

Bluetooth with low energy consumption

Working closely with Nokia, several years ago Nordic Semiconductor began developing a universal wireless solution which requires less energy than Bluetooth. Originally known as 'Wibree', this protocol is currently marketed as 'Bluetooth low energy' or 'Bluetooth LE'. Together with Bluetooth 3.0 there is Bluetooth 4.0 which will be found in smartphones, laptops, etc. in the future. "Depending on the data to be transferred, a choice can be made on the application side between devices with Bluetooth 2.0 or 2.1 or Bluetooth LE," says Hantsche. "For example, a hands-free set requires the Enhanced Data Rate, so Bluetooth 2.0 or 2.1 would be the ap-

propriate choice. A set of weighing scales or a blood-pressure monitor transmit just a few bytes, so Bluetooth 2.1 would be excessive: The hardware costs, energy consumption and licensing costs are unnecessarily high for that. Bluetooth LE provides a much longer battery life, is cheaper and will soon be available as standard like the current Bluetooth version."

ANT: Energy efficiency for sport and medical applications

Dynastream has developed ANT as a low-energy solution specifically designed for healthcare, sport and wellness applications. The ANT protocol primarily covers the network and transport layers, the ANT+ profiles optionally implement the presentation layer. The prerequisite for use of the ANT+ profile is membership of the ANT+ Alliance or the

Technology	Download	Upload
EDGE	220 kbps	110 kbps
UMTS	384 kbps	128 kbps
HSDPA/HSUPA	7.2 Mbps	5.76 Mbps
HSPA+	28 Mbps	11,5 Mbps
LTE	100 Mbps	50 Mbps
LTE Advanced	300 Mbps	75 Mbps

Max. wireless transmission speed

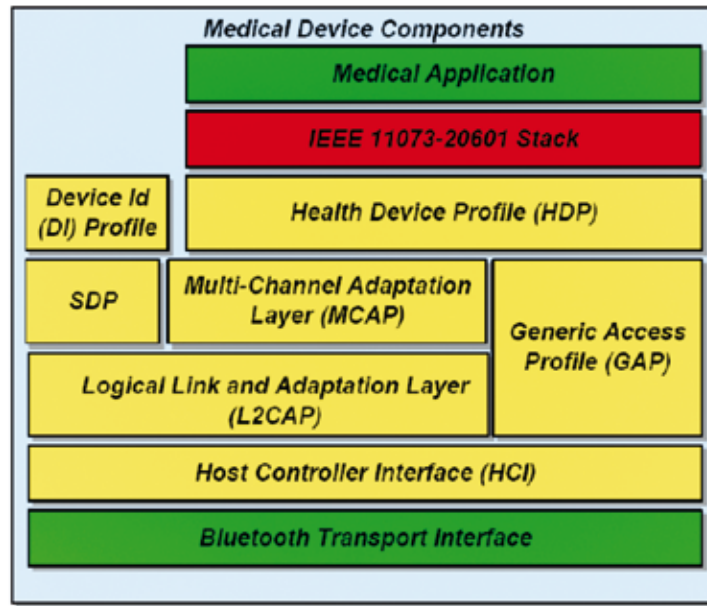
ticularly popular for healthcare applications which connect to the smartphone via short-distance wireless communication.

Bluetooth and WLAN are available for tasks requiring short-distance connections. WLAN, or wi-fi, already permits high data rates as well as the integration of smartphones into existing WLAN networks. In this way, medical data measured at home by a monitor can be sent by WLAN to the home's own router, which then

purchase of a development licence. "Since the beginning of 2011, it has also been possible to develop free of charge using ANT+, if access to direct support and certification is waived," says wireless expert Hantsche.

As with Bluetooth and WLAN, the hardware basis of the protocol is the licence-free, globally available 2.4 GHz ISM band. In contrast to these, however, ANT+ uses signal modulation in accordance with the Gaussian Frequency Shift Keying process (GFSK), which requires disproportionately less energy to form the zeros and ones than spread spectrum modulation used by solutions based on IEEE802.15.4 such as ZigBee and MiWi.

In theory, amplitude modulation requires less consumption than frequency modulation on average. However, the more error-prone demodulation increases the latency of transmission as some packets must be resent and in doing so, the transmitting power is in-



Embedding the HDP in a Bluetooth system

creased. This would result in a detrimental effect on the overall power balance.

In contrast to Bluetooth, ANT dispenses with unnecessary channel changes. Whereas Bluetooth changes the channel 1600 times

per second to ensure that there is always a free channel, ANT only changes when there is actual interference to the communication frequency. This fact as well as many other differences, particularly in the protocol design, makes

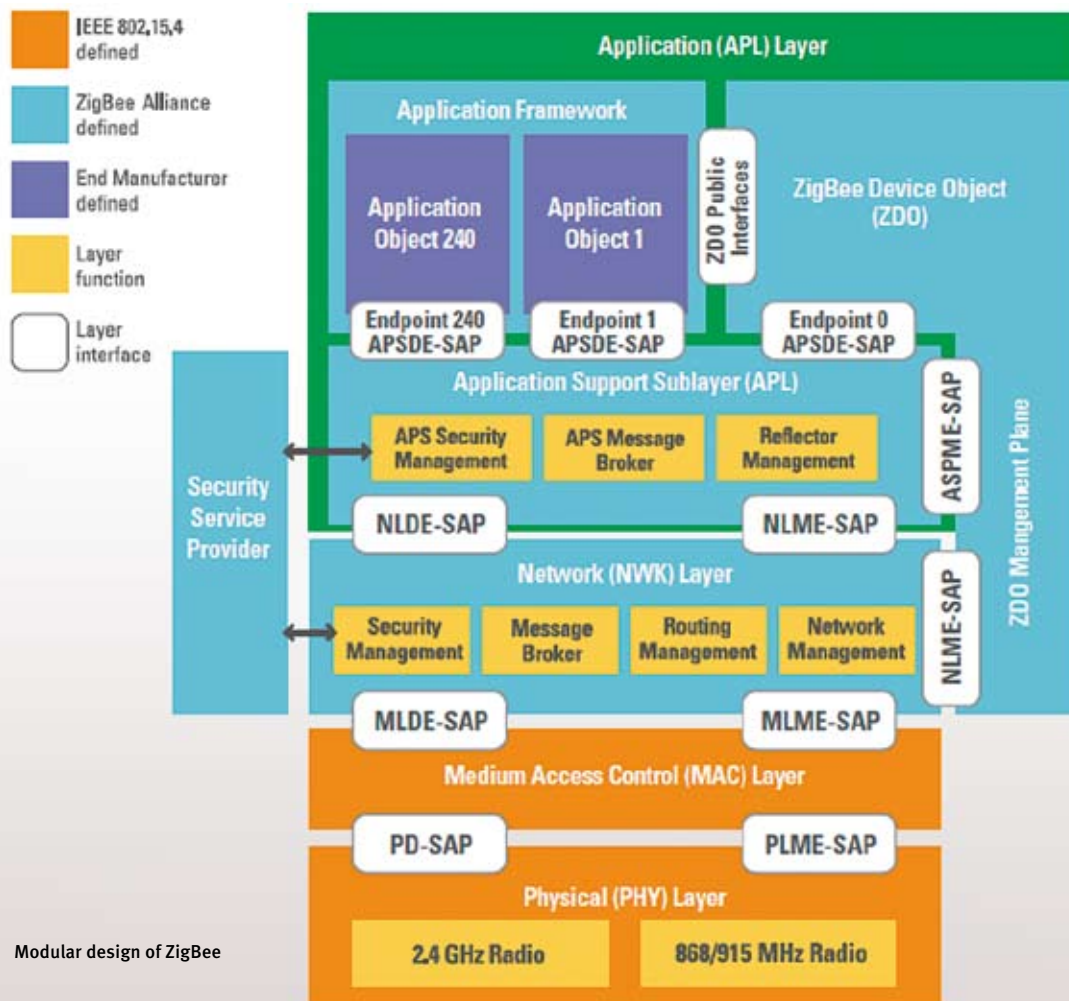
ANT very attractive for devices powered by batteries or accumulators – it's hardly surprising therefore that many well-known companies including Garmin, Adidas, Brooks, Timex and McLaren are members of the ANT+ Alliance. The first nine positions in the 2009 Tour De France were taken by riders with sports equipment featuring ANT+ technology.

To date, ANT is only supported by XPERIA mobile phones from Sony Ericsson and models from a few specialist manufacturers. "Although ANT is also technologically very interesting for many other sectors, because of the licensing monopoly it will probably only successfully break through in medical and healthcare applications where it has already been accepted as the de facto standard," assesses Hantsche. "If you look at the efforts Apple is going to ensure that its own standards are accepted as the 'must have' in an industry, ANT has achieved this more quickly and efficiently, probably because expensive licences are not required and the protocol has already been paid for with the acquisition of the transceiver chip."

Interest groups for medical applications

The Continua Health Care Alliance was formed in order to establish standards which are optimised for telemedical applications. For example, it defines the communications interface between data collectors, Internet servers and analytical services or the connection of sensor applications to the data collector, such as blood pressure monitors, scales or blood sugar monitors. Depending on the device, the ZigBee Health Care or Bluetooth Health Device (HDP) profile is available. As ZigBee always requires a coordinator, it is best used for intermeshed sensor networks, while Bluetooth with its restriction to seven participants is suitable for conventional point to point or point to multipoint connections (Piconet) on smaller networks.

Bluetooth LE is the most interesting for most medical applica-



Modular design of ZigBee

tions operated by patients themselves: Low costs, minimum power consumption, peak flows suitable for coin cells, global frequency standardisation and excellent marketing thanks to the Bluetooth SIG all speak for themselves. In the case of professional medical devices, it is to be expected that Bluetooth HDP will assert itself. Here the lower latency due to frequency hopping is an important argument for which the higher energy consumption will be accepted. The transceiver technology, processing of the more comprehensive protocol stack as well as the more comprehensive certification are also of less importance in the professional sector. The Bluetooth SIG guarantees compatibility.

On trend: Wireless-compatible system-on-chips

Several approaches are also available for implementation at

component level: In addition to pure transceiver chips, which require an external microcontroller for processing the wireless protocol, many developers are turning to certified wireless modules.

Here the levels of integration differ significantly in some cases, with the most popular being modules with antennas, controllers, quartz, programmed Bluetooth ID and the current certification. A new trend, particularly in medical devices, is wireless-compatible system-on-chips (SoCs). Not only do they contain the radio, a controller and wireless stack, but also a high-performance analogue circuit part with AD and DA converters, PWM, display controls as well as many other features and interfaces. "In comparison to designs with individual components, an SoC offers huge cost advantages, requires less space and needs less logistical handling in component procurement," explains Bernd Hantsche.

As system reliability is of the absolute highest priority in medical technology, it makes sense to keep the number of components, and therefore also the number of error sources, as low as possible. The same can be said for wireless system-on-chips, such as the particularly powerful Infineon MD8710, but also the smaller Infineon PMA5110, Nordic nRF-24LE1, ST STM32W or Renesas M16C/6B.

Understanding medical applications

The snapshot shows that wireless technologies are continuing to develop both in the hardware and software fields. This makes it difficult for developers to keep track of everything. In addition, when choosing a technology, (corporate) political aspects also play a role alongside commercial and physical factors. It is therefore crucial to the future sustainability of an application to know

which technologies market competitors or the IT sector are relying on.

In order to expertly answer questions such as these and to offer developers of medical applications the best support, Rutronik has established the Vertical Market Team Medical. This team, consisting of technology experts for semiconductors, passive components, wireless, displays, embedded boards and electromechanics, is intensively involved with the medical market, knows the specific requirements of the customers, the trends within the industry, all relevant formalities and political trends.

Along with the technical specifications, price considerations and availability, these aspects are also included in the consultation, and the customer does not just receive a technically feasible solution, but also a sustainable application with which it will still be able to assert itself on the market in the future. ■



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Telit® wireless
solutions
Making machines talk.®



Highly integrated single-chip solution for medical and healthcare applications

From the hospital to the living room and the gym

Medical devices are ‘on the move’: Blood sugar, blood pressure and heart monitors are increasingly being used away from their normal locations at hospitals and doctors’ surgeries, in patients’ homes. And fitness fans are also increasingly monitoring their physical condition themselves, with equipment traditionally reserved for use by medical specialists. This is made possible by more compact and cost-effective devices, featuring

highly integrated design. This trend presents developers with new challenges however: The devices have to be portable and user-friendly, and new methods of transferring and storing the sensitive data obtained need to be found. At the same time, the development of new technologies and expanding functionality means equipment needs to incorporate ever more components. Those demands can now be met with just one chip.

When using medical devices in the home, the data recorded must be transferred from the measuring device concerned to a local collection point where it can be stored. To enable users to retrieve, view and make an initial evaluation of their data from their home PC or from a mobile device such as a BlackBerry or iPhone, the devices need to be equipped with a simple, open interface. Many already provide USB ports, and some also feature Bluetooth, Zigbee or WiFi interfaces. This enables users to transmit data from their PC or mobile device to healthcare platforms such as GoogleHealth (www.google.com/health) and make it available to designated personnel, such as their doctor or fitness trainer.

counts more than 200 leading companies among its members, and the first set of standards has been drawn up. For all the relevant applications distributor Rutronik, working with Infineon, has now exclusively developed a single-chip solution featuring what is currently the highest level of integration in the medical IC field. The chip is designed especially for sports activity and healthcare and consumer medical devices. Potential applications range from simple heart-rate indicators in the gym, bike-mounted computer readouts or speed and step monitoring on blood sugar and blood pressure monitors, through to blood oxygen measurement and insulin pumps.

nua standards, enabling terminal devices to be very easily integrated into a standard ‘Personal Healthcare Ecosystem’. It also dramatically reduces the number of components required: For example, a conventional portable blood sugar monitor at present comprises about 12 integrated QFP component devices and a further 30 to 50 discrete components.

QFP components to between three and five and cuts the number of discrete components to about 15 to 30 – at lower cost, because the market price of the MD8710 is less than half that of the ICs otherwise needed. The platform concept underlying the MD8710 offers further savings. Thanks to flexible chip configuration, multiple devices can be implemented on one platform. The easy interchangeability of sensors and minimal software customization required means devices can be used in a wide variety of applications. This saves on expensive development time and significantly cuts the time to market for new devices.

In order to establish global standards for such a so-called ‘Personal Healthcare Ecosystem’, the Continua Health Alliance (www.continuaalliance.org) was created. The Alliance already

One for all: Single-chip solution

The single-chip medical device MD8710 conforms to Conti-

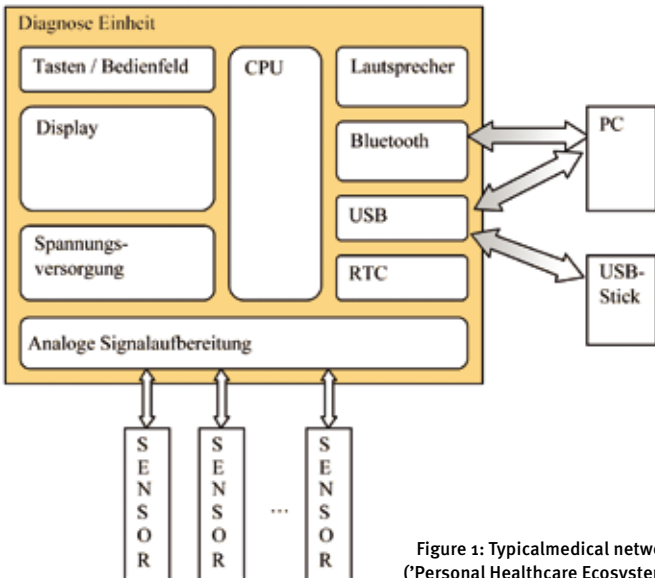


Figure 1: Typical medical network ('Personal Healthcare Ecosystem')

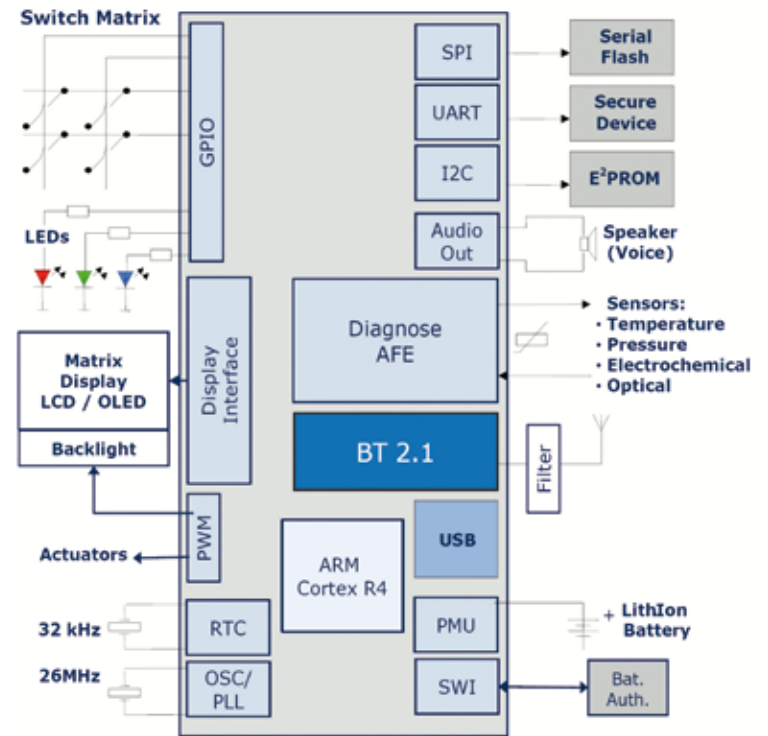


Figure 2: Block diagram – Infineon MD8710

Application example – Pulse oximetry

The example provided by the pulse oximetry application case illustrates the difference between discrete and integrated design. Pulse oximetry is a method for measuring the oxygen saturation of the blood. A pulse oximeter measures the light absorption when the skin on the finger is scanned. This is done with two different light wavelengths: The first is in the infrared range at 940 nm, as that is the location of maximum absorption of the oxygen-saturated hemoglobin (HbO₂). The second wavelength is at 660 nm, where the non-oxygen-saturated hemoglobin (Hb) absorbs the most light. The oxygen saturation of the blood is determined from the ratio between the two measured values.

Because of the constant absorption rate of the tissue, there is a high DC signal component. The AC signal component is caused by the pulsating blood. The exact AC and DC components respectively depend heavily on the light intensity and the tissue absorption. Owing to the variable blood flow through the tissue, there may be dramatic fluctuation of the AC component, which may be between 0.01 % and 10 % of the DC component. Maximum DC compensation is essential in order to determine the relative hemoglobin content. In the first step, the pulse oximetry signal is a current signal through the photodiode (measurement of the light absorption). For further processing, a transimpedance amplifier converts this into the required voltage signal. This is followed by the aforementioned DC compensation, by way of an additional OP stage.

In the discrete configuration this produces the block diagram of Figure 3.

Applying the measurement technique to the MD8710, almost all discrete components become superfluous. The chip is able to handle all the essential pulse oximetry functions. The dynamism of the absorption is in the range between 50 and 20,000 values (14 to 15 bits). For detailed analysis only a limited range is required however. As the delta-sigma converters of the MD8710 are specified with 16-bit resolution, error-free conversion is guaranteed and pulse oximetry can be carried out without problem. A noise analysis confirms this result. The block diagram then looks as shown in Figure 4.

