The only constant is change

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- Hibernate mode: 750 nA (typical)
- Shutdown mode: 60 nA (typical)
- ARM Cortex M3 processor with MPU

Contact Conrad Coetzee - Field Application Engineer on 083 746 2616 or ccoetzee@arrow.altech.co.za for more information.
Change means different things to different people and organisations. It can mean the challenging of paradigms, disrupting performances that are embedded in comfort zones, seeking a better way, constant learning and improvement, and much more.

Currently at Microtronix it means ‘renewal’ and ‘rejuvenation’ as the company embarks on an energised programme to reassess its performance standards, measured against best practice, customer expectations, changes in its environment and competitive landscape, whilst also maximising efficiencies. Learn more from CEO Mike Goodyer on page 16.

For more information contact Microtronix Manufacturing, +27 11 792 5322, mike@microtronix.co.za.

features

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Embedded computing drives change

Mike Goodyer says it best in the title of his article on page 16: “The only constant is change.” While he meant that in relation to developments at Microtronix Manufacturing and within the local electronics manufacturing industry at large, it is an adage that certainly holds true for pretty much every aspect of electronics technologies.

One particularly interesting aspect is the evolution (one could almost say revolution) of embedded computing and edge computing. As a colleague was enthusing about the other day, nowadays you can buy a CCTV camera made in China that costs next to nothing, has really good features and runs an embedded operating system like Linux on a circuit board the size of a postage stamp.

In his article on page 25, Farnell’s global head of technical marketing and solutions development, Cliff Ortmeier, gathers the thoughts of several leading global semiconductor manufacturers on this topic, and the sheer range of their responses illustrates just how vast the variety of applications for embedded systems is, and how deeply they have already, and will continue to, penetrate our modern lives.

In a 2018 research report, Variant Market Research predicted that the global embedded computing market is expected to reach $316.2 billion by 2025 from $172.9 billion in 2017. It went on to point out that rising wireless communication infrastructure, increasing adoption of consumer electronics along with growing adoption of Artificial Intelligence (AI) are the factors driving the growth of the embedded computing market.

I think one of the most exciting things about where the market is going, is the fact that it opens up all sorts of possibilities, not only for the mainstream electronics industry, but for the makers and hobbyists out there. Nowadays a person with a bright idea but almost no knowledge of how a capacitor or transistor works, can buy a single-board computer like a Raspberry Pi and play around to their heart’s content – whether just for fun or for a marketable product.

Also in this issue, Mark Patrick from Mouser’s article on page 28 highlights some cost-effective tools that makers and small businesses can use to innovate. As he points out, “some of the most innovative ‘out of the box’ concepts come from this sector. All too often, major companies have very strict and structured screening processes relating to their R&D activities. These can preclude assigning resources to high-risk or niche projects where it is unclear if there will be a return on the investment.”

Whatever level you are designing at, we have you covered, as this edition of Dataweek comes out with the latest edition of our annual Electronics Buyers’ Guide – EBG 2020 (yes, we really do come from the future). In it, you’ll find anything and everything you might need to design, build and test your latest electronics design.

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The Council for Scientific and Industrial Research (CSIR) has appointed Sipho Mbhokota as the new executive manager for CSIR Defence and Security. His career in the defence and security sector spans over 20 years, with 10 of those years spent as a member of the South African Air Force, where he was a systems engineer in the VIP Squadron, as well as a project engineer on the RSA Airbus A400M aircraft acquisition team. Prior to joining the CSIR, he was the divisional manager: Engineering Services at Armscor’s dockyard in Simon’s Town.

The Department of Science and Technology has received a R360 million boost to its budget allocation, and recently announced how it plans to spend its R8,15 billion over the 2019/20 period. Among its key priorities, it will spend R2,6 billion on human capital development, in particular on assisting Honours, Master’s and PhD students. In addition, about 120 knowledge products are expected to be generated with an allocation of R1,2 billion, focusing on bio-innovation, hydrogen fuel cell technology, renewable energy and energy storage applications.