As in the case of pulse oximetry, virtually any application in the sports activity and healthcare or consumer medical sphere can be implemented by the integrated solution offered by the MD8710, and the devices can be integrated seamlessly into a 'Personal Healthcare Ecosystem'. The cost saving on components usually also justifies the redesign of existing discrete solutions. And new market opportunities are opened up to the device.

For more on the module visit: www.rutronik.com/elwis.

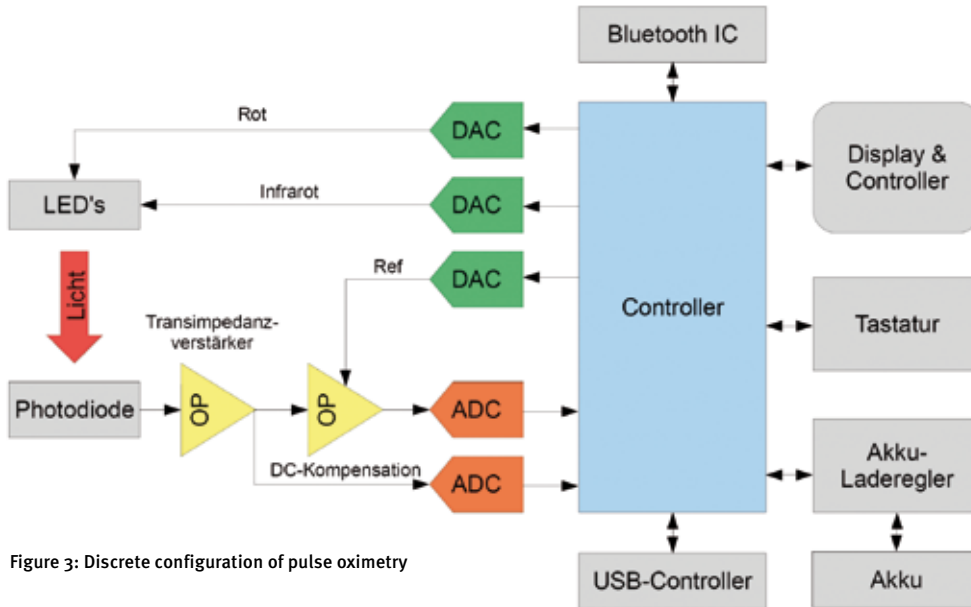
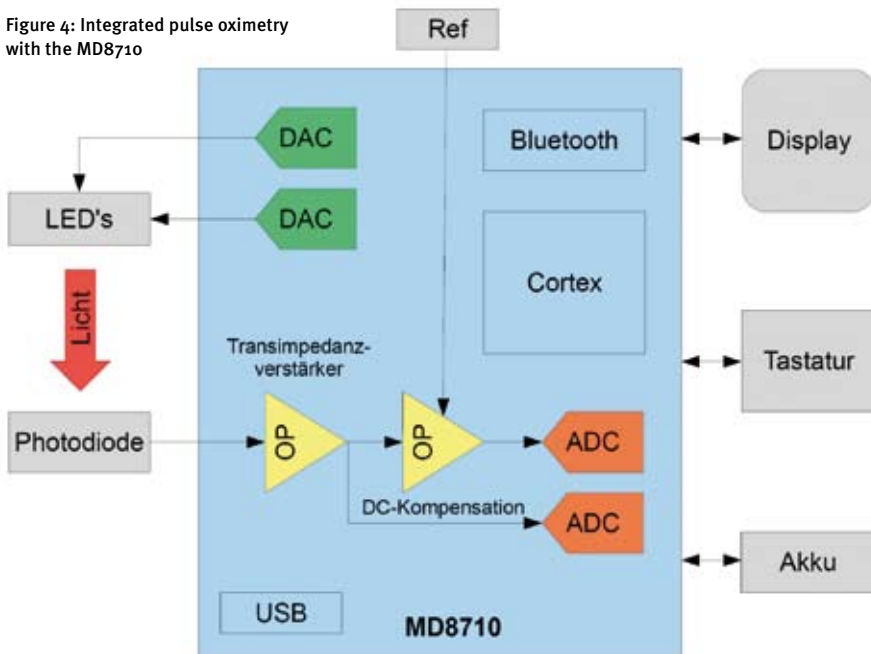


Figure 3: Discrete configuration of pulse oximetry

Figure 4: Integrated pulse oximetry with the MD8710



MD8710 components

The central component unit of the MD8710 is a powerful ARM Cortex R4 processor, combined with a comprehensive memory protection unit, an interrupt controller, a DMA controller and a watchdog timer. The module's analog front end allows for applications entailing high analog signal processing demands. It features two independent 16-bit ADCs and two 16-bit DACs. The DAC channels can be fed with data from an integrated 'wavetable', so no additional DSPs are needed. Two configurable OPs per ADC provide an analog pre-processing facility, such as transimpedance amplifiers for current inputs. Providing further system integration, the MD8710 features a 12-bit ADC with four external auxiliary multiplex inputs and a temperature sensor. The facility for synchronous sampling of the ADCs also permits com-

plex measurements, such as impedance spectroscopy for blood analysis. For data exchange, there is a USB 2.0 port and an on-chip Bluetooth module, as well as I²C, SPI and UART interfaces. The power management unit (PMU) generates all the required voltages and at the same time monitors all internal supplies using just a few external components.

It can handle a variety of power-saving and wake-up scenarios, and manages charging of a LiIo or LiPo battery. For security purposes (such as battery authentication), there is an integrated interface for an externally connectable Infineon ORIGA chip. The MD8710 also features a display controller which supports Matrix LDCs. Audio functionality is provided by a class-D output stage. As a result, the MD8710 provides all the key functionality for portable, battery-powered devices in the 'Personal Healthcare Ecosystem'.

New receiver module from Fastrax

GPS and GLONASS hybrid positioning

Everyone has typically more than one GPS receiver in use every day, either in navigators, smart phones, car alarms or sports devices. GPS is a de-facto standard for positioning and people use it as a synonym for satellite positioning. However, there is more than GPS in positioning, at least 3 or 4 Global Navigation Satellite Systems (GNSS) are available. One of the best known of these GNSS systems is GLONASS.

GLONASS is a global positioning system, equivalent to GPS. While the latter is maintained by USA, GLONASS is of Russian origin. There are 22 satellites currently visible around the globe, covering some parts better than the others, similarly to GPS. They are 19.100 km above the earth on three orbital planes. GLONASS satellites transmit two types of signal: a standard precision (SP) signal and an obfuscated high precision (HP) signal. They use similar DSSS encoding and binary phase-shift keying (BPSK) modulation as in GPS signals. All GLONASS satellites transmit the same code as their SP signal, however each transmits on a different frequency using a 15-channel frequency division multiple access (FDMA) technique. Presently they become modernized, new GLONASS-K satellites with CDMA are being launched every year to improve the system and finally to replace the older ones. The final GLONASS constellation will consist of 24 satellites. Today, the accuracy of GLONASS is in the range of 5m, while commercial-level GPS receivers can reach an accuracy of 2-3m. But both systems are targeted to reach higher accuracy soon.

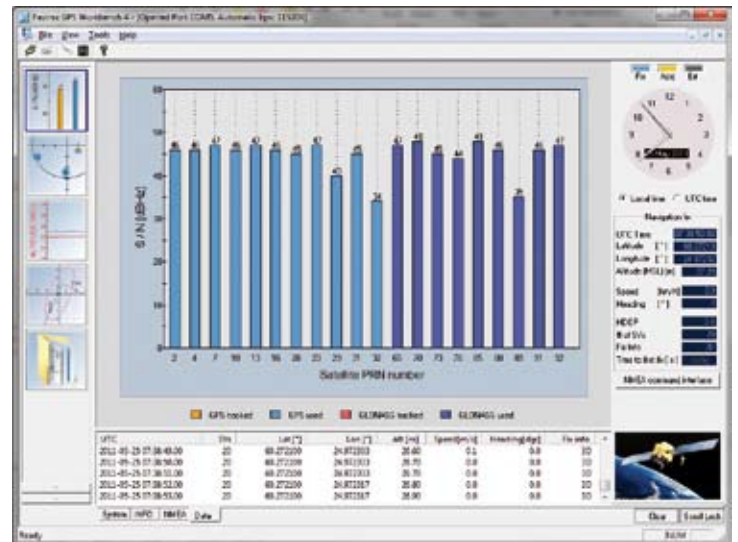
Hybrid Positioning

When a receiver is using more than one satellite system in positioning, this is called hybrid positioning. The advantages of this method are obvious: When using both GLONASS and GPS systems, the number of available satellites is more than 50. So the receiver has a high likelihood of seeing

enough satellites even in very dense urban areas. The accuracy of hybrid systems can be as good as 1,5m under open sky. However, the biggest benefit is to have a good accuracy where one system is failing due to low number of visible satellites. The third benefit of using hybrid positioning is security. In case of failure of one GNSS system, a GLONASS + GPS receiver can still use the functional system to continue navigation with.

Receiver Module for GLONASS, GPS and Galileo

Fastrax has recently released a new receiver module to support several GNSS systems, most importantly GPS, GLONASS and the Galileo, the upcoming European system. At the moment, the Fastrax IT600 is capable of positioning



GPS Workbench screenshot. 20 SVs in position fix.

with GLONASS and GPS, the support for other GNSS will be added later. Having the size of normal GPS receiver, the IT600 can be used to add hybrid positioning to improve the navigation quality and availability, with the support of dead reckoning.

Hybrid GLONASS and GPS receivers like the Fastrax IT600 can be used in lots of applications, where the availability of position fix is important, or when the accuracy of the position is meaningful for the operation of the device. Most commonly this type of applications are tracking devices or stolen vehicle recovery applications.

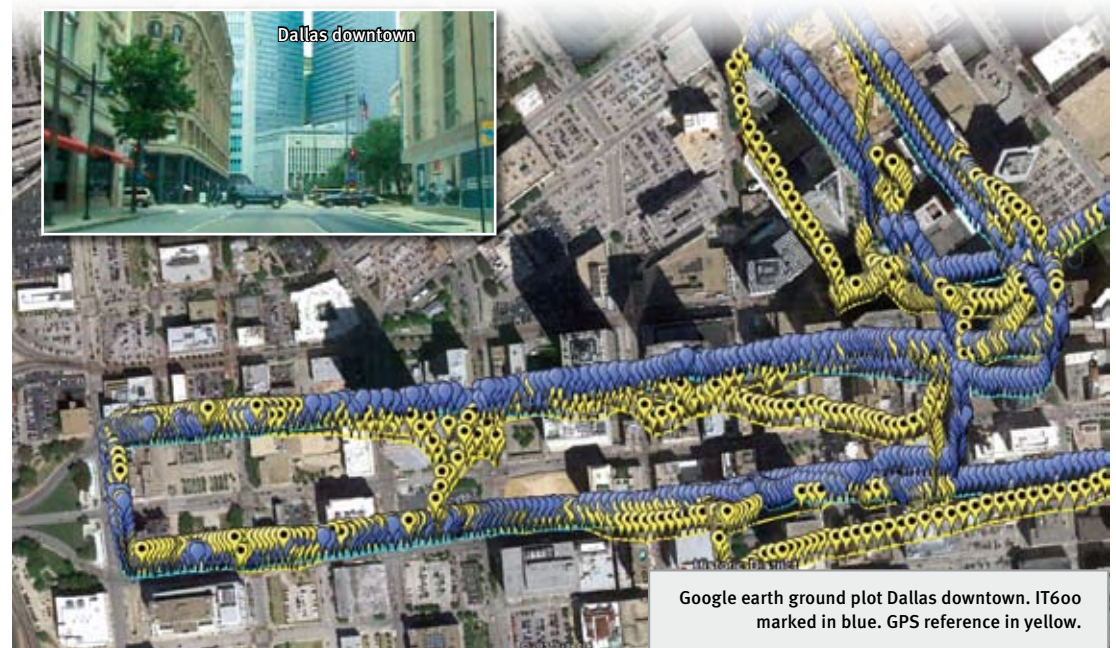
To test the effect of having visibility for satellites on both sys-

tems, Fastrax tested both systems in Texas, Dallas downtown.

GPS-only vs. Hybrid-positioning

In the line-up: The IT600 and a leading "GPS-only" receiver. Both test setups had obscured an antenna placed inside a car.

The results show, that in difficult conditions, the GPS-only solution drifted from the real position over 100 meters. The IT600 utilizing both GPS and GLONASS had a far more accurate position presenting the real route. Sometimes the SV (Space Vehicle) count used to positioning was double compared to GPS-only solution!



Google earth ground plot Dallas downtown. IT600 marked in blue. GPS reference in yellow.

Rutronik and Scorpion Automotive develop new Vehicle Tracking Platform

On the right track

1.5 million car related thefts were recorded in 2007-2008 according to the UK home office statistics. To help owners of vehicles not to be among the theft victims, Scorpion Automotive developed a new vehicle tracking platform. With the support of Rutronik, the manufacturer now successfully offers a low-price technologically advanced system.

For the new vehicle tracking platform, Scorpion had clear objectives: It should be a MCU based, low-power system, that is compact and robust on a budget that would compete aggressively in the after market automotive arena. With these specifications, they approached Rutronik to cost up and recommend components solution.

The core components that Rutronik had to select, were a GSM and a GPS module and the microcontroller. For the GSM slot, Rutronik chose the GE864-QUAD module from Telit. "It is a small quad band, low power module with an extended temperature range, that was proven to be very reliable and competitive", explains Lee Trueman, Field Application Engineer at Rutronik. "Above that, its BGA low profile package reduces the cost of production and PCB assembly significantly."

High performance, low-power components

For GPS capability, Rutronik proposed a Fastrax UP500 GPS receiver module. With its embedded GPS antenna, the module offers high performance navigation, allows the easy integration to the host system and offers a compact, capable and cost effective solution.

Its good acquisition sensitivity enables fast position fix in harsh urban canyons or blocking environments, removing the need for external antenna. The power supply and serial data is all that is required to make the receiver operational. The module supports also dedicated control commands for external control for the

operating state. The UP500 has built-in PCB-mounting flanges and standard 2.54mm IO-pin pitch, which enable easy and reliable mounting on host PCB.

Today, Fastrax UP501 is the successor of the UP500. It offers further improved sensitivity due to the MT3329 chipset with -148 dBm (Cold Start Acquisition) and -165 dBm (Navigation). Therefore, the UP501 can have a fix even indoors when necessary. Compared to its predecessor, it scores also with an improved power consumption of 75mW at 3.0V and a tiny form factor of 22mm x 22mm x 8mm.

The microcontroller was supported by Microchip. They proposed the a 16 bit high performance MCU with Flash/ Ram, extended temperature range and system robustness which are not matched on price or specification by any competitor.

Extensive support makes development easy-going

"Rutronik supported us outstandingly by providing us with all relevant data such as application notes, datasheets or user guides", explains Peter Stone, de-

sign engineer at Scorpion Automotive. "Rutronik FAE Lee Trueman visited us regularly and supplied samples, Telit's evaluation kit and advice with software and testing the components. They provided competitive costings and efficient supply of components for testing and pre production evaluation. Due to this comprehensive and competent support, we were able to approve the components very quickly and easily."

The Telit Support, based in Italy, validated Scorpion's schematic and Gerber files to ensure that the design was efficient and compliant to wireless and automotive approvals. Within just a few weeks, the parts proposed by Rutronik were approved on Scorpion's board. Directly afterwards, Rutronik supplied the first production volume for field trials. After they have been completed successfully, Scorpion ramped up production.

Not to be without a trace

Scorpion Track offers an insurance approved pin-point GPS tracking in both a stolen vehicle scenario or simply via 24 h web based



Scorpion Automotive

Based 20 miles north of Manchester, England, Scorpion Automotive is a leading supplier and manufacturer of OE & after-market Vehicle security / alarm systems and automotive electronic devices such as Radar/ Microwave sensors, LED assemblies etc. Since 1973, their in house hard- and software

team offer a service in taking a concept to prototype development through to volume builds in their own SMT manufacturing facility.

Scorpion is an approved supplier for Subaru, Iveco, Ford, Renault DAF, Aston Martin and others.

access worldwide. The position(s) of the vehicle(s) are plotted on a full road map with terrain option. Upon illegal movement detection, the tracking system discretely notifies the Scorpion international control centre of a possible theft. The monitoring staff will contact the car owner with details about the vehicle movement in order to confirm a theft in line with current Police legislation and procedures. Any alarmed vehicle is tracked until the recovery or a false alarm has been confirmed. Once a theft has been confirmed and a crime reference number has been obtained from the Police, Scorpion Track operatives will liaise with the Police in order to recover the vehicle. Upon recovery, the Scorpion Track operator will arrange the return of the vehicle. Scorpion Track is fully approved to the Thatcham TQA standard for Stolen Vehicle Recovery systems and will therefore cater for all insurance requirements.

When Telit came out with the GE864-QUAD-V2, a cost reduced light version of the GE864-QUAD, the adaption into customers design was made very quickly without big efforts to save further investments. So Scorpion was able to push the expansion of their product with their major clients. Despite economic growth cooling off in the UK in 2011, Scorpion's ramp up of this part has gone from strength to strength.

In May 2011, with the support from the key suppliers, Rutronik secured a major contract to supply Scorpion a kit of the wireless parts and microcontrollers in high volumes. "We choose these parts from Rutronik because of the core strengths of offering experienced and specialised technical local support attuned to our needs backed up by Rutronik's strong relationship with market leading suppliers", emphasizes Scorpion design engineer Peter Stone. ■

Fast on the final straight

Power consumption in tracking devices

Where is it? Tracking devices are there to provide answers to this question - whether the item in question is freight, a lorry, a painting, a destination or a geocaching cache. In all cases: GSM and GPS modules are the essential components in terms of functionality, value and power consumption. Power consumption is not only of central importance for battery powered

The measurement results: The power requirements of the modules varied greatly depending on the operating state, ranging from 1 μA in stop mode to 2 A and more in transmission mode. Accordingly, the average values vary from application to application depending on the mode used most in each case. For instance, a tracking system which simply monitors an oil painting hanging on a wall only uses a few microamps. It is in standby mode practically the whole time, only starting a transmission when and if the alarm goes off. The application returns an average consumption of 480 mA for GPRS class 10 and an output level of 2 watts.

However, as the power requirements fluctuate greatly, such average values are only useful to a certain extent. Some components must be dimensioned to cope with the peak values. And an optimization of the device's power consumption is only possible when data is available for each individual mode. This is what Rutronik has now documented with the aid of the measurement series. The current peaks were registered using a storage oscilloscope. The measurement resistance of 100 mOhm was connected in series with the Telit GL865 Quad GPRS module. „We selected the measurement procedure with the intention of gaining generally valid data providing a solid decision making basis for all device development programmes,“ explains Harald Naumann, Field Application Engineer Wireless at Rutronik.

The results:

- **1 μA : in stop mode**

For efficiently designed applica-

tions the power consumption in stop mode is even less than the battery's self-discharge rate. Microcontrollers such as the Renesas RL78, which are optimized for extremely low power consumption, require 70 μA per MHz and 0.52 μA in stop mode. In this case the GPRS module is switched off and galvanically isolated. The microcontroller and the self-discharge rate are the main factors influencing the maximum application lifetime.

- **1.5 mA: GPRS module in idle mode** for receiving an SMS or voice call, data (CSD) or fax. In this mode it is not possible to set up a GPRS connection.

- **21 mA: in GPRS receive mode** and connection to server in internet.

- **230 mA: with GPRS class 8 during transmission**

A fax, voice and data transmission or a GPRS connection in class 8 requires up to 230 mA on average in the GSM bands 850/900 at the highest performance level.

- **360 mA: during transmission with GPRS class 10**

The GPRS module transmits more quickly in GPRS class 10, causing the average module current to double, up to 360 mA.

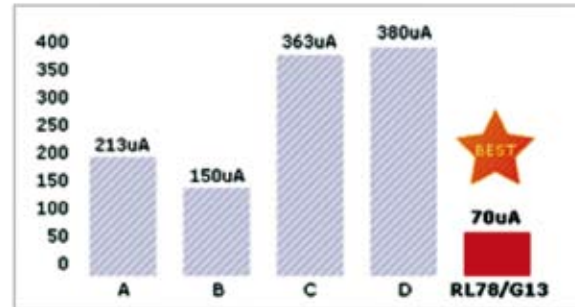
- **1 ampere**

Peak current in the GSM bands 1800 and 1900 rises to as much as 1 ampere. Here, the GPRS data is transmitted in packets.

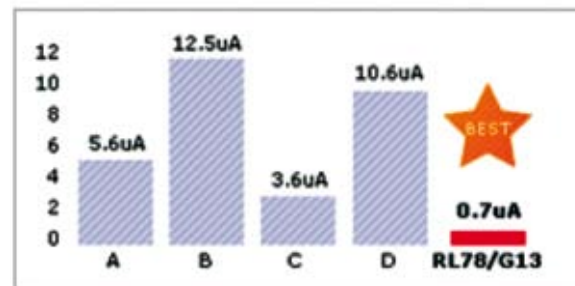
- **2 amperes**

The peak current when using GSM 850 or 900 reaches 2 amperes. This current may be reached

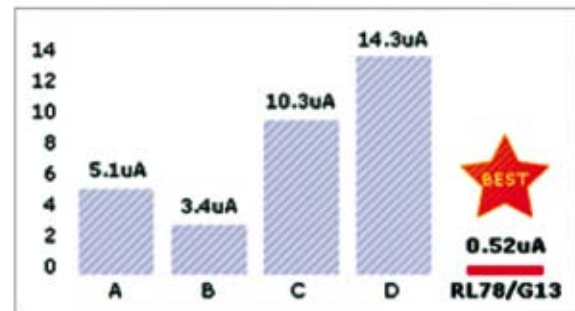
tracking devices, but in view of possible power supply fluctuations and peaks it remains a critical factor for mains fed devices as well. It is not possible to give a wholesale answer in respect of power consumption. Therefore Rutronik has conducted a series of measurements of consumption in various operating modes.



RL78
70 μA
per MHz



RL78
with 0.70 μA
in 32 KHz Modus



RL78
with 0.52 μA
in stop mode

both when sending and receiving an SMS as well as during handover between two base stations. Therefore it is advisable to dimension the decoupling capacitor near the module to cope with peaks of 2 amperes. It is also important to take account of the impedance of the batteries and/or the DC/DC converter.

- **More than 2 amperes**

Some GSM modules raise the current above 2 amperes in order to compensate for poor antennae. A base station demands more transmission capacity from the module

if the antenna loss is too high. This means that inferior antennae cause extra power consumption. Developers should therefore aim for high-quality antennae design in order to reduce power requirements.

As wireless expert Naumann points out, „The measurements show just how large the differences really are. Basically, any value between 1 μA and 2 A is possible. Also, our measurement series has highlighted how much energy is required simply to log into a GSM network.“ As shown in the figure at the top of page 21 the power

consumption while the tracking device was switched on and the PIN was entered. Several 2A peaks can be seen, repeated after a short pause. They result from a renewed search for a base station because the first station had no free capacity. As described, the peaks reach 2A and the average consumption current is 230 mA. In the experimental setup 2A peaks were measured for as long as 4.5 seconds. During this time this amounts to a consumption of $230 \text{ mA} \times 4.5 \text{ s} = 1035 \text{ mAs}$. If setting up the connection only took 1 second, this would amount to a consumption of only $250 \text{ mA} \times 1 \text{ s} = 230 \text{ mAs}$.

GPS module operating modes

The following sections contain examples for states encountered in operating GPS modules. Of the many power saving modes used, only the SiRFaware™ mode is used as an example here. The degree of accuracy increases with the number of GPS channels used, but so does the power consumption. The number of GPS satellites which can be reached is limited by the curvature of the earth. The latest models are able to receive signals from five different satellite systems in parallel. In Europe, GPS and Glonass are available at present, and in the near future Galileo will be added to the list.

● 58 mW with GPS

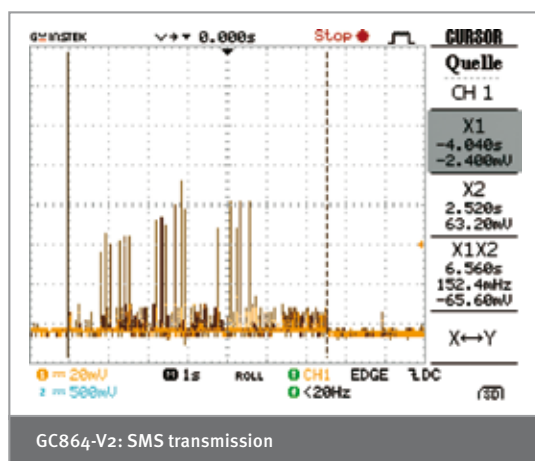
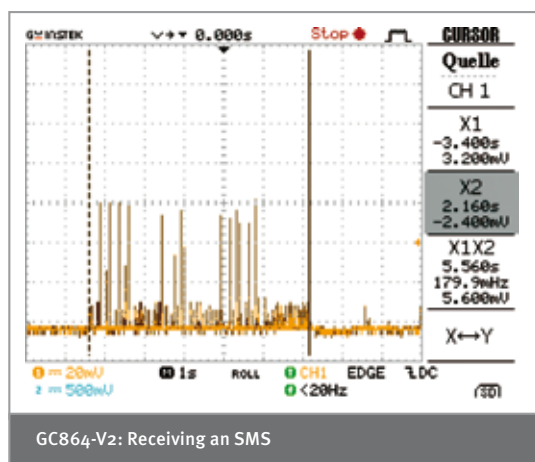
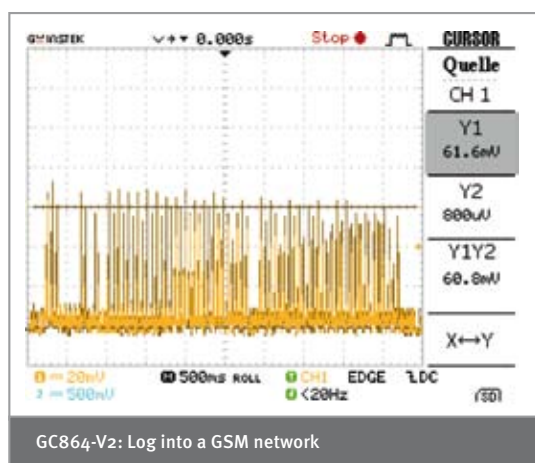
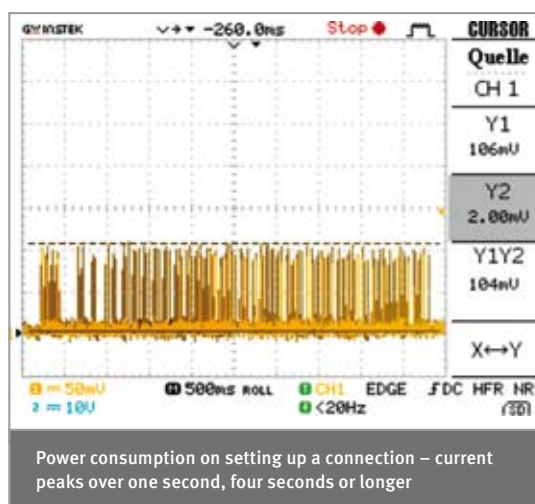
$58 \text{ mW} / 3.8 \text{ volts} = 15 \text{ mA}$ or $70 \text{ mA} / 3.8 \text{ volts} = 18.4 \text{ mA}$. A decisive factor towards minimizing the power consumption consists in reducing the time needed for the initial position determination. A-GPS can provide for a significant reduction. Developers who use the GPS modules from Fastrax can obtain free access to the Fastrax A-GPS server for this purpose. In this way they can speed up the positioning process and minimize the power consumption of their devices.

● 500 µA for SiRFaware™

For applications which require frequent GPS position updates, the use of SiRFaware™ is to be recommended. This technology downloads the ephemeris data in the background. At the same time the real time clock is synchronized. On average, this requires 500 µA of current. This represents a significant saving compared with the power consumption without SiRFaware™, when positioning takes longer.

● 150 mW with GPS/Glonass

For applications which must supply highly reliable data in critical situations, energy efficiency is of lower priority. In such cases it often makes sense to accept high-



er power consumption. Thus when using a combined GPS/Glonass module such as the Fastrax IT600, the power consumption increases with the number of channels which the module actively uses for satellite reception. At the same time, the quality of the positioning increases. Up to 32 channels can be received in parallel. During a test conducted in Paris, it was possible to receive 21 channels simultaneously. As the IT600 can also receive signals from the Galileo system, the 32 channels will be exploited to the full when this satellite system is put into operation. Altogether the Fastrax IT600 can process signals not only from the American GPS, the Russian Glonass and in future from Galileo, but also from the Japanese QZSS, Chinese Compass and all SBAS systems.

The selection of the GPS module or GNSS module (Global Navigation Satellite System), the A-GPS or A-GNSS concept and the right energy saving mode all have a major influence on the power consumption and the standby time of a tracking device. „However, this is anything but trivial, because there is no such thing as the right GPS module or one uniquely suitable energy saving strategy,“ says Harald Naumann.

So before starting to design a device, developers should pose themselves a series of questions: Will a GNSS module that supports GPS be sufficient or will a hybrid GPS/Glonass/Galileo be necessary? Does it make sense to use A-GPS? Will interfaces for gyrometers, acceleration sensors, pressure sensors, magnetometers or speed sensors be useful? Should a suitable prototype be developed first in order to test which sensors help most with the positioning? Is one of the five energy saving modes useful, and if so, which? Which antennae are most suitable? When answers to all of these questions have been found, the same factors should be considered for the GSM/GPRS module: Is GSM sufficient? Is GPRS necessary? Can USSD be implemented to lower energy consumption? How can compliance with SAR, the European R&TTE, the American FCC and PTCRB, the European ATEX (Atmosphäre EXplosible) or the Brazilian Anatel standards be achieved? Which energy supply concept or which battery should be used? These complex decision making processes can quickly lead developers without sufficient knowledge of wireless technology astray. The distributor's experienced product and application specialists can provide support to help designers navigate quickly and safely to the final straight. ■

Highly efficient switching regulators save energy, space and cost

Full power without cooling

Linear regulators are often preferred due to their low price, a strong argument at high volumes. Whether they are cost effective is not a question of just the component cost, but rather of the energy consumption during the lifetime of operation.

When the input voltage rises above the drop-out threshold a linear regulator efficiency will continue to drop and waste electrical energy as heat. The losses are related to the current and the voltage dropped across the regulator. The larger the voltage drop, the greater the heat generated. This heat has to be managed, usually by costly heatsinking. Switching regulators are renowned for their efficiency, with well-designed types achieving up to 97% conversion efficiency. With high efficiency comes lower losses and less heat generation, which in turn allows ambient operation to 85°C.

Advantages of efficient switching regulators

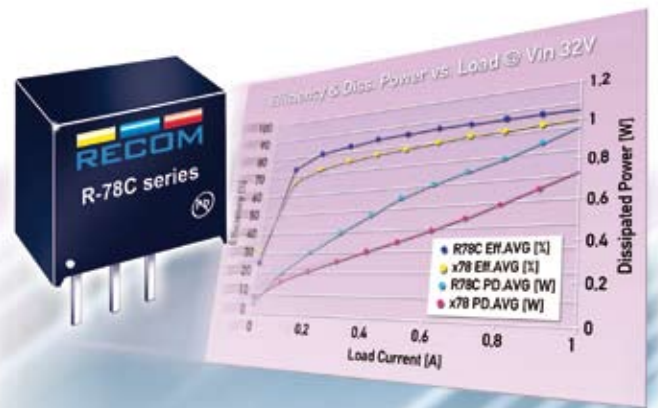
As soon as the input voltage widens, the efficiency starts to decline. Low efficiency translates into higher energy losses. Regulating down a voltage of 32V to 5V at 1A generates losses of 27W in a linear regulator. In the case of the Recom switching regulator type R-78C this value is reduced to 0.7W.

Stable high efficiency with varying load

The Recom 15V/1A regulator R-78C15-1.0 has an efficiency of 94% at 42V input and 96% at 18V input, which is just a 2% difference, no comparison to the linear regulator which remains well below 50%. The new R-78C switching regulator also compares very favourably with other brands. Comparison tests with competitive 5V/1A switching regulators at 32V input and varying load put the R-78C (fig. 1, blue curve) ahead with an efficiency 5-10% better than comparable regulators (fig. 1, yellow curve). This may not seem significant, but the effect on losses, particularly in the medium load sector, is substantial with the R-78C generating approx. 40% less losses (fig. 1, red line below).

Noise levels lower than expected

Switching regulators are commonly assumed to be electrically noisy, and are often shunned in critical applications. The new Re-



com R-78C switching regulators show that this is no longer the case. Noise levels are between 20 and 40mVpp, depending on the model, and therefore are better by a factor 2 than the best competitive product. This was achieved by careful design, reducing noise peaks with an internal filter and by operating at a very high switching frequency of more than 400kHz. The R-78C do not require additional external filters in most applications. By simply applying an external 40kHz low-pass filter, noise peaks can be further reduced down to 5mVpp.

High power density – no isolation

Measuring 11.6x8.6x10.4mm (H x W x D) all R-78C switching regulators are very compact and the power density is close to 15W/cm³. All converters are short circuit and overload protected. They

operate in hiccup-mode until the fault is eliminated. The ambient temperature is specified between -40°C and +85°C, whereby derating has to be observed at the upper limit. The thermal overload protection switches the converter off, until a pre-set temperature limit has been reached.

R-78C-switching regulators are EN-60950-1 certified and RoHS 6/6 compatible. The MTBF calculated to MIL-HDBK 217F at 25°C is 13.3 million hours. Warranty extends to 3 years.

High efficiency, low noise, high power density of 15 watts/cm³ and an input of up to 42V puts this new product at an advantage to standard linear regulators, thus increasing the trend toward “energy saving converters”.

Further Informations:
 RECOM Electronic GmbH
 info@recom-electronic.com
 www.recom-electronic.com

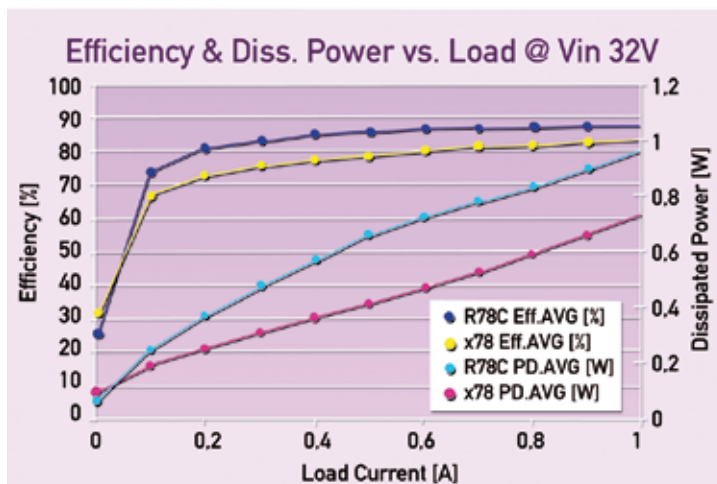


Fig. 1: With 32V input and 5V output the new R-78C reaches 88% efficiency 10 points higher, with 40% reduced losses.

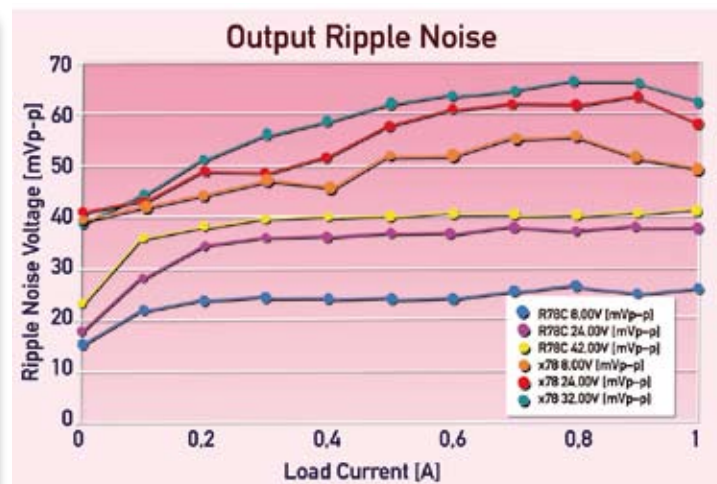


Fig. 2: The ripple of the R-78C is significantly lower than of competitive products, thus eliminating the issue of “external filters”.

Connectivity between devices

Interconnecting everything using Wi-Fi

Connectivity between devices has become one of the major necessities for most embedded systems. The need to quickly and cost-effectively connect devices, be it in the automotive, medical, consumer or industrial sector, has been made possible by wireless technology. WLAN (or commonly called Wi-Fi®) technology has enabled interconnectivity between devices and also to the internet, while technologies like Zigbee, Bluetooth have also been used for various wireless applications. 802.11n is the latest WLAN standard that is fast replacing legacy WLAN (802.11b/g) and even Zigbee and Bluetooth.

Why Wi-Fi and why 802.11n?

Wi-Fi has become the default technology to impart standards based IP connectivity to devices starting from mobile phones to medical equipment to your

household air-conditioner. A single internationally accepted WLAN protocol suite ensures the thousands of devices, made by manufacturers all over the world, work seamlessly with one another. Easy installation of wireless infrastructure, minus the costs of laying and maintaining physical

cables has made WLAN technology even more valuable.

802.11n is the latest WLAN protocol that has taken over in the wireless world, staging a phase-out of the previous technologies like 802.11b/g. 802.11n supports higher data rates and better power consumption performance. This obviously is advantageous for applications where higher throughputs are required, but is also significant for systems working at low throughputs (such devices can quickly transmit data and go back to sleep, turning off the RF, the primary power consumer, faster than 802.11 b/g can). Beyond the faster physical data rates, 802.11n has a more efficient error correction mechanism, employs frame aggregation to share

overhead instead of repeating the overhead per frame and can also use "channel bonding" to create a larger bandwidth (40Mhz) channel by combining to 20 Mhz adjacent channels, providing bandwidths of up to 300Mbps using a single antenna configuration.

Networking equipment providers are moving en-masse to 802.11n, which is a significant development for every manufacturer that makes a device to connect to a WLAN network. 802.11b/g brings down the overall capacity of an 802.11n network, so to ensure that devices that connect to modern WLAN installations do not hurt the network performance, they have to be 802.11n. In other words, 802.11b/g is not future-proof, while 802.11n is.

Wireless Everywhere

Yageo offers a wide range of high frequency products for wireless applications, including metal antenna, patch antenna, PCB antenna, LDS antenna, FPC antenna, active antenna, and chip antenna. We also provide customization service to meet specific requirements.



Patch Antenna



Chip Antenna



Active Antenna



Metal Antenna

Key Features

- Seamless wireless application coverage: RFID, DVB-T/H, GPS, Bluetooth, UWB, WiFi, MIMO, UMTS, WiMAX and LTE
- Surface mountable and LTCC technology, meet the compact and low-profile requirements
- Mechanical effect / Body effect consideration
- Embedded antennas with good radiation performances
- Compact-size antennas with light, thin, short and small characteristics for mobile devices

www.yageo.com

Wi-Fi beyond the traditional networking application

Gone are the days when Wi-Fi was considered as the technology to wirelessly connect computers in an office. Today, Wi-Fi has penetrated multiple new markets including consumer, industrial, medical and automotive markets.