Industry

World Semiconductor Trade Statistics (WSTS) figures showed that worldwide sales of semiconductors were $33,1 billion in May 2019, a decrease of 14,6 percent from the May 2018 total of $38,7 billion and 1,9 percent more than the April 2019 total of $32,5 billion. Regionally, sales increased on a month-to-month basis in China (5,4 percent), the Americas (1,4 percent), and Japan (0,9 percent), but decreased in Europe (-0,4 percent) and Asia Pacific/All Other (-1,1 percent). On a year-to-year basis, sales were down across all regional markets: Europe (-9,0 percent), China (-9,8 percent), Asia Pacific/All Other (-12,6 percent), Japan (-13,6 percent), and the Americas (-27,9 percent).

Although Asian semiconductor companies’ market share has surged hugely over recent years, market research from IC Insights shows that US firms continue to dominate the global IC (integrated circuit) scene. US companies held just over 50% of the total worldwide IC market in 2018, followed by the South Korean companies with a 27% share, up three percentage points from 2017. Taiwanese companies, on the strength of their fabless company IC sales, held the same 6% share of total IC sales as European companies.

Technology

Imec revealed at the European Electric Vehicle Batteries Summit a solid-state Li-metal battery cell with double the energy density of its previous efforts – 400 Wh/litre at a charging speed of 0,5 coulombs (2 hours). It has also started to upscale the materials and processes in a pilot line for fabrication of solid-state pouch cells at the EnergyVille Campus in Genk (Belgium). With its engineering roadmap for solid-state batteries, Imec aims to surpass wet Li-ion battery performance and reach 1000 Wh/litre at 2 to 3 coulombs by 2024.
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According to Rugged Interconnect Technologies’ owner, Bossie Coetzer, the experience was highly valuable in terms of networking and interacting with local electronics engineering companies and developers. As its name implies, the company focuses on providing rugged solutions for the commercial, industrial and military market segments, by offering single board computers, modules and server solutions, with support for high-end processors and FPGA functionality including high-speed interconnect capabilities.

To comprehensively cater for its customers’ requirements, Rugged Interconnect Technologies’ offering includes I/O boards and sub-systems, backplanes, power supplies, chassis, system integration and training. The company also boasts an open and welcoming policy of putting together demonstration systems for developers, to assist them with proofs-of-concept.

“The ability to offer Pentek’s market-leading solutions is a vital component in us being able to provide a complete one-stop experience to our customers,” Coetzer states. “Their design and engineering philosophy directly correlates with our own, making Pentek products a perfect fit for our business and for the South African market.”

The history and growth of Pentek
Hosking, a Master’s degree graduate from Columbia University in New York, co-founded Pentek in 1986 together with three colleagues of his at the time. “We are in a very fortunate and somewhat unusual situation where the founders all still get along really well, and those strong relationships have given us the foundation to continue to grow our business with a clear, coordinated vision,” he says.

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“Today the company employs around 70 staff, with roughly 30 of those being engineers. We have always fostered a strong family culture and this shows in terms of our phenomenal record of staff retention, and has enabled us to consistently uphold our philosophy of always treating the customer right. We also offer free lifetime application support as opposed to simply selling support packages to our customers.”

Based on constantly evolving digital signal processing (DSP) and data converter technologies, Pentek’s board-level products enable solutions for wireless telecoms, radar, waveform generation, and especially military/defence applications where most of its market resides. Today the company provides over 700 high-performance COTS (commercial off-the-shelf) and rugged board and recording system solutions for the lab and deployment, in AMC, cPCI, FMC, PCIe, PMCs+, XMC, VME, VPX, XMC and 1U rack-mount form factors.

“Fundamentally, Pentek’s focus is the same as it’s always been: to provide solutions that fit into our customers’ systems, and enable developers to fit the pieces of the puzzle together. We therefore endeavoured to abstract the chip design aspect while keeping to compact form factors, and also give developers sophisticated software tools to enable maximum design flexibility,” Hosking explains.