Wi-Fi in the automotive market

The automobile has become more than just a medium of transit. Passengers in vehicles can now connect to media, listen to songs, check the internet and watch movies with their Wi-Fi enabled devices like Tablet PCs or laptops, while a “media-farm” inside the vehicle can act as the server.

Sensors in high end cars, like rear view cameras, tachometers, seat belt sensors, acceleration and harsh-braking sensors can now be interconnected with ease. And further to this, all this data can be accessed and monitored by any fleet management system through the internet.

3G to Wi-Fi converters have enabled multiple users to share a 3G connection inside the vehicle using their Wi-Fi enabled devices.



Wi-Fi in the medical market

Today’s hospitals are increasingly turning mobile. Expensive equipment are shared and moved from one place to another. Wi-Fi enabled equipments log patient data like blood-pressure, heart rate, body temperature and stream the data wirelessly across the Wi-Fi installation of the hospital to a doctor, who can monitor these real time signals using a Tablet PC or a hand held device. Critically ill or elderly patients are monitored 24x7 from even outside the hospital using a secure IP network, and appropriate alarms can be generated. Fall-susceptible patients can be located inside the hospital using Wi-Fi locationing engines, while traditional GPS fails in indoor environments. Because

Wi-Fi can be designed to consume very low power, such devices are typically battery operated.

Wi-Fi for consumer applications

Wi-Fi is the right connectivity target for home appliances. Want to switch on the AC by sending a command from your smart-phone through the internet before reaching home? Want to stream a movie from your Tablet PC or phone to your widescreen TV? Wi-



Big Power in a Small Package. No External Heat-Sinking: The Original – Now in the 3rd Generation.

NEW! The most efficient 1A Switching Regulator worldwide

RECOM's R-78 switching regulators have grown in the last 5 years to become the industry benchmark as a replacement for inefficient linear regulators. The new generation of the R-78C beats all the “me-too” copies by a mile. The R-78C is specified higher

than any comparable product: the power density has been doubled to 15W/cm³, the input voltage increased up to 42V, while still maintaining high efficiency, an operating temperature up to +85°C, short circuit protected outputs and overload protection.

www.recom-electronic.com

Basic Features:

- ✓ 8:1 Input Voltage Range up to 42V
- ✓ High Efficiency up to 96%
- ✓ High 15W/cm³ Power Density
- ✓ Continuous Max. Output Current (1A) Low
- ✓ Standby Current (1mA)
- ✓ -40°C to +85°C Operating Temperature
- ✓ SIP Case compatible to TO-220 footprint
- ✓ 3 Year Warranty

Fi is the solution that enables such applications. The high throughput, and zero-configuration, one click connectivity makes user operation hassle free. The latest peer-to-peer form of Wi-Fi, called Wi-Fi Direct™ makes it possible to connect two devices together, without any access point or router in between. Using such technology, a wireless digital camera can display photos on the TV or on a digital photo frame, while a set of wireless speakers can play music from your phone, much like Bluetooth does, but only at much lower data rates and ranges.

Wi-Fi for smart energy

Wi-Fi is gaining significant traction in smart energy applica-

tions. The advantage of Wi-Fi over other wireless technologies in the field (such as Zigbee) is the accessibility of real time energy data from the site of consumption, by any secure device connected to the internet. Such IP connectivity has never been offered by traditional Zigbee installations.

Wi-Fi has opened the doors to unprecedented levels of monitoring, adapting to peak load conditions and automated consumption regulation. Data from multiple geographical points can now be aggregated at a central server, leading to the realization of a true smart grid where load balancing and consumption efficiency measures are taken on holistic, aggregated data.



System architecture for Wi-Fi enabled devices

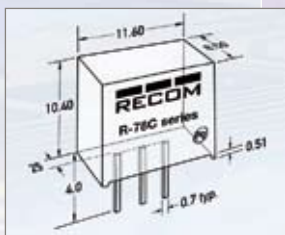
Wi-Fi modules can connect to the internet using standard WLAN equipment. Data from sensors and peripherals can be accessed through the IP network for monitoring purposes, while the Wi-Fi enabled host can be controlled remotely using a mobile device. Wi-Fi modules or chipsets come with standard interfaces like SPI, SDIO, UART or USB. Different interfaces provide different throughputs. For example, an SDIO inter-

face can provide throughputs of the order of 40 Mbps using 20 Mhz wide 802.11n channels, while SPI and UART can provide 10 Mbps and 3 Mbps of application throughputs respectively. These are illustrative numbers and actual performance can vary across systems depending on the clock frequency used for data transfer, controller capacity to process the data etc.

In terms of software integration, manufacturers provide fully integrated solutions so that the Host controller needs only to write the top-level applications with-



R-78C-family with input voltage range of 5V to 42V



Double power density from a standard SIP3 package



3 year warranty – RECOMs high level quality guaranteed



RUTRONIK
ELECTRONICS WORLDWIDE

RECOM

out worrying about Wi-Fi implementation. There is flexibility to use a third party TCP/IP stack also.

Design choices

Higher performance requires stronger Host controllers. SDIO based Wi-Fi modules are usually controlled by 32-bit controllers with an embedded OS, and provide higher throughputs of 40 Mbps or more. Such performances are required for high quality media streaming applications. SPI based modules can be controlled by 16-bit or 32-bit controllers, while an OS is not indispensable.

UART based modules are usually very easy to integrate and even an 8-bit controller would suffice. Such systems can be used for low throughput applications like industrial wireless sensors. Target cost of the final system, the complexity of the final application, power consumption requirements are other important determinants of the Host controller and the Wi-Fi module or chipset.

Redpine Signals' 802.11n Solutions for Embedded Systems

Wi-Fi is soon becoming the all pervading connectivity solution to

become one single standard on which every conceivable device inter-works and connects to every other device through the vast IP network of the world. Theoretically, every single home, enterprise or industrial device can have its own IP address and become an integral part of the World Wide Web.

One of the first companies to roll out 802.11n chipsets and modules into the connectivity market, Redpine Signals provides solutions for all applications like media streaming, sensors, monitoring and all market segments like medical, industrial and consumer. The Connect-io-n™ line

Wi-Fi modules can be used with a wide range of Hosts from 8-bit to 32-bit controllers. They provide a high level of hardware and software integration with inbuilt antenna, RF/PA and TCP/IP stack and enables a developer to directly develop applications on the Host without worrying about implementing Wi-Fi. nLink™ represents the high-performance Wi-Fi product line of Redpine Signals and provide throughputs up to 40 Mbps for media applications. ■

Further Informations:

Redpine Signals Inc.
Didanta Baishya, Product Manager
<http://www.redpinesignals.com>

A second chance for Near Field Communication

There's life in the old dog yet

The NFC (Near Field Communication) standard is already nine years old. At the time of its launch there was a non-stop flood of ideas about the functions mobiles would be able to offer, from acting as keys and wallets to ID. Up to now, not much has happened but now these – and many more – functions are actually going to become reality.

It is rumoured that Apple is going to incorporate NFC chips into the next iPhone and that Google will install the chip in its new Nexus S. As reference mobiles for all developers who write Android programs, this will give NFC a significant boost. Analysts from Juniper Research estimate that, over the next year, every fifth mobile will be an NFC device; NXP anticipates 70 million NFC mobiles in 2011 alone.

NFC is a transmission standard for the contactless transfer of data over a few centimetres. It operates in the 13.56 MHz frequency range with a maximum data rate of 424 kBit/s. NFC technology is standardised in accordance with ISO 14443, 18092, 21481 ECMA 340, 352, 356, 362 or ETSI TS 102 190.

There are three modes available which can be selected according to the requirements of the application: In reader/writer mode, the device equipped with

the NFC chip, e.g. the mobile, functions purely as an RFID read/write device. It reads or writes to passive transponders which comply with ISO18000-3 Mod1, ISO-14443A/ B/C or ISO15693. This mode is used to retrieve information which is stored in a tag.

In card emulation mode, the NFC device is recognised as a transponder. By recording and automatically responding to signals, a mobile can be used to unlock a

car, as an access card, to pay in the supermarket or to buy tickets in buses or on trains.

When two NFC devices actively communicate with each other, this is known as the peer-to-peer mode. Simply by holding two devices next to each other, users can exchange contacts, links, photos or music files without any further clicks. It is even possible to play a game together on both devices. This is also possible more easily, quickly and energy efficiently using two

Bluetooth-compatible devices, but an NFC-based connection is considerably more secure and cheaper.

NFC components

STMicroelectronics offers two NFC components: With an SPI and UART interface, the IC CR-95HF transceiver only supports the reader/writer mode. The data rate varies depending on the ISO/IEC standard. With ISO 14443 A and B, a maximum gross data rate of 424 Kbps can be achieved, with ISO 18092 424 Kbps is possible and with ISO 15693 just 52 Kbps. However, the read range is the greatest with ISO15693. This makes this IC transceiver ideal



for applications such as access control and time-recording systems.

The ST21NFCA system-on-chip (SoC) solution from STMicroelectronics contains all the hardware and software for a complete NFC system and supports all three modes. In addition to the standards which also support the CR-95HF, ECMA340 (NFCIP-1) and FeliCa™ also complement the NFC microcontroller. An I²C or SPI interface is available for connecting the component with a host processor. The single-wire protocol (SWP) interface provides the connection with a universal integrated circuit card (UICC).

For example, using parameter settings, the SoC enables filling quantities to be regulated or temperature and mixing ratios to be set for industrial coffee machines, firmware updates to be installed from TVs, devices to be calibrated or POS terminals to be protected against misuse via product activation. All these applications can be provided with an RFID reader or an NFC device in combination with the dual interface EEPROM.

In addition to the passive HF interface as per ISO15693, the IC transponder has a standard I²C interface for communication with a μ Controller. The memory capacity is 64 Kbits and it has a unique ID with 64 bits. For security, the component offers 32-bit password protection.

With a μ Controller, a CR2032 battery and a sensor (e.g. temperature sensor), the ST21NFCA is ideal for use as a data logger. The μ Controller reads the temperature data of the sensor and writes it via the I²C interface into the memory of the dual interface EEPROM. An RFID reader can then read this on request. This passive data transfer has the advantage that the stored data cannot just be read when there is power to the memory, as is usually the case, but also when the data logger is switched off or there is no power supply. The RFID antenna can be placed directly on the PCB.

Should there be insufficient space for this, then the antenna can also be realised by an inductor. In addition to a program for the dimensioning of the antenna, STMicroelectronics also provides application notes for the antenna design. Such a design permits the convenient and reliable recording of temperatures during the transport of blood supplies or food. If other sensors are connected, other physical values such as pressure or vibrations can be measured and recorded.

The applications of tomorrow ...

Concepts such as cashless payment, access control and immobilisers using wireless technology are sufficiently well known. The

renewed popularity of NFC technology is also encouraging the development of new ideas. For example, BMW is working on a solution where, when the driver is identified using an NFC device, the car will not only unlock itself and disarm the immobiliser, but also automatically adjust the seat position, mirror, radio station and the pairing of the Bluetooth hands-free device.

Google has chosen to focus the theme of a 'smart home' with Android. Here smartphones and tablets recognise and communicate with devices in the household via wireless technologies – in effect like a universal remote control for the entire home. From Version 2.3, Android already supports NFC.

Other NFC applications are described by the NFC Forum, an association comprising manufacturers of mobile phones, semiconductors and consumer electronics as well as other interested companies. Members include Microsoft, NEC, Nokia, NTT Docomo, Renesas Electronics, Samsung, Sony, MasterCard and Visa. They promote the so-called 'smart poster' where NFC chips in reader/writer mode are integrated into a poster, billboard, the page of a magazine or even three-dimensional items. When an NFC device is held close to the tag, it reads the information stored there, perhaps a website

address for buying tickets on a concert poster, the day's menu with the option to place an order on a restaurant menu or special offers on display in a shop.

... and today

In reality, only isolated NFC offers are available at the moment. Deutsche Bahn is currently trialing its Touch&Travel NFC ticketing system. Before and after their journey, the passenger scans their mobile at a reader in the station. Deutsche Bahn then calculates the route travelled and the ticket price which is deducted from the account specified by the customer. NFC ticket purchasing at Hanau near Frankfurt or paying at the Metro ticket office are still in the test phase.

The unanimous opinion: Technically, the system functions smoothly, customer feedback is positive – all that is missing are the NFC mobiles.

But it seems that this is all about to change: It is not only Google and Apple that are turning to short-range wireless technology; at this year's Mobile World Congress, almost all the manufacturers announced the installation of wireless technology and the mobile operators currently agree on uniform NFC standards. So the signs are good that this time round that NFC won't just be a flash in the pan! ■



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Lots of potential applications

Bright future for ultra low power RF

Currently in its infancy, the short-range RF sector is set to boom. And the catalyst for this expansion will be ultra low power technology.

Ultra low power (ULP) wireless applications are set to increase dramatically. According to analysts ABI Research, for example, the wireless sensor network (WSN) chips market grew by 300 percent in 2010. And the same company forecasts that no less than 467 million healthcare and personal fitness devices using ULP chips will ship in 2016.

ULP wireless connectivity can be added to any portable electronic product or equipment featuring embedded electronics, from tiny medical and fitness sensors, to cell phones, PCs,

machine tools, cars and virtually everything in between. Tiny ULP transceivers can bestow the ability to communicate with thousands of other devices directly or as part of a network – dramatically increasing a product's usefulness.

Yet, for the majority of engineers, RF design remains a black art. But while RF design is not trivial – with some assistance from the chip supplier and a decent development kit – it's not beyond the design skills of a competent engineer.

But what are these chips and how do they operate? Let's take a closer look.

Low duty cycle, low power consumption

ULP wireless technology differs from so-called low power, short-range radios such as Bluetooth technology (now called Classic Bluetooth to differentiate it from the recently released Bluetooth v4.0 which includes ultra low power Bluetooth low energy technology) in that it requires significantly less power to operate. This dramatically increases the opportunity to add a wireless link to even the most compact portable electronic device.

The relatively high power demand of Classic Bluetooth – even for transmission of modest volumes of user data – dictates an almost exclusive use of rechargeable batteries.

This power requirement means that Classic Bluetooth is not a good wireless solution for 'low bandwidth – long lifetime' applications and it's typically used for periods of intense activity when frequent battery charging is not too inconvenient. (Note: There are some highly specialised Classic Bluetooth applications that can run on lower capacity primary batteries.)

Unlike other wireless technologies like Wi-Fi and Bluetooth wireless technology, ULP transceivers are designed to run from batteries of modest capacity such as coin cells (for example, the CR2032 or CR2025 type).

Typical applications are based on compact sensors, for example a heart rate monitor (HRM). To track pulse and display the information on a wristwatch only requires the transceiver in the HRM to send small quantities of data (typically a few bits) infrequently (i.e. once every few seconds to a few times per second at most). Duty cycles of 0.25 percent are com-

mon with the transceiver spending much of the time in a low energy consumption sleep state.

The duty cycle is minimised because the transceiver wakes up quickly, sends a relatively high-bandwidth "burst" of data (at a rate of up to 1 or 2 Mbps), before immediately returning to sleep.

The combination of very low duty cycle and the incredible efficiency of today's silicon radios is the secret behind the technology's ULP performance.

During the short period of activity, the transceivers operate at peak currents of just tens of milliamps. Nordic Semiconductor's nRF24LE1 2.4GHz transceiver, for example, features a peak transmission current of 11.1mA (at 0dBm output power) and peak receive current of 13.3mA (at 2Mbps). Thereafter the chip returns to sleep state, drawing just a nanoamps. Because transmit/receive time is so short, the average current consumption over the long term is just tens of microamps.

Diverse applications

The sheer diversity of potential applications for ULP wireless technology is remarkable. It has already made inroads into the sports, health, entertainment, PC peripherals, remote control, gaming, mobile phone accessories, home automation and industrial control sectors, and will spread to many others in the coming years.

In simple terms, wireless connectivity requires a radio, software code to control communication ("protocol") and an application processor (with its own code, that supervises the specific application). How these elements are implemented affects the efficiency, size and cost of the wireless system.

Until recently, the sector was dominated by proprietary solutions (i.e. one that uses technology owned by a single company) primarily because the semicon-



Figures 1a and b: Nordic's μ Blue nRF8001 is the company's Bluetooth low energy chip and has been selected by Casio for its G-SHOCK Bluetooth low energy watch



Figure 2: The nRF24LU1+ allows PC peripheral manufacturers to make tiny USB dongles with a physical profile that hardly extends beyond the USB port of the host computer

ductor vendors were able to optimise the silicon and protocol without the encumbrance of the additional overhead required for the assured interoperability typical of a standards-based solution.

The result was a more efficient solution with lower power consumption and reduced cost – the two critical factors for companies searching for the best ULP wireless solution. So-called “ultra-low power” wireless technologies such as ZigBee, while offering impressive performance, couldn’t compete with the power consumption of the best of the proprietary offerings.

Nordic, for example, has had good success supplying its proprietary nRF24LE1 to the wireless desktop peripherals market (mice and keyboards). The nRF24LE1 comprises a 2.4GHz ULP transceiver, Gazell™ protocol in flash or one time programmable (OTP) memory and an enhanced 8-bit microcontroller all on a single chip. This chip measures just 5 by 5mm – allowing it to fit into even the smallest of wireless mice designs.

The other end of the link is completed by an nRF24LU1+ which allows PC peripheral manufacturers to make tiny USB dongles whose physical profile

hardly extends beyond the USB port of the host computer. (See figure 2.)

The demand for interoperability

As ULP wireless has diversified into more applications, the lack of interoperability has started to become a problem for some OEMs. The success of Bluetooth wireless technology has demonstrated the huge benefits of establishing a wireless “ecosystem” where products from different manufacturers can seamlessly connect.

Nordic and its design partner ANT Wireless of Cochrane, Canada, have addressed the interoperability demand to a certain extent with a combination of Nordic’s radio expertise and ANT’s ANT+ software and managed network product.

Running on Nordic’s nRF24AP2 – integrating a 2.4GHz ULP transceiver, ANT wireless protocol and high-quality microcontroller/processor interface in a single chip – ANT+ technology is supervised by an alliance of nearly 400 companies and has been adopted as a de facto standard by manufacturers such as Garmin and Trek in the cycling sector. (In fact, ma-

ny of the riders in the 2011 Tour de France used wireless performance sensors linked to bike computers powered by Nordic chips and ANT software.)

And, recently, in addition to Nordic Semiconductor, another semiconductor company has started to offer ANT chips offering customers a multi-vendor environment.

However, the Holy Grail for interoperable ULP wireless technology promoters is to emulate the success that Bluetooth wireless technology has had in the low power RF sector.

Extending Bluetooth

That ambition is now set to become reality because the custodian of Bluetooth wireless technology, the Bluetooth Special Interest Group (SIG), has now ratified a version that can operate from coin cell batteries. So-called Bluetooth low energy (a hallmark feature of the latest release of Bluetooth wireless technology, Version 4.0) has been designed to allow sensors and other peripherals devices to communicate with each other and products such as the next generation of mobile phones.

Semiconductor vendors are now shipping Bluetooth low energy chips. For its part, Nordic – which played a significant role in the development of the specification, donating its extensive ULP wireless design heritage to the technology – has released the first in its μBlue™ Series of Bluetooth low energy chips. The nRF8001 is a complete Bluetooth low energy solution in a 32-pin 5 by 5mm QFN package incorporating a fully embedded radio, link controller, and host subsystem. The chip is suitable for watches, sensors and remote controls among other applications. Casio’s recently released G-SHOCK Bluetooth Low Energy Watch uses this chip. (See Figures 1a and b.)

The Bluetooth SIG’s stated intention is to release Profiles for Bluetooth low energy, including Personal User Interface Devices (PUID) (such as watches), Remote Control, Proximity Alarm, Battery Status and Heart Rate, in the next several months. Other health and fitness monitoring profiles such as blood-glucose and -pressure, cycle cadence and cycle crank power will follow.

Bluetooth v4.0 chips are also becoming available. Devices such as mobile phones should start to incorporate these chips as a replacement for the current generation of Bluetooth wireless technology. Once that happens, the full potential of this exciting new technology will start to be realised because the ULP wireless-powered devices will be able to link directly with the huge Bluetooth ecosystem.

As Nordic Semiconductor’s CEO, Sverre Tore Larsen, puts it: “Once designers have an inexpensive way to add an interoperable wireless link to anything that’s battery powered, even devices with the smallest batteries, the application potential is vast. Designers will come up with thousands of ways to use that link.” ■

Further Information:
Nordic Semiconductor
Thomas Embla Bonnerud
Product Manager Ultra Low Power
Wireless
www.nordicsemi.com

Communication within short distances

The Bluetooth history

King Harald “Bluetooth” (Blåtand) Gormsson was a viking born around the year 940 in today’s north Germany. King Harald united warring fractions in Denmark and parts of Norway, Germany and England and christianised Denmark. King Harald “Bluetooth” Gormsson was killed by his son in 986 or 987. So this is the historical background to the name Bluetooth we all know today, the unified technology for short range communication. Just one question remains: Which technology will kill today’s Bluetooth?

Before 1996

companies like Ericsson (MC-Link), Intel (Biz-RF) and Nokia (Low Power-RF) had their own ideas about how to connect wireless peripherals to mobile phones and PC’s.

1996/1997

First plans about a local wireless technology are made with the aim to create a standard to guarantee the compatibility between different manufacturers. Market driver is the mobile communications industry.

1998

The Bluetooth technology is introduced to the market and the Bluetooth SIG (Special Interest Group) is formed. The founding companies are Ericsson, IBM, Intel, Nokia and Toshiba.

1999

3Com, Lucent, Microsoft, and Motorola joined the SIG promoter group. Bluetooth specification 1.0 is released

2000

The first mobile phone with Bluetooth.

2002

Over 500 Bluetooth qualified products. IEEE 802.15.1 is approved and conforms to Bluetooth.



2003

Specification 1.2 is adopted. Over 1 million Bluetooth enabled products are shipped every week.

2004

Bluetooth Core Specification 2.0 with EDR (Enhanced Data Rate) is adopted. Product shipments are over 3 million units per week.

2005

Rutronik launches the Wireless Competence Centre with more than 8 years Bluetooth experience. The Bluetooth SIG has

over 4000 members. Product shipments have passed 5 million chipsets per week.

2006

The installed base of Bluetooth enabled devices passes 1 milliard (1000000000) units. Product shipments pass 10 million devices per week.

2008

10 year anniversary of the Bluetooth technology. Over 10000 members in the Bluetooth SIG.

2009

Version 3.0 HS (High Speed) of the Bluetooth Core Specification is adopted.

2010

Bluetooth Core Specification version 4.0 LE (Low Energy) is adopted. This opens new markets for the Bluetooth technology because products can run on small batteries for a very long time now. Nordic Semiconductor Bluetooth qualified the first products in the µBlue™ family of Bluetooth LE products. Over 3500 new products were Bluetooth qualified



during the year. More than 13000 member companies in the Bluetooth SIG.

2011

Apple and Nordic Semiconductor join the Bluetooth SIG Board of Directors.

Since 2011

Bluetooth LE is designed into mobile phones, laptops and other handheld products. This opens the market for different types of very low power sensors built with Bluetooth chips and modules.

Sensors with long battery life-time are used in health and fitness products, medical devices, remote controls and wrist watches. Bluetooth LE will be included in new Bluetooth chips and mobile phones, laptops and PDAs. Users have their host or master for "free", they don't have to add any hardware to their device, they just have to search for the sensor and make a connection. Therefore, almost everyone will have a Bluetooth LE enabled device in a few years.

Who kills Bluetooth (IEEE 802.15.1)?

The Viking "Bluetooth" was killed by his son. Today, many wireless technologies are competing with Bluetooth. Is there one,

which is strong enough to kill Bluetooth?

WLAN (IEEE 802.11) is not competing with the standard speed of Bluetooth. Fewer channels can be used at the same time, because one channel blocks almost 30% of the available band. WLAN is preferred if high data speed is needed or if the device should connect to the internet over an access point. WLAN is no real threat against the Bluetooth market.

ZigBee™ (IEEE 802.15.4) is competing with Bluetooth LE in areas like sensor networks, remote controls and AMR. ZigBee can be used in very big mesh-networks, Bluetooth is a master-slave network with one master and up to seven slaves. Another advantage is that ZigBee can be used in the 868 MHz and 915 MHz open ISM bands in addition to the 2,4 GHz band. Lower frequency normally gives longer range and lower data rate and is also an advantage if the communication link needs to through walls or ceilings. The disadvantage is that it's only one channel available in the 868 MHz band in Europe and the data rate over the air is only 20 kbps. DSSS modulation is used on 2,4 GHz, this takes more bandwidth compared to Bluetooth (FHSS modulation). ZigBee can use not more than 20 channels on 2,4 GHz compared

to 79 channels for Bluetooth. The number of supporters also speaks in favour of Bluetooth: The ZigBee Alliance has about 400 member companies compared to about 13000 member companies in the Bluetooth SIG. So, ZigBee isn't a threat against Bluetooth neither.

WBAN (Wireless Body Area Network, IEEE 802.15.6)

The IEEE 802.15 Task Group 6 was formed in 2007 to develop a communication standard optimized for low power devices and operations on, in or around the human body (but not limited to humans) to serve a variety of applications including medical, consumer electronics, personal entertainment and others. The group have not released any standard and very little information about the work can be found. Therefore, this is no threat against Bluetooth LE at all.

ANT™ was born out of the need to develop the very lowest available power solution for Nike's foot pod to watch communication. It is a 2.4GHz practical wireless networking protocol and embedded system solution specifically designed for wireless sensor networks (WSN). ANT is available in compact single-chip network processor format with integrated 2.4GHz RF transceiver and embedded ANT protocol from Nordic

Semiconductor. The ANT+ protocol is used in many sport and fitness products. About 400 companies are members of the ANT+ Alliance. It is no real threat against Bluetooth LE altogether, but it is a competing solution for the low energy market.

Proprietary protocols

The "Gazell" protocol from Nordic Semiconductor is used in many wireless mouse's and keyboards and is also the first choice for manufacturers of remote controllers, who like to replace infrared with wireless. Gazelle has been on the market for a long time and is a strong competitor to Bluetooth LE in consumer products. But Gazelle is not the only one, most of the suppliers have their own proprietary protocols, which are free to use without any "membership" costs. If the device doesn't need to communicate with a "standard" protocol for communication with devices of other suppliers, the free protocols are in most cases the best choice.

Who kills today's Bluetooth?

As there is no other standard which offers as much possibilities for such a wide range of applications, Bluetooth is not going to be killed by other technologies in the near future. ■

Leaf the cable.

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Human-machine interface

Family Concept Solution for variable visualisations

Human perception is most strongly influenced by sight – which is why the spotlight is on visualisation in the most varied of applications.

Currently, the development of new technologies is accelerating with brilliant colours and sharp, focused images increasingly becoming a sales criterion. Suppliers

both pin and electrically compatible and the customer has the choice whether to replace or expand each display diagonal with another from the same series. And

cable set specially adapted for the system, a control board as well as the necessary software with timing parameters for the display. Such a kit solution can also be configured to support a number of wireless technologies, e.g. WLAN for network connectivity, RFID for access control or identification applications, Blue-

ments of each application. Often only minor adjustments are required, allowing us to keep the development time very short.” In this way, investment in evaluation, development, the test phase and development of prototypes is as low as possible. However, to ensure that this is not at the expense of quality, Rutronik concentrates on high-

quality components from selected manufacturers. In addition, the engineers check all data sheets to ensure that all individual components are optimally coordinated with each other. Market-specific factors are also incorporated, e.g. the required certifications. “However, in addition to technical data, other factors such as manufacturing quality, delivery reliability of the manufacturer, its product strategy or availability also play a role in the selection of components. Our wide experience gained from many custo-

mer projects has stood us in good stead in this respect,” says Displays & Boards expert Zilly.

Full flexibility

Flexibility is one of the main advantages of this concept. Within a turnkey solution, sizes of 3.5” to 7” as well as RGB and MCU interfaces can be realised. The MCU models may replace existing passive displays which no longer achieve the desired performance. The optical performance is therefore significantly increased, but the proven control technology remains untouched. Even the transition to TFT dis-

are therefore faced with the challenge of equipping their existing applications with state-of-the-art displays. Low costs and short development times are therefore a must. A family concept with turnkey kit solutions fulfils both the technological and commercial requirements.

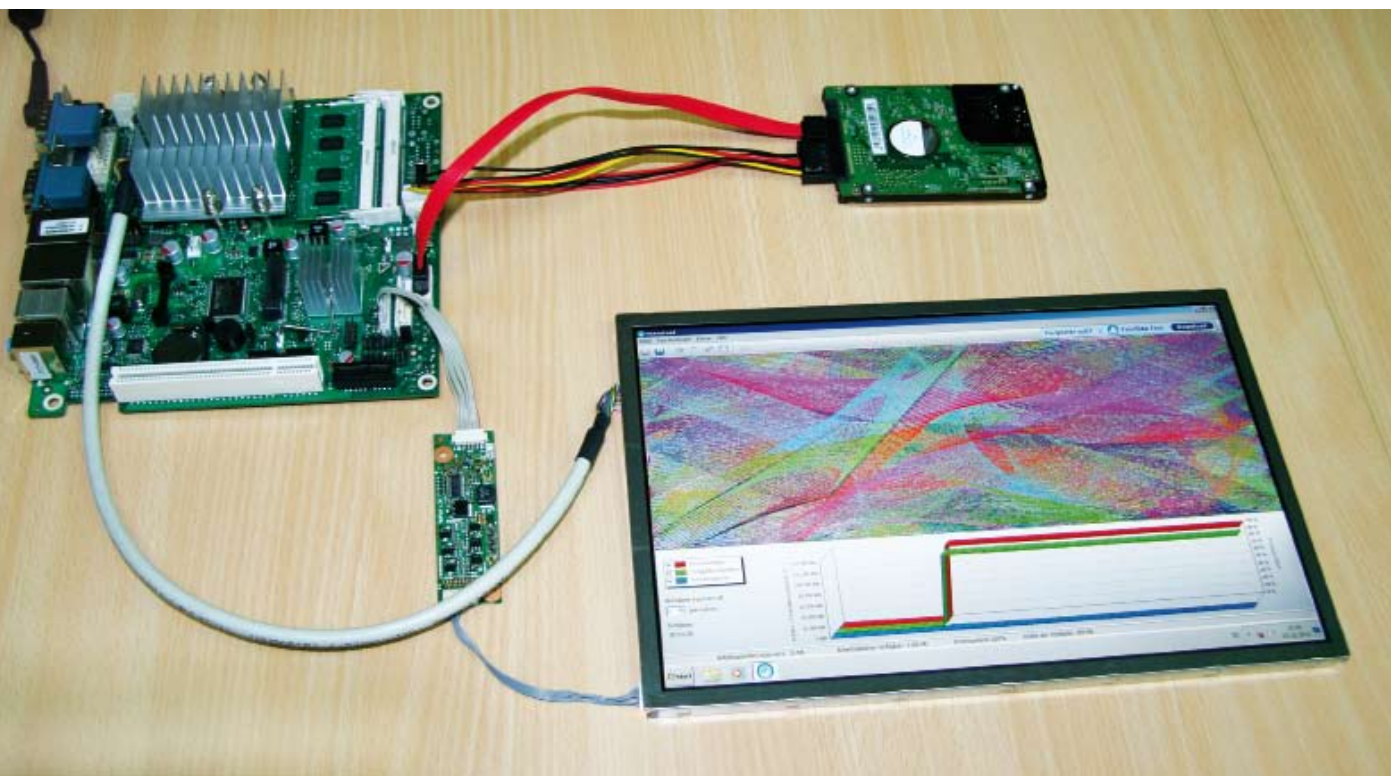
Two contrary approaches can be used to achieve this: The first is platform-independent and therefore extremely flexible. Displays specially developed for this are configured for the same expanded temperature range and the same power supply across all displays. Thanks to the standardised interface, these are therefore

to do this: Simply reconnect and it’s all done, no other hardware changes are required. The displays can equally be used for RGB applications as for MCU applications and can be connected to practically any existing board. A touchscreen as well as the appropriate controller as chip or finished hardware is also available for each display.

Made-to-measure off the rack

The second approach follows the motto: ‘Plug and Play’. It comprises a turnkey solution consisting of a display plus a

tooth or proprietary wireless sticks, GSM or GPS. Not only do companies save on their own development, something which is always an important argument when low volumes are involved, but they also benefit from an extremely short time until market readiness. We have preconfigured solutions at hand which we have evaluated based on many customer enquiries and our experience,” explains Tobias Zilly, Technical Support Engineer for Displays & Boards at Rutronik. “Despite this, we consult extensively with the customer at the beginning of each project in order to fulfil the individual require-



plays will be smooth and cost-effective in this way. Smaller software adjustments to the existing application, such as the import of the display initialisation as well as its parameter transfer are quick and easy to implement. Different wireless technologies or performance scaling of the control can also be handled in advance so that customers can concentrate on other development priorities, such as the adaptation and programming of software or housing design.

'All-inclusive' kit solutions

"Special requirements outside the small sizes of 3.5" to 7" are fulfilled with turnkey display solutions which function independently of the family concept," explains Zilly. "These are also designed in accordance with the

'Plug and Play' motto." For industrial customers, such a solution could comprise a Tianma 10.4" display TM104SDH03 LED and a D3003-S1 board from Fujitsu. All the cables required for this are adapted and specifically manufactured according to the customer's specifications. The display combines a 50,000-hour LED backlight lifetime with a converter integrated into a piece of hardware. This eliminates the need for separate mounting points for the converter as well as the additional backlight cable required for this.

The D3003-S1 board in mITX format offers many approaches and connectivity options for the greatest possible creative freedom. In addition to the opportunity to use MSATA flash memory from Apacer as the data carrier, the platform is fitted with a newest generation Atom processor

and an LVDS port. A riser card provides even more expansion slots. The combination of the Fujitsu board with the Tianma display thus offers great flexibility with mid-range performance and low energy consumption. If the performance requirements are higher, the Fujitsu D3003-S3 can be selected with a dualcore Atom CPU. "The broad portfolio comprising several manufacturers guarantees that we can offer the appropriate hardware for every customer and every application," says Zilly.

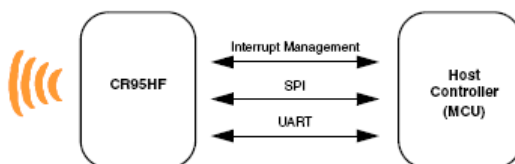
Moreover, the customer can also select additional components, for example one of the touch variants from Hantouch, an additional bar of RAM from Swissbit or a data carrier suitable for its application such as a hard disk, SSD, USB stick or CF card. Rutronik has stored such kits, e.g. for industrial and medical

applications, in a database-based system. "Each individual one is tested and corresponds to the applicable industry standards. This gives the opportunity to draw on many preconfigured solutions," explains Zilly. "Most individual customer requirements can be fulfilled cost-effectively, efficiently and quickly with just minor adaptations." The data sheets for all the components are cross-checked to ensure that the individual components are perfectly suited to each other. Market-specific factors, such as component certifications, are also taken into account. All this ensures that the customer receives a perfectly customised turnkey solution. Not only does this enable them to benefit from a shorter wait for market readiness but also from planning reliability, flexibility of design and concentration on purchasing. ■

Contactless Transceiver CR95HF - 13.56 MHz multi-protocol contactless transceiver IC with SPI and UART serial access



Application Overview



Key Features

- Transceiver IC for contactless applications.
- Manages the frame coding and decoding in Reader mode for standard applications such as NFC, proximity and vicinity standards.
- Embeds the Analog Front End for 13.56MHz Air Interface
- Supports ISO/IEC 14443A and B, ISO/IEC 15693(single or double subcarrier and ISO/IEC 18092 protocols

System-on-chip instead of stand alone transceiver

MCUs go wireless

Anyone wanting to expand an existing device to include wireless technology usually connects a transceiver to the microcontroller. It sounds simple, but it isn't. It requires recalculations regarding cost, quality and risk ratings, development and logistics costs increase and the reliability of the device often drops. Reason enough to consider a microcontroller with integrated transceiver. Many MCU manufacturers have already responded to the wireless trend and the growing demand for transceivers, supplying their chips with different wireless peripherals.

For example, the multimanufacturer architecture with processor cores from ARM helps to minimise the risk of a delivery bottleneck or a failure by the electronics manufacturer.

Minor adjustments to the software and hardware enable processors to be exchanged relatively easily, thereby protecting investment in development tools and

Bee, RF4CE, 6LoWPAN and other network protocols based on the IEEE802.15.4 standard. The receiving sensitivity is 100 dBm and the transmitting power can be up to 7 dBm. Such a wireless-compatible microcontroller offers a number of advantages: As no external wireless module is necessary, the bill of materials (BoM) is reduced and therefore also the logistical expenditure on procurement, storage and assembly. The integration of the transceiver in the microcontroller also has a positive influence on the calculation of the MTTF and MTBF value of the end product.

Someone wishing to operate ZigBee on a 16-bit microcontroller would find a smaller alternative in the Renesas M16C/6B, also with integrated IEEE802.15.4 transceiver. The Renesas RL78 series is suitable for battery-operated applications, such as the nodes of a wireless network, due to its low power requirement and large supply voltage range. The microcontrollers in this series range also offer low energy consumption in Run mode (140 µA/MHz) with high processing power (40.6 DMIPS @ 32 MHz), low energy consumption in Sleep mode, rapid waking from Snooze mode as well as excellent scalability as far as housing sizes and memory expansion are concerned.

Through the integration of data flash, Window Watchdog, a real-time clock, temperature sensor, low-tolerance oscillator and safety functions for self-diagnosis, the RL78 series facilitates compact hardware designs with a small footprint.

An even better power balance is provided by small, 8-bit microcontrollers, most of which comprise not much more than a few AD converters and interfaces. They dispense with the broadband DSSS signal modulation of the IEEE802.15.4 standard and rely on ASK, FSK, GFSK and OOK modulation, all of which require little energy.

Nordic Semiconductor's contribution in this field is the nRF-24LE1 which uses the globally available 2.4 GHz band. The ShockBurst™ transmission technology and the 'Gazell' open-source protocol are designed for low power consumption so that they can easily be powered by a CR2032 coin cell.

The PMA5110 family from Infineon is an 8-bit microcontroller with integrated transmitter, which transmits in all ISM bands below 1 GHz. A wider range and better material penetration compared with the 2.4 GHz band are the primary reasons for its use in home automation and outdoor applications. The derivatives set themselves apart from their competitors thanks to their automotive certification, an expanded temperature range of -40°C to +125°C and an integrated 125 kHz receiver, e.g. for wake-up functions.