Harnessing the power of RFSoC

Over the years, Xilinx FPGA hardware has provided the ideal platform for Pentek to create its specialised solutions, and Hosking says Xilinix’s release of the Zynq UltraScale+ RFSoC architecture in 2017 was something of a game-changer. It enabled Pentek to introduce its new Quartz family, starting with the Model 5950, an eight-channel A/D and D/A converter, 3U OpenVPX board that opens up new opportunities in applications such as electronic warfare and countermeasures, phased-array antenna systems, 5G wireless infrastructure, waveform and radar chip generators, and high-bandwidth data streaming.

While the Model 5950 follows the form factor of a standard 3U OpenVPX board, the unique modular design of Pentek’s Model 6001 QuartzXM eXpress Module provides the flexibility to deploy this solution in many different situations. The QuartzXM is a system-on-module containing all of the key components including the RFSoC FPGA, DDR4 SDRAM, and power and clock management.

The 5950 design places the RFSoC as the cornerstone of the architecture. All control and data paths are accessible by the RFSoC’s programmable logic and processing system. A full suite of Pentek developed IP and software functions utilise this architecture to provide data capture, timing and interface solutions for many of the most common application requirements.

Pentek helps streamline the process from development to deployed application by providing a full suite of built-in functions. These address the data flow and basic processing needed for some of the most common applications.

In closing

In describing the company’s core philosophy, Hosking says: “Pentek takes pride in listening to its customers and creating new products to meet their needs. We promise an atmosphere of freedom and creativity among our engineers, so they can design industry-leading products to satisfy the most demanding applications. This has been the key to our success through the years.”

For his part, Coetzer states that “it was a pleasure for Rugged Interconnect Technologies to host Rodger in South Africa. I enjoyed the opportunity to tap into his knowledge and experience first-hand, and having had him accompany me on visits to companies and developers across the country really put a stamp of our approval on both of our companies’ efforts in the local market. I look forward to welcoming him back in the future.”

For more information contact Rugged Interconnect Technologies,
+27 21 975 8894, sales@ri-tech.co.za, www.ri-tech.co.za

Pentek’s Quartz family debutant, the Model 5950.

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Pentek’s Quartz family debutant, the Model 5950.
Clearing the Static

with Greg Barron,
Actum Group director

Topic 5:

ESD testing and monitoring – Part 3

Continuous monitoring and testing are key to effective static charge control. To ensure there are no loopholes in your ESD control programme, all ESD equipment, as well as personnel operating it, need to be tested regularly to comply with industry standards.

Depending on the environment and application, specific testing methods and testers are recommended. Below are a few of the most popular testers used in the working environment:

Surface resistivity testers
Surface resistivity defines the electrical resistance of the surface of a material in ohm/square. Altico Static Control offers a range of meters that can measure surface resistivity, resistance to ground and point-to-point resistance. These meters are portable and come with two electrodes and a probe. They also contain LEDs for quick reference of conductive, dissipative and insulative properties.

Field service testers
Static field meters detect and accurately measure electrostatic fields. Allowing measurement in hard-to-reach places and offering an accuracy of ±10%, most handheld meters require the measurement to be taken at a fixed distance from the object.

Wrist and shoe/heel strap testers
Test the operator’s path to ground and determine whether their personal grounding device (wrist strap and coil cord or shoe/heel strap) is fully functional. Separate test circuits should be used in each instance. Tests should be conducted daily and every time an operator enters the ESD protected area (EPA). Constant wrist or shoe/heel strap testers, as well as wall-mounted ones, are available for ease of use and quick pass or fail results.

For more information contact Altico Static Control Solutions on +27 11 608 3001 or email sales@actum.co.za to discuss your static control requirements.