Significantly more powerful is Infineon's MD8710. As an integrated wireless peripheral, the ARM Cortex R4 offers both Bluetooth and Bluetooth LE. Comprehensively equipped with interfaces, signal converters and a display controller, the system-on-chip module is a genuine diagnostic and communications processor.



Anyone already using a microcontroller and seeking to expand its circuitry to include wireless communication is faced with the question of whether to install the transceiver externally or to choose a controller with an integrated wireless unit. With a combi solution in particular, manufacturers and distributors generally provide an example protocol which delivers good results without a great deal of expense.

Hardware and software tools

Amongst the manufacturers of development tools, Segger has crystallised its position as one of the leading technology providers within the ARM universe. Segger supplies both hardware and software tools. Its hardware tools include the well-known JTAG debugger 'J-LINK' with its various modifications as well as the 'Flasher ARM' programming device.

J-LINK is supported by renowned compiler manufacturers such as IAR and Keil. However, with the additional 'GDB Server' software, it also works with the GNU Project Debugger (GDB). In addition to the standard J-LINK with USB interface, users can also select a number of different variants which fulfil different requirements, for example an additional Ethernet interface, the option for faster download speeds or expanded TRACE functionality, specifically for Cortex-M3.

Segger's software tools include libraries for RTOS (Real Time Operating System, task scheduler), graphics, file systems and interface drivers for USB and Ethernet. ■



the build-up of expertise. Thanks to the large number of ARM licenses, customers also have access to a wide selection.

The STM32W is based on a 32-bit ARM Cortex M3 core and the popularity of the STM32 range makes it very interesting. As a rule, it ensures long-term availability and sound support in the event of technical difficulties. The STM32W has an integrated 2.4 GHz IEEE802.15.4 transceiver and is therefore suitable for Zig-

The lower the carrier frequencies, the less sensitive they are to absorption by obstacles

What RF technology is the best fit for smart metering?

Authorities, utility companies and smart meter manufacturers have to consider several issues before choosing a smart metering system. The first factor is whether the system must support wireless communication. If RF (radio frequency) communication is required, the next question focuses on the type of RF technology to be deployed. There is no single correct answer as the “right” technology depends on the meter type, communication setup and regional legal restrictions.

The common RF technologies vary regarding different performance parameters such as power efficiency, reliability, range and flexibility. If power efficiency were the only factor influencing the choice, 802.15.4 (ZigBee) radios would fall far behind sub-1 GHz radios.

This is due to the efficiency of the power amplifiers used. In a ZigBee radio, a Class-A power amplifier must be used and this achieves a maximum efficiency of 25%. Sub-1 GHz radios, which generally use simple modulation techniques, support a Class-C power amplifier, which typically reaches an efficiency level of more than 50%. Of course, power efficiency is not only defined by the power amplifier. Current consumption in power-down mode also plays an important role. This is determined by the IC and not the radio technology. The reliability of an RF channel is mainly defined by channel access techniques and expected traffic on the used frequency band. Within this category, there are basically no winners among the common RF technologies. In general, ZigBee radios have transmission schemes that are quite robust against simple interference, but the 2.4 GHz frequency band is shared with widely used technologies like Bluetooth and WiFi.

Sub-1 GHz radios are less immune to direct interference but offer similar levels of reliability because data traffic is limited due to regulations. Additionally the use of more than one RF

channel increases reliability dramatically.

Range determined by regulations and free path loss

The range of an RF technology is influenced on the one hand by regulations, which differ around the world, and on the other hand by the free path loss of the different RF frequencies.

Regulations generally define the permitted output power and the bandwidth of the communication channel, which determines the available link budget. The RF frequency path loss can be calculated using the Friis formula. This general rule of thumb states that the range can be doubled with the same performance values and half the RF frequency. This shows that the lower frequencies – such as 169 MHz (factor of 14 in comparison to 2.4 GHz) and 434 MHz (factor of 5.5) – have an advantage over the high frequency solutions at 2.4 GHz. Another important factor is penetration through concrete and walls. Here the chosen frequency also plays a key role. The lower the carrier frequencies, the less sensitive they are to absorption by obstacles. The decision for an RF technology is also determined by the existing topology of the household and infrastructure. Huge regional differences lead to different data collection approaches:

- drive/walk by
- central, fixed collection point but no network routing (simple star topology)



- central, fixed collection point with network routing (mesh network)

Most of the technologies currently available are able to handle the varying requirements of the different collection approaches and can adapt to changing requirements such as data rates and modulation techniques via software. In general, a higher degree of flexibility is provided by bi-directional RF communication. Employment of an RF transceiver also increases communication reliability. Unfortunately, this does not always result in the highest levels of power efficiency or the lowest system costs. Bi-directional communication solutions are available for all RF technologies.

To summarize, there is no single answer to the question, “Which RF technology is the best fit for smart metering?” This is mainly due to the different requirements for each country and region. If power efficiency combined with long range requirement is the key parameter for the smart metering solution sub-1 GHz radios outperform higher frequency standards. Therefore, Infineon Technologies has specialized on sub-1 GHz radio products and offers an innovative and broad product portfolio in this area. ■

Further Informations:

Infineon Service Center
 Email: support@infineon.com
 Phone (international):
 00800951951951
www.infineon.com/wirelesscontrol

New generation of mobile communication modules

M2M in the 3G era

In the past, m2m applications have been dominated by circuit switched connections or simply by the use of SMS, and only in some cases by GPRS. Today, 3G technology is proving to be mature for adoption in a massive way in the m2m market. But it is not always the first choice.

The decision between 2G and 3G technology for m2m applications depends on several criteria. Some of these criteria are well-known factors: High bandwidth requirements will make it necessary to use 3G transmission while cost limitations might dictate the use of 2G. The unknown in this equation is the crucial issue of longevity. It refers to the lifetime an application is required to work, without having to be upgraded. For applications such as in the field of meter-ing, alarm systems and asset monitoring, there is the need to maintain applications in the field for at least ten years. This consideration might tip the scale in favor of a future-proof 3G solution.

The biggest push towards 3G stems from smartphones, tablet PCs and datacards, which are responsible for a tremendous expansion in data traffic. According to the Global mobile Suppliers Association (GSA), 429 operators in 167 countries are committed to deploy HSPA networks. 398 operators have already launched commercial service in 160 countries - an increase of 17% over last year. More than two thirds of these are already configured to support at least 7.2 Mbps in the downlink, while a year ago was just over 50%. Of these, 123 operators in 65 countries have already launched the HSPA+ service commercially. In terms of throughput, 90 networks support speeds of 21 Mbps, 10 networks supports 28 Mbps, and 23 networks support 42 Mbps, using 64QAM modulation and two HSPA carriers in parallel to double the bandwidth from 5 MHz to 10 MHz. GSA estimate that there will be at least 150 active commercial HSPA+ networks by the end of 2011.

Moreover, even if premature to be used in a strictly m2m sense, it

should be mentioned that the rapid increase of data traffic supported by the HSPA and HSPA+ technologies is arousing interest in the deployment of LTE. According to the GSA, 140 network operators in 56 countries have committed to the deploy LTE, and there are currently 17 operators who have commercially launched the service. According to forecasts, there will be 73 network operators who will have launched the service by the end of 2012. It is important to highlight that LTE can be deployed on existing 2G and 3G bands, and the new 2.6 GHz spectrum that is being allocated in many regions, and also in the 700 MHz band released as part of the Digital Dividend, beginning with USA. In addition, there is a strong demand in Europe and other countries to use the new 800 MHz spectrum that enables LTE to be deployed more efficiently on large areas, and improve coverage in indoor environments.

Modules for the dynamic m2m market

The past year has especially shown how much a dynamic market such as the m2m market can change and with which new developments - whether technical or of a structural nature - it can suddenly generate new situations. This may tempt some enterprises to advance into new sectors and to develop completely new business fields. Telit has always been pursuing the clear strategy of focusing on the development and production of modules and offering services that represent a meaningful and value adding supplement to these modules. As a result, Telit is the only global player on the m2m market fully focusing on its core competencies and continuing to expand its strengths.



The recent acquisition of the Motorola m2m division has therefore been a logical step for Telit. On the one hand, it results in a meaningful enhancement of Telit's product portfolio. Take, e.g., the H24 module: With HSPA connectivity (HSUPA 5.76 Mbps / HSDPA 7.2Mbps) it enables true mobile broadband for next generation m2m solutions such as automotive infotainment, fixed-wireless terminals, telemetry, and advanced security systems. The H24 also features enhanced robustness and on-board GPS, making it a suitable solution for location-based applications. The H24 includes receiver diversity for optimal performance under harsh network conditions as well as FOTA for maximum reliability.



Its series include four individual versions, offering the following HSPA-band combinations:

- H24-Global 850/1900/2100 MHz
- H24-NA 850/1900/1700-2100 (AWS) MHz
- H24-Single 2100 MHz
- H24 Dual 900/2100 MHz

The H24 is certified by AT&T and T-Mobile as well as all major international regulatory bodies and approvals.

On the other hand, Telit now boasts an improved R&D qualification. With the integration of the newly

added R&D team in Tel Aviv, Telit now has a total of five R&D locations worldwide. This once again emphasizes the focus of the company on the further development of trendsetting cellular and short-range modules. With the introduction of new 3.5G modules in BGA packages, Telit further expands its portfolio. The development of new modules is a dynamic response to market demand and to the availability of new chipsets. Applications not feasible only a few years ago have become common place thanks in part to advances in size reduction and package design. From car telematics and fleet management to intelligent metering and consumer applications, each segment imposes its own set of individual demands on the module's electronic package.

The HE863 module is the first Telit 3G module to be offered in BGA form factor. It enables high-volume m2m applications with advanced capabilities leveraging the 3G HSPA technology while minimizing development time. With dimensions of only 31.4 x 41.4 x 2.9 millimeters the module is suitable for medium to high volume applications. The HE863 features a 3GPP Release 6 stack, with HSPA connectivity in two bands, and with throughput of 7.2Mbps in downlink and 5.7Mbps in uplink. It also supports quad-band GSM / GPRS and EDGE class 33, in 850, 900, 1800, and 1900 MHz. The HE863 will be offered in three regional variants, with different combinations of 3G bands and regulatory and network approvals



depending on the region, including AT&T for North America. The product, which features analog and digital audio interfaces, serial port multiplexer, 6Mbps high-speed serial port, as well as a high speed USB 2.0 port, will be available in three versions for each of the three regional variants: as data-only, data with voice and with standalone assisted GPS.

The HE910, the world's smallest LGA m2m module featuring 5-band HSPA+, is a perfect solution for consumer applications requiring wireless connectivity on the move. Thanks to support for all five 3G network bands (i.e.

850, 900, 1700, 1900, and 2100 MHz) the HE910 provides mobility virtually without borders. Furthermore, it includes features such as HSDPA 14.4 Mbps (Cat 10), HSUPA 5.7 Mbps (Cat 6) with RX diversity and Quad-band EGPRS Class 33 (i.e. 850, 900, 1800, and 1900 MHz). Due to its low profile LGA package and advanced connectivity features, the module is very well suited for mobile computing devices such as PDAs, tablet PCs, and consumer electronics in general, both for business and personal use. The HE910 can also optionally be provided with integrated high-sensi-

tivity A-GPS for indoor fixes and simultaneous GPS with voice and data. The product, which also features digital audio interface, USB 2.0 high speed and SPI, will go through the regulatory and network approvals, including AT&T for the North America market.

Technical Forum: connecting experts

It is one thing to develop innovative and powerful products. Telit takes up the cause of providing its customers with additional support and comprehensive service. Therefore, the company has

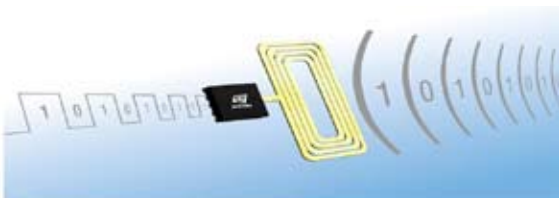
established the Telit Technical Forum last year. It connects system integrators, developers and partner companies around the world on an online platform where everybody can ask questions, discuss them and obtain assistance from Telit global technical support teams. Already more than 700 members in more than 55 countries benefit from this Telit support channel. ■

Further Informations:
Telit Wireless Solutions
Alexander Bufalino
VP Global Marketing
Alexander.Bufalino@elit.com
www.telit.com

Dual EEPROM M24LR64 64-bit EEPROM with I²C and 13.56 MHz ISO 15693RF



Dual Interface EEPROM
Two worlds connected



Key Features

- Industry standard interfaces
 - I²C: 400 kHz, from 1.8 to 5.5V
 - ISO 15693: 53Kbit/s data rate, up to 1 m remote access range
- 64-Kbit EEPROM user memory
- 64-bit unique identifier
- 32-bit password protection
- 13.56 MHz carrier frequency

Wireless technology for visitor counting systems

Big Brother is counting you

George Orwell knew it would happen. The culture of surveillance in our society has grown massively. But it's usually not used to control people like it is in Orwell's "1984". Instead, companies use it to count visitors as they come and go in order to fine-tune opening hours and staff planning, or to analyse the success of marketing campaigns. The industry was one of the first to choose M2M technology – such as that of Viometrics, manufacturer of (probably) the best visitor counting system.

Back in 1994, Viometrics, then still trading as Elektromontage AB, developed a solution on behalf of Lindex to enable the clothing store chain to count the number of visitors to its stores. As the counting system needed to operate without an external PC or LAN connection and had to be installed in as discreet a position as possible, Viometrics designed a plug-and-play solution using GSM and a GPRS terminal. The first system also offered only a small number of features. Lindex has since fitted 360 "Viometrics Entrance" systems in its stores in Northern

and Eastern Europe. In that time, the provider also has been constantly improving the system. During the development of the latest-generation model, Viometrics put their trust in Rutronik to provide technical assistance. The aim was to reproduce the device with smaller dimensions and replace the terminal with an integrated GSM/UMTS module.

The distributor recommended the GC864 wireless module from Telit for the first generation of integrated devices. It has an integrated TCP/IP stack and a serial multiplexer, which makes forming

a connection to the internet much simpler. TCP/IP provides end-to-end connectivity specifying how data should be formatted, addressed, transmitted, routed and received at the destination. Viometrics has adapted the M2M technology for its own counting systems. The Technology is more stable than ever and you have the access and good coverage all over the world. This makes the system particularly reliable, both in terms of operation and results.

The greatest advantage of the module is the "unified form factor" design by Telit, which provides customers with a maximum of flexibility.

Some of the Telit GSM/GPRS and UMTS modules are compatible with the other devices in the compact product family, because they all have the same form factor, and their connectors and software are all compatible. This enables Viometrics to use new modules and benefit from additional features with no need for a redesign. For example, the manufacturer has installed the 3.5G module UC864 in the latest "Entrance" generation, enabling the use of UMTS. Depending on where "Viometrics Entrance" is being used, customers also have a choice of different cellular technologies. In Europe, GPRS is recommended in light of the good service coverage. If this coverage is not available, users can use UMTS, 3G or even CDMA instead.

"During the evaluation and design phase, Rutronik didn't only assist us by providing excellent technical expertise; they also gave us the benefit of their good con-

nections with the various manufacturers", explained Mr. Peter Skoglund, owner of Viometrics AB. "We initially had a few problems with the AT command set, which is used to access the module. The antenna also didn't receive the signal perfectly to begin with. Thankfully, Rutronik and Telit quickly managed to find a solution together."

The result is a self-contained system that can be installed discreetly in any shop fitting. This is important for counting systems, because the location and positioning are critical in ensuring that the counting is correct. Also, customers should not notice the device. With a size of just 10 cm x 10 cm, "Viometrics Entrance" can easily be hidden in small recesses or among shelving. Even when using several systems, operation is quite simple, with administration of all measurement devices being possible from any computer with an internet connection, and users can also read the information collected from there.

Software updates are also performed via the internet. Visitor numbers can be saved as needed in hourly or five-minute intervals. This data is transmitted via GSM to a secure database and stored there for up to three years.

For serial production, Rutronik delivers the components, as cellular modules and the antennas, as Viometrics needs them, where Viometrics needs them. Today, these devices are counting visitors for Intersport, Toyota, Expert shops, and for many shopping centres and railway stations. ■



Rutronik provides ACD Elektronik with redesign support

Equipped for the future: Modernising current mobile wireless technology

Gone are the times when utility workers had to visit every house individually to read the electricity, gas or water meters. Today, modems such as the ComuContGSM+ from ACD Elektronik allow for convenient remote access. When ACD Elektronik was recently faced with replacing the GSM module in its modem, it called on Rutronik for support.

The ComuContGSM+ is a compact industrial modem which transmits relevant billing data over a secure connection. In addition, remote maintenance, machine or system monitoring and programming changes can also be undertaken via this device.

Adjustable inputs and outputs can be used to synchronise meters, monitor alarm inputs or to initiate switching operations via SMS. In order to ensure the continued smooth transfer of data, ACD Elektronik decided to replace the GSM module used to date. In the future, the use of an additional GPRS transmission will



become more and more important as the telecoms companies would like to 'switch off' the analogue channels. Another reason for the replacement of the GSM module was the future possibility of being automatically notified of faults via SMS or e-mail. For this to be possible, the new module would have to allow both data transfer via GPRS and the direct sending of e-mails. ACD Elektronik turned to the distributor Rutronik for help in selecting the ideal module and for subsequent development support. "We were really impressed by the expertise demonstrated by the representative from Rutronik's Wireless Competence Center," explains Johan Bolkart, Managing Director of ACD Elektronik GmbH. "The diverse product portfolio including accessories and manufacturer-independent advice were also key to our decision."

Following preselection by ACD Elektronik's development department, several meetings took place with Rutronik. The decision to go with Rutronik was due both to the product advantages offered by the Telit module and to the excellent cooperation and expert advice provided by the company. "Making



this selection was not a trivial matter, because the new module did not just have to facilitate the additional features, but it also had to be seamlessly integrated into the modem's existing IT environment," explains Daniel Barth, Product Sales Manager for Wireless at Rutronik. "So there are more prerequisites to fulfil than with a redesign."

Compact module with many functions

The eventual choice was the Telit GC864-QUAD V2 SIM GSM module. A quad-band GPRS module (class 10), its compact dimensions of 30 x 36.2 x 3.2 mm and its expanded temperature range of -40°C to 85°C make it the perfect solution for M2M applications and mobile data devices. It also meets ACD Elektronik's requirements for a GPRS link and e-mail capability. The existing device design meant that the industrial connector was also an important plus point. This enables the module to be ordered and fitted as required so it does not have to be soldered on in larger quantities during manufacture of the printed circuit boards. Integrated into the module are a SIM card holder, a TCP/IP protocol stack and a serial multiplexer for additional functionality without additional costs. A further advantage provided by the GC864-QUAD V2 SIM is that this member of the compact family is identical to other UMTS and CDMA modules in terms of pin, voltage, dimension and software compatibility, allowing for cost-effective assembly of the circuit boards.

Support from the distributor and manufacturer

In order to test the new module, Rutronik supplied development kits and samples for development of the prototype. Together with Telit, the distributor was available at all stages of the development, providing both telephone and on-site support.

In the process, it was revealed that the instruction set for the new module has become significantly more powerful. In addition, the GC864 has different timing than the module previously used and gives different commands. "Rutronik and Telit helped us to adjust the AT command scripting and the necessary timing to ensure that the new module behaves in the same way as the old module. This meant that no additional work had to be undertaken on the server side which was a huge plus for us," says Johan Bolkart, Managing Director at ACD Elektronik. "Rutronik always reliably guaranteed its availability for this – and with an excellent price/performance ratio."