Demand for local products highlighted at LME expo

The Local Southern African Manufacturing Expo (LME), held in Johannesburg in late May, managed to draw a respectable 3473 visitors in its first ever outing. “The Expo was the culmination of a vision that the South African Capital Equipment Export Council (SACEEC) has nurtured for a number of years,” said Eric Bruggeman, CEO at SACEEC. “We fully believe that the time has come for local manufacturing to take centre stage by capturing a large slice of the international pie, together with replacing imported products with local alternatives.”

In his presentation at the free-to-attend SAIMechE Seminar Theatre, Bruggeman emphasised that South African manufacturers need to learn to market their strengths through entrepreneurship, aftersales service, innovation, 4IR (the Fourth Industrial Revolution), as well as finding the right BBBEE partners and technology partners. “We can no longer work in isolation. This is a team effort, if you will, and requires full participation and dedication from all stakeholders.”

This sentiment was echoed by Steve Jardine of Recapitalise, who said: “Re-industrialisation of South Africa takes team work and skill to access markets and achieve the levels of local content desired. It takes thousands of entities working together, although independently, to achieve an increase in productive outputs and sustainable growth across the economy.”

In addition to the wide array of locally manufactured products and local services showcased at the Expo, visitors enjoyed 12 informative seminar sessions, the hands-on Skills Development Zone hosted by the Artisan Training Institute (ATI), and the SA Mining Supply Chain Conference and Workshop, which had 112 delegates over two days.

The conference and workshop fostered positive interaction and produced a number of tangible goals. According to Ronnel Yankana of the Mandela Mining Precinct, these included the fact that local industry requires robust coordination to capitalise on the opportunities behind the Mining Charter 3 for the development of local content and localising our supply chain. “This would encourage import displacement and enhance our competitiveness through:

• Building strong supply chain clusters.
• Technology and R&D investments.
• Implementing coding for standards, inventory and supply chain control.
• Understanding the needs and requirements from the end users (mines).
• Investigating/developing funding vehicles to assist local players.

“In addition, mechanisation and automation could be jobs neutral and create more jobs if the mining supply chain developed locally.”

For more information visit www.localmanufacturingexpo.co.za
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Analog Devices explores use-cases for wearable devices

By Jan-Hein Broeders, Analog Devices.

The population is ageing and more people need health support, which is having a big impact on the overall spend in medical care. Due to this situation, authorities and health insurance companies are putting more emphasis on prevention, health awareness and lifestyle.

In general, it is not just about exercising more or better nutritional intake – there is more interest in monitoring certain vital body parameters. This is the reason why companies in the smart watch and health watch business have seen their revenue grow over the last few years.

Buying a health watch and measuring body parameters does not mean that you are living healthier. The trick to healthy living is that you're monitoring certain body parameters over a long period of time to get more familiar with these numbers and use them to adapt your day-to-day life for better health. This is a process that can help you to understand better how the body works and how to reduce the cost of health over the long term.

Although Analog Devices is not a manufacturer of finished products, it has developed a wearable VSM platform to serve as a reference to help the electronic designer and system architect speed up the development process while designing newer, smarter and more accurate wearable devices for the professional and medical market.

What, how, and where we are measuring

A broad range of vital parameters can be measured with a wearable device. Depending on the overall objective, certain specifications are more important to measure than others. The location of the wearable device on the body has a big impact on what can be measured and what cannot. The most obvious location is the wrist. We are accustomed to wearing a device on our wrist, which is the reason why so many products like smart watches and wrist-worn devices are on the market. Besides measuring on the wrist, the head is another good location for wearables.

For example, headphones and earbuds are offered in different styles containing embedded sensors to measure parameters such as heart rate, oxygen saturation and temperature. A third good location for wearables on the body is the chest. First-generation heart rate monitors were designed around a chest strap and this biopotential measurement principle is still a very accurate technique. Today we tend to prefer a chest patch, as the strap is not very comfortable to wear. Several manufacturers are involved in the design of smart patches to monitor vital parameters.