In addition to the GC864-QUAD V2 SIM GSM module, Telit GSM modules are also used in other products manufactured by ACD Elektronik: Telit GC864-QUAD V2 and UC864-E modules are used in the M210, M250 and M260 mobile data terminals to ensure smooth data communication within very large premises where WLAN coverage either would not be possible at all or only at great expense. ■



ACD Elektronik

ACD Elektronik GmbH was established in 1976. In addition to ACD Elektronik GmbH, the ACD Group now also includes ACD Systemtechnik GmbH and ACD Antriebstechnik GmbH in Achstetten and Neustadt (Orla). The company has around 340 employees.

Since 1982, ACD Elektronik has developed and produced mobile data terminals for retail, logistics, industry and the social market. These include hand-held and truck terminals as well as mobile workstations. Within the computer technology field, the ACD Group focuses on development, CAD PCB routing and the manufacture of electronic assemblies or complete modules. Development, production, inspection and testing are carried out using state-of-the-art technology at two sites in Germany.

Pedestrian signal lights in France to be fitted with wireless modules

Wireless technology replacing the guide dog

Wireless technology is increasingly being used instead of guide dogs to help blind people move around on the streets. EO Guidage has been developing solutions in this field since 1993. One of these solutions is an audio signal system for pedestrian signal lights. Thanks to Rutronik, these systems can now be configured using a PC, laptop or smartphone.

When a blind person approaches a zebra crossing, “Blue EO36” will send a spoken message like “pedestrian red Castle Road”. This device is either installed in the traffic light pole itself or in a separate box. To keep the noise from the audio announcements down to a minimum, the messages are only sent as needed. They are triggered by means of a Bluetooth signal from a smartphone or GPS device carried by the visually impaired person, or at the press of a button.

The devices usually need to be configured after installation to cater for the environment in which they are installed so that the signals can provide genuinely useful support. Often, the announcements are either too quiet, they are triggered at too far a distance at narrow crossings, resulting in a confusing cacophony of voices, or the pedestrian needs to move too close to the lights for the signal to be triggered.

Also, whenever conditions change, with alterations to the traffic regulation for example, the devices need to be reconfigured.

To make this process as simple as possible, the latest generation of Blue EO36 devices can be configured using wireless technology. Using a laptop or smartphone with the Blue EO software installed, city employees can change the announcements, adjust their volume to the local conditions or even change the distance at which the signal is triggered. If the laptop has a voice synthesiser installed, it is even possible to install new announcements on the spot.

Bluetooth simplifies configuration

EO Guidage called upon the support of Rutronik to implement the wireless connectivity. The distributor provided technical assistance and selected two wireless modules that conformed to the applications’ requirements. Rutronik provided EO Guidage with two evaluation kits for testing purposes. The most important requirement imposed upon the modules was they had to have a very high transmission strength. After



all, the signal had to be capable of passing through the metal housing of the lights and still cover a sufficient distance. The decision was taken to use the F2M03GXA module from Free2move. The v2.0 + EDR module with integrated Bluetooth can transmit at up to +18dBm and has a receiver sensitivity of up to -92dBm. The fully Bluetooth-compliant module makes it possible to transfer both data and speech. The integrated spherical antenna simplifies the process of installing the module – even for developers with limited knowledge of Bluetooth. The UART firmware is included as standard and is compliant with the Bluetooth Serial Port Profile (SPP) for quickly and easily establishing serial connections. “Our

choice and the expert technical assistance provided by Rutronik helped us greatly, enabling us to begin serial production just six months after the start of the project”, said Sylvain Denoncin, CEO of EO Guidage. “The meteoric rise in demand for the product alone is a sign of how well it has been received by our customers. Under these circumstances, we’re glad that Rutronik was still always able to deliver the required quantities on time.”

60,000 of these EO Guidage devices are currently being used in 600 towns and cities across France. And this number is rising, particularly since audible pedestrian signals became a legal requirement in France in 2007 – as it is in many other countries too. ■



IPv6 for increased interoperability

Smartphones to street lighting

Wireless sensor networks are becoming increasingly important and more widely used in our daily environment, whether in industrial or home automation, health monitoring, building security, smart metering or keyless entry systems. One particular reason for this development is the pursuit of increased energy efficiency and comfortable living.

There are many systems for the wireless networking of sensors and actuators, but unfortunately they are frequently not interoperable. In the medium term, this market will consolidate itself, leading to solutions which allow for interoperability between the application scenarios. One solution which has the best chance of winning this race is based on Internet Protocol version 6 (IPv6). Somewhat of a mouthful, it is called 6LoWPAN. This abbreviation stands for 'IPv6 over Low-Power Wireless Personal Area Networks'.

IPv6

IPv6 is the successor to the currently widely used IPv4, which is generally used without its suffix 'v4'. IP is the standard for communication by network devices in local and global networks and is available in every company and home with a computer. The IP protocol is also used for data communication by mobile devices. Sensor networks operated using IPv6 can therefore be smoothly integrated into household, company and mobile phone networks. They can then be monitored and controlled via the Internet.

IPv6 has a number of characteristics which seem to make it particularly suited for use in sensor networks. Probably the most important of these is the address width of 128 bits compared with 32 bits in networks based on IPv4. This makes it possible to represent $3.4 \cdot 10^{38}$ addresses. This quantity makes it possible to assign each sensor a

globally unique address and make it accessible via the Internet from anywhere in the world.

The second advantage is the ability of IPv6 devices to independently and automatically assign themselves locally and globally unique addresses. This eliminates time-consuming manual configuration and the need for a DHCP server, significantly simplifying installation of the sensor network.

A further important factor in favour of using IPv6 in wireless sensor networks is the availability of a standardised security mechanism at network level which, in practice, has already proven itself in millions of virtual private networks (VPNs).

This is the IPSec protocol. IPSec was originally developed for IPv6 and then ported to IPv4. In contrast to IPv4 networks,

addresses in IPv6, the message header alone has increased to 40 bytes. In addition, there is also the header of the transport layer at least – in the case of UDP, that is another 8 bytes. In contrast, the IEEE 802.15.4 standard, which standardises the physical layer and the data link layer, permits maximum packet sizes of 127 bytes. Up to 21 bytes in size, the header for the data link layer is accommodated in these 127 bytes. Therefore, if an IPv6-based UDP packet was to be transmitted, more than half the packet would be made up of the various headers. The 6LoWPAN standard was developed to prevent this mismatch.

6LoWPAN

6LoWPAN adds an adaptation layer between the network and

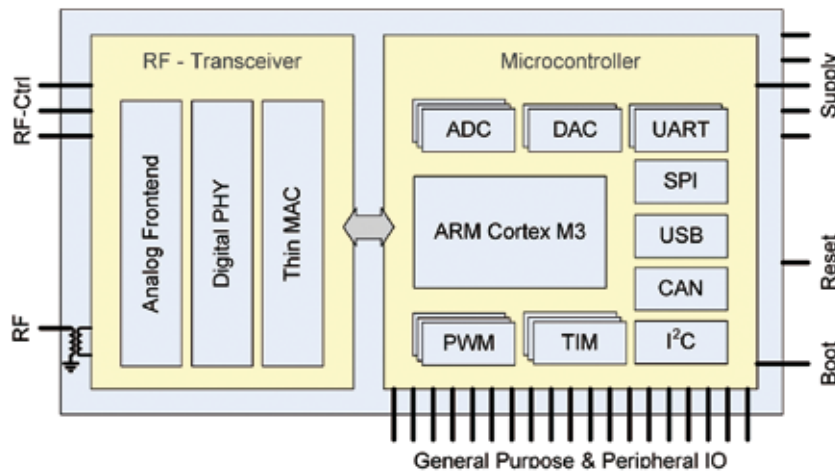
vice must be able to receive packets with a minimum size of 1280 bytes. In sensor networks, packets of such a size have to be divided – or fragmented – into smaller packets. The 6LoWPAN layer facilitates the fragmentation at the transmitter and the reconfiguration of the packets at the receiver.

Switching on lights with smartphones

In order to demonstrate a 6LoWPAN-based application, ZMDI has developed a demo kit for lighting controls based on its ZWIR4512 6LoWPAN module. This module enables lights to be dimmed or switched on and off by a standard Android smartphone with the help of a wireless LAN. To do this, the Android smartphone connects with a standard WLAN router which is connected to a gateway via Ethernet.

This converts Ethernet to IEEE 802.15.4, and inserts the 6LoWPAN layer in the protocol stack to guarantee the effective transmission of messages. This enables the smartphone to communicate directly with the wireless modules in the lights. When doing so, the communication latency is below 100 ms and therefore virtually imperceptible to humans.

With the aid of the IPv6 multicast addressing, dynamic groups of lights can also be created which can be simultaneously controlled. ■



IPSec functions without restrictions in IPv6 networks. It enables true end-to-end encryption between two communication partners, thereby permitting the transport of packets across unsecured nodes.

Unfortunately, IPv6 also has one significant disadvantage: Owing to the considerably longer

the data link layer and is transparent for the overlying layers. It compresses the IPv6 header data where possible. For most application scenarios, it is possible to compress the header from its original 48 bytes to 11 bytes. In addition, 6LoWPAN handles the fragmentation of large IPv6 packets. Each IPv6-compatible de-

Further Informations:
ZMDI
Torsten Limberg
Product Manager WPAN
www.zmdi.com

e-kompakt

product innovations

Low-power plug & play modem



The **CEP CT63** terminal contains the latest module generation of Cinterion and supports industrial data transfer applications with the range of functions of the feature-rich Cinterion TC63i. This complete plug&play modem respectively cellular terminal is compatible with Cinterion's TC35 terminal, MC35 terminal and TC65 terminal. The CT63 communicates via USB 2.0 and RS232. Custom-made versions also include I²C and SPI interfaces. The terminal has an optional JAVA programming feature which enables it to use existing JAVA applications. Its wide voltage range from +5V to +32V and the extended temperature range from -40°C to +80°C permits the use in challenging industrial environments. The terminal's power saving mode allows the operation of this device with only 1mA electricity consumption while the GPRS connection is active. The CEP CT63 therefore particularly qualifies for battery- and solar-powered applications such as vending machines or intelligent traffic displays.

Contact Rutronik: Daniel Barth
Tel: +49 7231 801-491, daniel_barth@rutronik.com

Multi GNSS receiver for automotive



With IT600, **Fastrax** presents a new module, including GPS, GLONASS, QZSS and SBAS in a single receiver module. In addition to currently supported Global Navigation Satellite

Systems, the IT600 is designed to also support other positioning systems such as European-based Galileo and Chinese Compass/Beidou2 in the future. The new receiver module is specifically designed to serve the needs of the automotive industry. Enabling both GPS and Glonass generally doubles the number of visible satellites compared with using GPS only, reducing the time to first fix and increasing positioning accuracy, especially while driving in urban canyons. Fastrax IT600 provides ultimate level of reliability and highly accurate positioning even in challenging environments. Advanced dead reckoning estimates the position of the vehicle when satellite signals are unavailable. The module can utilize an analog gyro and odometer pulse and can later be complemented with a digital 3-axis gyro and differential wheel pulse from a vehicle's CAN interface in order to compensate for possible unavailability of GNSS signals. Fastrax IT600 features 32 dedicated tracking channels that are dynamically assigned to acquire and track a mix of GPS, GLONASS, QZSS, Galileo and Compass/Beidou2 signals. It is able to operate normally with only one of the Global Navigation Satellite Systems (GNSS) or utilize several systems simultaneously. Thanks to the support for multiple GNSS systems and advanced dead reckoning users no longer need to make different designs for different markets. Fastrax IT600 features the same small size as other Fastrax IT multiplatform modules, 16.2mm x 18.8mm x 2.3mm, however the pin-out is different. The low power consumption of 80mW is further decreased with the ability to turn off unused tracking channels.

Contact Rutronik: Daniel Barth
Tel: +49 7231 801-491, daniel_barth@rutronik.com

Smallest GPS antenna module

The UC430 from **Fastrax** is the probably smallest GPS antenna module in the world. With a size of only 9.6 x 14.0 x 1.95mm (including the antenna) and with different advanced power saving modes, the module is very well suited for battery powered applications with strict space restrictions. The antenna design makes it easy to add an external antenna, should this be needed. With its new SiRFstar IV innovative SiRFAware mode, the Fastrax UC430 auto-



ously activates itself periodically to maintain awareness of its location at all times consuming only 125µA on average. As a result, updated location information is available almost immediately when activated, without compromising battery life or TTFF (Time To First Fix). The antenna module offers also a solution to reduce warm start TTFF by 70% to 10 sec (typ.) over 3 days with embedded assistance based on Client Generated Extended Ephemeris (CGEE), which is derived internally from broadcast ephemeris data. The CGEE data can be stored either on the host side or on an external EEPROM. Despite of the small antenna size, it performs well against larger patch antennas. In addition, the circular radiation pattern increases flexibility for device installation significantly. When an external antenna is required, the UC430 works efficiently as a back-up antenna if the external antenna is damaged or removed.

Contact Rutronik: Daniel Barth
Tel: +49 7231 801-491, daniel_barth@rutronik.com

Micro SIM connector for 3FF SIM cards

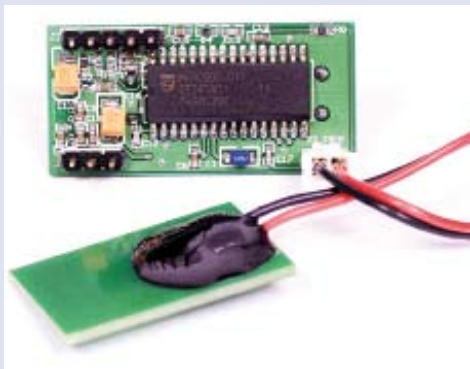


GradConn offers the CHO3-FB, which is an economical Micro SIM connector for 3FF SIM cards (also known as Mini UICC). Its attractive pricing allows customers to transition from traditional

Mini SIM designs to Micro SIM designs without price penalty. Micro SIM cards have the same thickness and contact arrangements as Mini SIM cards, however the reduced card size (12mm x 15mm) achieves significant savings in both PCB and card footprints. With 6 or 8 contacts, and a profile height of just 2.4mm, the CH03-FB comes in tape and reel packaging, withstands IR reflow temperatures and is fully RoHS compliant. It is available at distributor Rutronik.

Contact Rutronik: Berndt Blitzner
Tel: +46 8505 549 06, berndt_bltzner@rutronik.com

Easy set up for common RFID applications



IDTRONIC has upgraded its Mini OEM Reader family with the NFC and NXP 7 Byte UID functionality. The new Mini OEM HF Reader is a flexible Read / Write device with a separate antenna, which allows an easy set up for the most common RFID applications. The device fully supports all common ISO 14443A, 15693 and NFC technologies. The reading range is up to 8cm, at a max. data transfer speed of up to 106KBits per seconds. **IDTRONIC's** Mini OEM Reader HF comes with a complete SDK with demo software and MS Windows based application software. The 3 available antenna sizes are perfectly designed for built into POS devices, but also can be used for ticketing, payroll systems, time attendance, access control systems and vending machines.

Contact Rutronik: Daniel Barth
Tel: +49 7231 801-491, daniel_barth@rutronik.com

Low power consumption and long ranges

The SmartLEWIS™ TRX product family from **Infineon Technologies** consists of intelligent, multi-band, multi-channel transceivers. The TDA5340 and TDA5325 are ideal for applications in the major sub 1GHz frequency bands such as smart meters, security systems, home automation solutions and automotive systems. TDA5340 builds on the TDA5325 feature



set to include digital baseband processing and autonomous receive functionality. These smart signal processing features reduce the system current consumption by more than 80% in crowded environments, also offloading the microprocessor. Highest receive sensitivity of up to -118dBm for FSK and a programmable, highly efficient class-C power amplifier with up to +13dBm output power enable long range communications over extremely reliable links. An integrated LNA, IF filter and antenna switch mean that only 14 external components are required, keeping the bill of materials extremely low.

Contact Rutronik: Bernd Hantsche,
Tel: +49 7231 801-506, bernd_hantsche@rutronik.com

MiWi™ Wireless Development Environment (DE)



Microchip's new MiWi™ Development Environment (DE) provides a complete ecosystem for the cost-effective design of low-power star and mesh wireless networking products. The MiWi DE comprises Microchip's free, proprietary MiWi P2P, MiWi and MiWi PRO star and

mesh networking protocol stacks; the 8-bit Wireless Development Kit (WDK) and 2.4 GHz ZENA™ Wireless Adapter; as well as the multi-purpose Wireless Development Studio (WDS) with cross-platform support for Linux, Mac OS® and Windows® operating systems. The MiWi DE simplifies the development of ISM-band wireless networking applications for the home and industrial automation, wireless sensor monitoring and control, and smart energy markets.

Contact Rutronik: Bernd Hantsche,
Tel: +49 7231 801-506, bernd_hantsche@rutronik.com

Support for Android operating system



Redpine Signals announced its support for the Android operating system with the release of Wi-Fi client mode drivers for n-Link™ family of 802.11b/g/n and 802.11 a/b/g/n modules. This Google backed operating system is making inroads into the embedded devices market, with focus on tablets and home display units. The first release of Redpine Wi-Fi client drivers is for the Android 2.2 release (Froyo). Redpine allows the customer to use Android's native supplicant or integrate Redpine's supplicant for wireless configuration and driver management. The drivers can be downloaded from Redpine Signals website at www.redpinesignals.com/downloads.

Contact Rutronik: Bernd Hantsche,
Tel: +49 7231 801-506, bernd_hantsche@rutronik.com

Wi-Fi connectivity solutions



Redpine Signals has integrated their 802.11a/b/g/n wireless connectivity solutions for Renesas RX62N MCUs. These solutions are based on the Connect-io-n modules from Redpine Signals. The RS-RX62N-2201 Wi-Fi starter kit is a user-friendly development platform for users

who want to develop applications on the RX62N microcontroller and use Redpine's fully integrated (on-board antenna, frequency reference and embedded TCP/IP stack) Wi-Fi module, RS9110-N-11-22, to connect to the network for data transfer. The kit includes the API Library for controlling the Wi-Fi module, sample code, an easy-to-setup demo firmware/application along with Renesas Electronics' rich suite of development tools for coding and debugging - the High-performance Embedded Workshop (HEW), RX compiler and on-board debugger.

Contact Rutronik: Bernd Hantsche,
Tel: +49 7231 801-506, bernd_hantsche@rutronik.com

Low power consumption and a wide range of security functions

Silex Technology is offering a powerful dual-band wireless module for manufacturers who wish to equip their product with wireless functionality quickly and securely. The SX-560-2701



is programmable and integrates a wide range of security functions for Wi-Fi connections. The compact (34.3mm x 49.5mm) wireless LAN module transmits in 2.4GHz and 5GHz ranges and can be used in all situations. Operating on a current of 3.3V, this component consumes 240mA of electricity on average, with only 60mA being consumed in power-saving mode. It supports the IEEE 802.11a/b/g standards and offers security functionality such as WPA2 encryption and 802.1x authentication. Thanks to the 32-bit processor and Linux-based firmware, the module can be easily expanded to include new functions. With 16MB RAM and 8MB of flash memory, even complex applications are supported. A USB 1.1 interface and two serial connectors provide ease of implementation. There are also nine universal I/O interfaces available for customized functionality. Additionally, the developer kit SX-560-6900 is available.

Contact Rutronik: Bernd Hantsche,
Tel: +49 7231 801-506, bernd_hantsche@rutronik.com

Extended range

The PAN1317 dual-mode module from **Panasonic** and its PAN1327 antenna version are designed for sports and medical equipment with

low power consumption and their peripherals. In comparison with a single-mode ANT™ solution, the modules facilitate communication between bluetooth-supporting devices and



low-power ANT™ sensors with extended range. Dynastream's Area Network Technology (ANT™) software protocol facilitates the recording, automatic transmission and tracking of sensor data for monitoring personal vital signs. Low cost and very small footprints (antenna version: 9.0mm x 9.5mm x 1.7mm) classify the HCI modules (Host Controller Interface) for ultra-thin use in low-power wireless networking solutions for short-range applications with data transfer of up to 3Mbit/s (gross).

Contact Rutronik: Bernd Hantsche,
Tel: +49 7231 801-506, bernd_hantsche@rutronik.com

Smallest GSM-/GPS tracking device



The Picotrack from **Telit** is the smallest tracking and tracing device in its class with high GPS tracking performance and communication via GPRS. Weighing only 35g, the Picotrack 2 is a smaller than a matchbox. It features the Telit module GE865 and the Fastrax IT520 GPS module. In spite of its compact size (57mm x 38mm x 15mm), it is packed with high-end functionality such as a complete set of telematics software functions. This makes the device ideal for mobile usage as GPS tracker for athletes, children, elderly and impaired persons requiring care as well as for vehicles, packages and merchandise shipments. The large GPS-patch antenna ensures high accuracy of location information, even under bad reception conditions as for example, inside a house. The configurable motion sensor and alarm button combined with its small size allows the use in nearly all security applications. Due to the state of the art low-power architecture, the Picotrack 2 is also suitable for the surveillance of valuable goods, where a long standby time is required without having an electric power supply. With the Picotrack Power version, the battery life can be doubled, as it incorporates a stacked LiPo (Lithium-Polymer) battery.

Contact Rutronik:
Daniel Barth, Tel: +49 7231 801-491,
daniel_barth@rutronik.com

Extremely resistant RFID label with ultra-thin design



Due to its robust product design the ((rfid))-DuraTag by **Schreiner LogiData** has been perfectly tailored to harsh ambient conditions and is ideally suited for ragged industrial environments. The ultra-thin design of only 0,75mm allows attaching of the tag inconspicuously to a wide range of non-metallic materials. Its high temperature resistant (short-term 220°C) and complete encapsulation prevents moisture ingress. The ((rfid))-DuraTag is used in the construction industry, in warehouse logistics and in the healthcare sector. Another highly suitable use is in textile and laundry logistics. The quality and fault tolerance of the ((rfid))-DuraTag have been confirmed by the independent textile research institute Hohenstein.

Contact Rutronik: Daniel Barth
Tel: +49 7231 801-491, daniel_barth@rutronik.com

Dual-Interface EEPROM enabling remote access



The new dual-interface EEPROM from **STMicroelectronics** provides the flexibility to remotely program or update electronic products, anytime during their lifetime, and anywhere in the supply chain. It enables manufacturers to update parameters, regionalize or activate software without a programmer or opening the

retail packaging. The M24LR64 is an EEPROM memory with a standard I2C serial interface, and a standard ISO15693 RF (radio frequency) interface. No power is required to operate the M24LR64 in RF mode, which enables on-board energy savings and provides easy and convenient remote access to electronic product parameters. The EEPROM is compatible with existing RFID equipment, thereby delivering a wide range of solutions and an accessible technology to product manufacturers. The M24LR64 has a 64-Kbit capacity for storage of program code, product parameters, serial numbers, calibration data, or event-log data. Its RF ISO15693 interface can be accessed by a wide range of RF readers, covering hand-held devices, pad antennas, gate systems and tunnel readers.

Contact Rutronik: Bernd Hantsche,
Tel: +49 7231 801-506, bernd_hantsche@rutronik.com

Professional remote control



The STD35 from Telic is capable to handle all disciplines of a high-end telemetry control device. It can be configured via telephone or SMS commands, and with access via Internet. For exact measurement and transmission of data, the powerful STD35 can handle up to 5 inputs (2 analogues) and activate up to 5 relay outputs. Its robust and water protected housing facilitates its outdoor application with industrial facilities, buildings and machinery, for complete professional remote monitoring and controlling.

An optional camera can be connected to verify alarm messages. By default, the necessary RS232 interface is integrated in the module. With the module and the camera, photos can be sent out by e-mail. These provide valuable information in case of an alarm. For a limited time period, the integrated backup LiPo battery keeps the device operating even during power cuts. On-site servicing checks are avoided because of the remote checking of data and the switching of systems and facilities. Thus, costs are being reduced and it is environmentally friendly. The STD35 can also be used as a GPRS modem for data transfer by using the RS232 interface in terminal (transparent) modus. When using a SIM card with fixed IP, a comfortable configuration and control by internet is possible. Additionally, Telic offers a

configuration tool that allows for the implementation of full functionality even with complex applications.

Contact Rutronik: Daniel Barth
Tel: +49 7231 801-491, daniel_barth@rutronik.com

Worldwide compatibility



With its HE910 Telit presents, as the only player in the M2M arena, a penta-band solution using HSPA+ technology with the most compact and powerful design currently available on the market in an LGA form factor. The HE910 module provides ubiquitous 2G coverage with quad-band GPRS and EDGE class 33 connectivity and features 21Mb/s in downlink. Together with its low profile, low consumption and advanced connectivity features, the HE910 is well-suited for applications such as mobile computing devices, PDAs, smart-phones, table PCs and consumer electronics in general, for both business and day-to-day life. An integrated high sensitivity A-GPS receiver for indoor fixes and simultaneous GPS with voice and data is optionally available. The module supports five frequency bands (850/900/1700/1900/2100 MHz). It can be used worldwide - regional versions are not needed. A portfolio with subsets of three-bands regional variants is available together with the penta-band module version.

Contact Rutronik: Daniel Barth
Tel: +49 7231 801-491, daniel_barth@rutronik.com

Energy-efficient, wireless M-bus module



The ME50-169 module from the Telit xE Family belongs to the latest generation of wireless M-bus products. It optimizes one- or two-way data exchange with gas, water, heat and electricity meters and concentrators. The module

is compliant with EN13757 part 4 and works at 169MHz. With an output power of 25mW and an excellent sensitivity, it can reach a transmission range up to 5km. Available in LGA format, the pre-certified RF module provide a TTL RS232 interface, integrated digital and analog I/Os and can easily be integrated into a system, thus reducing development time and cost. ME50-169 has also an ultra-low-power consumption for maximum battery life applications.

The module maintains the characteristics of all the Telit xE RF modules family: ultra-low-power consumption for maximum battery life applications, an in house developed Protocol stack giving the highest flexibility and best technical support. It is upgradable Over-the-air and remotely managed and controlled by means of the SR SW Tool. The ME50-169 is mechanically and pin-to-pin compatible with ME50-868.

Contact Rutronik: Bernd Hantsche,
Tel: +49 7231 801-506, bernd_hantsche@rutronik.com

Low-profile compact size



The 5320 PIFA dual-band ceramic chip antenna from Yageo integrates the existing PIFA ceramic GPS antenna and the BT/WiFi antenna into one multi-functional GPS/WiFi/Bluetooth antenna emphasizing design space saving and manufacturing cost saving. With a low-profile compact size and dimensions of only 5.3mm x 2.0mm (5320), it is designed to be isolated from environmental interference and features high reliability and stability characteristics. This antenna is specifically designed for Tablet PC, Smartphone, and PND applications, where the design space for antenna is limited. It supports both 1.575GHz and 2.45GHz central frequencies to integrate GPS, Bluetooth, and WiFi functions into one single package. Featuring a low-profile fitting, it effectively solves the issue of limited design space. Moreover, the use of SMD packaging makes it easier to mount on a circuit board, and decreases the placement requirement to one package; thus reducing manufacturing costs.

Contact Rutronik:
Berndt Blitzner, Tel: +46 8505 549 06,
berndt_bltzner@rutronik.com

Jobs with prospects

You reap what you sow

The demographic change that society is undergoing has many different effects, including those that are impacting the labour market. Measures have already been taken to counter some of these, such as raising the statutory pension age to 67. Further changes to how long we have to work cannot be discounted. For employees, these developments mean it is more important now than ever for them to be capable of working. This capability refers not only to health and fitness, but also to ensuring they are suitably qualified to compete at the current level.

It is increasingly important for newcomers to the profession and employees to find an employer who takes their role in developing talent seriously, and offers their employees opportunities to stay fit professionally with continuing professional development and training.

At Rutronik, we greatly value opportunities for training and education of our employees. These include vocational training in commerce for wholesale and export trade, in haulage and logistics and in IT, as well as the provision of study places for electronic engineering, business engineering and business IT, offered by Rutronik in partnership with the Duale Hochschulen (DH - Institutes of "Cooperative Education"). We currently have 22 trainees and 11 students pursuing education in 10 different vocational categories and faculties. Once they successfully complete their courses, then the world is their oyster: "We certainly do not apply the "once a trainee, always a trainee" maxim. In contrast, the vocational journey taken by many of our employees at Rutronik has been quite astonishing. For example, our current Head of Business Development for Europe in the Displays & Boards division started out as a trainee on our wholesale and export trade programme. Another lady who started out on the whole-sale and export programme in Materials Management, has now reached the level of Product Sales Manager in Optoelectronics," explained Christina Gruber, Head of Human Resources Management at Rutronik.

Generally, people who have completed their traineeships in our wholesale and export programmes start out in Materials Management or Sales Back office, with prospects and opportunities to become Product Sales Managers, Line Managers or Field Sales Staff. Students who graduate

engineering. There are comprehensive promotion opportunities for everyone, according to each individual's own capabilities and targets. These are not just limited to Rutronik's base in Ispringen, either. As a global company with subsidiaries in 27 countries, Rutronik offers its employees interesting opportunities in other countries, too, and trainees also have the chance to gather experience abroad.

Qualifying is just the beginning

Life-long learning has long been a basic principle of modern career planning. However, enacting the principle in practice has

sure to help develop them professionally and personally. Each employee has an individual programme that is defined by area of responsibility, interests and knowledge. "We want to work with our employees for a long time. This is a process that includes a preference to fill management positions from within our own ranks," explained Head of Human Resources Management Gruber. "For that reason, CPD and long-term development of the next generation of managers are particularly important tasks. We seek out and give specific support to those who show potential. True to our corporate motto of "Committed to excellence", the next step on the ladder for all our employees is determined by their performance, willingness to work and desire and ability to help shape our company. Therefore, our internal training does not just cover technical knowledge, but also the soft skills needed by our management. This comprises developing our employees' entire personality, with factors such as communication and the capability to express themselves, demonstrate team spirit and develop social skills.

Security in volatile times

Especially in strained economic times, a secure job is not always a given, even if you have good qualifications. "Young people, in particular, require stability for their personal development. But this reliability is also enormously important for older staff. For this reason, our philosophy involves establishing working relationships for the long term. We are not the sort of organisation that randomly hires and fires," explained Gruber. "Our company, which has out-performed the market average since it was founded, is in great economic health, and therefore we are in the fortunate situation that we can offer our employees secure jobs with good prospects." ■



"We want to work with our employees for a long time. This is a process that includes a preference to fill management positions from within our own ranks," explained Head of Human Resources Management Christina Gruber.

through the Duale Hochschule (Cooperative University) route generally enter at business engineer level, such as Junior Product Sales Manager, or Junior Field Application Engineer in the case of those who have studied electronic en-

often lagged far behind. That is not the case at Rutronik. Here, employees, whether they started out as trainees or students, continue to spend time behind a desk long after qualifying. They are offered wide-ranging training mea-


 Fascination Electronics

Connecting intelligence

Rutronik is one of the leading distributors of electronic components. More than 1.200 employees worldwide contribute to its success. Continuity, high dynamics and ambitious objectives ensure a future-orientated environment.

For our product portfolio to be successfully positioned in the market place, it must be defined in Product Management and product strategies must be implemented. Technical and commercial parameters both play a decisive role here. For our team we are looking for:

RFID/NFC Product Manager (m/f)

Bluetooth/WiFi Product Manager (m/f)

The product manager defines the product portfolio and associated warehousing structure in their area of responsibility in line with technical and commercial parameters. Following a thorough training and orientation period, you will support customers and sales colleagues in the selection of appropriate products. Working in close consultation with globally active manufacturers, you will be responsible for organising all the marketing materials and campaigns for your own product area.

What we require of you:

- Degree in engineering or business administration or appropriate training
- Technical and commercial expertise
- First-hand professional experience in sales or product marketing is an advantage
- A strong communicator and confident in dealing with business partners
- Excellent command of English and MS Office

Are you interested? You can expect to receive an attractive remuneration package, excellent training and outstanding opportunities for development. We look forward to receiving your application (please provide details of salary requirements and starting date). For further information, contact:

RUTRONIK Elektronische Bauelemente GmbH

Industriestraße 2 | DE-75228 Ispringen | Germany | Tel. +49 (0) 7231 801-273 | career@rutronik.com | www.rutronik.com

The sale and distribution of electronic components is central to our activities. Customer orientation and proximity are therefore of top priority to us. Commercial and technical distribution profiles can produce important synergies.

Wireless Field Application Engineer (m/f)

In the long term, the correct selection of components from a technical point of view will safeguard our customers' business and, ultimately, our future. Following intensive internal and external training with our manufacturers, you will consult with our customers' development engineers on all technical matters during the evaluation and design phase. You will be based at one of our locations in Europe. You will function as an interface to our manufacturers until production begins.

What we require of you:

- Degree in electrical engineering/communications technology/IT or appropriate equivalent training in conjunction with a long period of professional experience
- Established expertise in the use of the most popular wireless technologies such as RFID, GPRS, UMTS, GPS, Bluetooth, WLAN and ZigBee.
- First-hand professional experience in technical sales/development
- An interest in consulting, technical support and project work
- Good command of English and MS Office



Securing supply and optimising process costs

Competitive advantage from professional logistics systems

The market for electronic components is characterised by periodic fluctuations in demand. This alternation between shortage and excess production needs swift intervention to ensure a reliable, uninterrupted supply.

Tailored, consistent logistics systems show off their advantages in this respect. Thanks to their advance planning capabilities, they even out the effects of shortages so that customers barely notice them, if at all. A prerequisite for any functional logistics system is permanent electronic data exchange, allowing fast reaction to changing demand. At the same time, it also enables processes to be optimised and errors to be reduced. The human factor in manual data entry and confirmation represents a much larger source of error than any electronic system.

Since 1996, Rutronik has developed and implemented logistics solutions for and with its customers, who now number 500 in this sector.

The broadliner earns half of its total revenue through logistics systems and looks after logistics customers around the world. Orders are prepared and coordinated from the head office in Ispringen, so that Rutronik can supply the same standards of service around the world in terms of consistency of labelling, packaging,

notification and much more besides.

The work centres around three standardised, easily implemented logistics systems, “Delivery schedule”, “Kanban” and “Consignment”, with established procedures for the flow of information, materials and money. These are adjusted according to custo-

mer wishes to fit the relevant processes, costs and factors, and can be combined flexibly with system-supported forecasting, ship-to-line, bar codes and many other additional options, producing a final tailored system. In many cases, other optional services are useful, even if they come at added cost, such as traceability. The most advanced system in the European distribution sector is developed by Rutronik. It allows easy unique identification and traceability of all electronic components. The underlying platform is a system of cameras that read the bar codes and record the information from every packaging unit in the distribution centre, saving the data in a file. As soon as the data is in a format that can be processed, further handling or search for detailed data do not pose problems anymore. Each packaging unit is allocated a unique number (PU-RID – Packaging Unit Rutronik ID) affixed to the label. This identifies each packaging unit uniquely, in contrast to the “PUN” (Packaging Unit Number) of the vendor, which can sometimes be used for a large number of packaging units.



Flexible delivery schedule system

Scheduled deliveries can be used for all components and are also suited for a smaller volume of item numbers. Customers send their rolling consumption forecasts to Rutronik each week. These forecasts are used as the planning basis. Rutronik uses the plan figures to distribute specific volumes that are agreed with the customer within a defined period of time. The demand patterns may be quite irregular.

Kanban: "Card system" for secure goods circulation

Kanban processes are suitable for constant demand and continual production. The basic requirement is that the customer has sufficient storage space, regular consumption and long-term, constant batch sizes. Kanban containers are defined in advance as having a specific fill level, and a specific number. Each container, or bin, is allocated a unique Kanban ID number. All the information on a bin (quantity, finished part no., bin type, storage location, recipient store and delivery time) is recorded on a card (the

Kanban). Two containers as a minimum are in circulation – if there are more than agreement must be reached about how many Kanban containers can be collected by Rutronik. As soon as one Kanban container at the customer site is empty, the Kanban ID number is set to "empty" and the electronic Kanban card is sent to Rutronik. Rutronik then sends one or the agreed number of full Kanban containers back to the customer.

Since there are always at least two full Kanban containers available at any one time, the circulation of goods and therefore ability to supply is always ensured. Production and material stocks are adjusted to match the order books, and schedules are managed so that they will always be met in optimum conditions. The advantages include a very secure supply chain with low stocks of material, supply close to the point of manufacturing and low management complexity.

Consignment store: Flexible and reliable

For short-term fluctuating production, a consignment store is an ideal solution. The customer provides the storage space while



Rutronik assumes complete responsibility for inventories, including any capital commitment. The distributor therefore purchases the goods and stores them in the customer's location, but only issues invoices when they are picked from the store. As a prerequisite for this model, the customer must be able to replicate the store in IT systems, since the inventories must be managed separately, without any stock valuation.

The main advantages are high availability and security of supply, combined with low handling effort and lower capital costs. Consumption-controlled minimum and maximum fill levels can be used to ensure the consignment store is replenished, or

alternatively goods can be supplied by a demand-management process using forecasting.

A high degree of supply security and efficient handling of passive components figure among the main decision making criteria for the introduction of a logistics system. In this respect, Rutronik has gathered wide-ranging expertise from numerous practical projects, and excels with innovative approaches. Where the initial situation was concerned with efficient management of 'C' parts, the Rutronik product portfolio today covers all product areas equally, leading to a tangible reduction in the number of vendors. The resulting economic advantage is a major factor in times of hard competition. ■



Flag

Editorial:	Maria Hasel, Public Relations, Rutronik (Chief Editor, responsible for the content), Ph. +49 (0)7231 801 679 Bernd Hantsche, Product Area Manager Wireless Competence Center, Rutronik, Ph. +49 (0)7231 801 506 Christine Schulze, Agentur Lorenzoni GmbH – Public Relations, Ph. +49 (0)8122 55917 14 Beate Lorenzoni, Agentur Lorenzoni GmbH – Public Relations, Ph. +49 (0)8122 55917 22 Susan Bürger, Agentur Lorenzoni GmbH – Public Relations, Ph. +49 (0)8122 55917 16 Markus Krieg, Managing Director Marketing, Rutronik, Ph. +49 (0)7231 801 505
Advertising Manager:	Carmen Hernandez, Rutronik Marketing & Communication, Ph. +49 (0)7231 801 686
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Fairs in 2012

Embedded World, Nürnberg

28. Februar - 1. März 2012

Electronica China, Shanghai (China)

20. - 22. März 2012

Display, Paris (Frankreich)

3. - 5. April 2012

Light & Building, Frankfurt

15. - 20. April 2012

S.E.E., Stockholm (Schweden)

17. - 19. April 2012

Lumiville, Lyon (Frankreich)

5. - 7. Juni 2012

Electronica, München

13. - 16. November 2012





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