Depending on body location, we are not just faced with the choice of which parameters can be measured, but also what technology should be used. For heart rate measurement, biopotential measurement is one of the oldest technologies. The signals are strong and easy to retrieve from the body by utilising two or more electrodes.

For this approach, integration of the circuitry in a chest strap or headphones is perfect. However, measuring biopotential signals at a single point like the wrist is nearly impossible. You need to measure across the heart where these electric signals are being generated.

For single-spot measurement, optical technology is more appropriate. Light is sent into the tissue and its reflection as a result of blood flow in the arteries is captured and measured. From this optically received signal, beat-to-beat information can be retrieved. This technology sounds rather straightforward, however there are several challenges and influencers that can make the design really difficult, such as motion and ambient light.

Analog Devices’ GEN II wearable device reference platform has most of the previously described technologies on board. The device is designed to wear on the wrist, although you can also remove the soft belt and attach the device to the body to use it as a smart patch. It includes technology to support biopotential measurement, optical heart rate measurement, bioimpedance measurement, motion tracking and temperature measurement, all integrated in a tiny, battery-operated device.

The overall objective

Why did Analog Devices design a system like the GEN II watch? The goal for a system like this is to be able to measure, in an easy way, several vital parameters on the body. The device can simultaneously measure the parameters and store the results on an SD card, or send them over a BLE wireless connection to a smart device. Since the measurements are done simultaneously, it also can help to find correlation among the several measurements.

Biomedical engineers, algorithm providers and entrepreneurs are continuously looking for new technologies, applications and use cases to detect diseases at an earlier stage, in order to minimise negative effects or damage to the body that might occur in the later stages.

A single measurement doesn't say anything

The new wearable system from Analog Devices is a unique device due to the combination of embedded sensors, processing power and wireless communication.

The optical system is built around the ADPD107 optical analog front end. It makes use of green LEDs to measure PPG and heart rate, while an infrared LED is integrated for proximity to detect when the device is attached to the human body.

Biopotential ECG measurement is supported by two individual AD8233 analog front ends. One front end interfaces to the electrodes embedded in the device. One electrode at the backside of the device is touching one limb and
a second electrode at the top of the device can be touched by the other limb (hand) to close the loop.

A second analog front end can be enabled to measure ECG with an external electrode. This allows the user to wear the device like a smart patch and connect the external electrodes directly to the chest. The electrodes at the back side of the device have a double function: in addition to ECG measurement, these can also be used for electrodermal activity (EDA).

EDA, or galvanic skin response (GSR), is related to the conductivity of the skin, which can change due to emotion, coming from either an internal or external stimulus. The GEN II watch is able to detect this minute change in conductivity.

The circuit around this measurement principle, including the transmit- and receive-signal chain, is completely built with discrete components. It delivers a high level of accuracy at minimum power dissipation.

Last but not least, a temperature sensor for skin temperature measurement and a three-axis ultra-low-power MEMS sensor (ADXL362) have been integrated. The MEMS sensor tracks motion; this can be used for motion profiling, but also artefacts due to motion can be compensated within the other measurements.

Motion is always an important aspect, since several vital parameters including heart rate, SPO2 or respiration rate are very dependent on activity, and so motion of the body must be measured. A heart rate of 140 bpm is fine while you are jogging, but you might have to worry if it is 140 bpm while you are sitting on the couch. By combining various sensor signals, new applications can also be supported.

The ultra-low-power ADuCM3029 has been integrated to collect the sensor data and to run the algorithms. Figure 2 gives an overview of the integrated devices on the sensor board.

**Stress and continuous blood pressure**

For heart rate, either ECG or PPG measurement is needed, so this doesn’t require the combination of sensor outputs, unless we want to compensate for artefacts coming from motion. Use cases where multiple measurements are needed include stress management or continuous blood pressure monitoring.

The emotional state can be measured by monitoring changes in skin conductance. This is just one parameter, but if we are going to combine this with monitoring other parameters, such as heart rate and heart rate variability (HRV), the value of the measurement increases a lot. Skin temperature could also be included as an additional input in measuring stress.

Blood pressure monitoring is another interesting use-case. This is a very important parameter – thankfully most of the systems are cuff-based, which is hard to integrate in a wearable and continuous system. However, there are certain techniques that can be used to measure blood pressure without the need for a cuff.

One technology does this by making use of the pulse wave transmit time (PTT). The arterial PTT signal can be measured between the moment of contraction of the heart on the R-wave and the pulse arrival time in the finger. This PTT signal has a direct correlation with blood pressure. Figure 3 shows a measurement of ECG in combination with PPG. The watch can be used for this measurement as it supports ECG and PPG measurement all in one device.

**Prototype to product**

The GEN II watch has many high-performance sensors and features embedded in a small wearable device. Besides the electronic design, many mechanical aspects have also been taken into consideration. This makes the platform very attractive to design companies and device manufacturers that are focusing on the semi-professional and professional sports markets, as well as on the medical market.

Several parameters can be measured simultaneously – however, algorithms need to complement the application and support the use-cases. This device can give developers and device manufacturers a quick start on the development process, cutting out the need to validate algorithms and build before testing.

The GEN II watch is available in limited quantities and Analog Devices is interested in working with design companies and algorithm providers to develop a state-of-the-art system that can be sold to the professional caregivers and health insurance companies. Some features already meet medical specifications while others still need improvement, but we are definitely on the right track.

For more information contact Conrad Coetzee, Altron Arrow, +27 11 923 9600, ccoetzee@arrow.altech.co.za.
Low-power IoT module in volume production

Nordic Semiconductor’s nRF9160 system-in-package (SiP) – an LTE-M/NB-IoT and GPS cellular IoT module – has entered the final volume silicon production phase, having successfully passed a series of major qualifications and certifications.

At just 10 x 16 x 1 mm in size, the device is suitable for compact consumer and medical wearables, and asset-tracking devices. Yet it is a complete solution that integrates everything a cellular connection and IoT application may need beyond requiring just an external battery, SIM and antenna. The nRF9160’s modem and microcontroller (MCU) were designed from the ground up for optimised power performance in IoT systems.

The SiP is also available on a powerful single-board development kit made for the IoT application developer. This comes with free development tool support, a cloud demonstration platform, and a software development kit (SDK) in GitHub with sample applications to provide a starting point for product development.

To achieve the module’s high level of integration, Nordic partnered with Qorvo to make an SiP that integrates application processor, power management, modem, RF front-end, crystals and passives. It also supports global operation with a single SiP variant, thanks to the combination of Nordic’s multimode LTE-M/NB-IoT modem, SAW-less transceiver, and a custom RF front-end solution from Qorvo.

The nRF9160 is the first cellular IoT module to incorporate Arm’s latest Cortex M33 CPU core, which is further supported by 1 MB of Flash and 256 KB of RAM on-board memory. It is also the first cellular IoT module to incorporate Arm TrustZone and Arm CryptoCell security for Internet-level encryption and application protection with Arm Cortex-M-based devices.

Integrated GPS support allows a combination of GPS and cellular data to be used for more accurate positioning than either technology is capable of when used in isolation.

For more information contact Andrew Hutton, RF Design, +27 21 555 8400, andrew@rfdesign.co.za.

DC-DC power module reference design

Magi³C power modules from Würth Elektronik are DC-DC converters with integrated controller IC, inductors and capacitors.

With the new Magi³C power supply reference design, the manufacturer aims to demonstrate the ease with which an adjustable current or voltage source can be built with one of these power modules.

The board is based on the Magi³C VDRM (variable step-down regulator module) to which two additional control loops have been added. The design is aimed at various applications that require an adjustable power source: it generates a constant voltage with an adjustable maximum current on the one hand, or can be set to generate a constant current with adjustable maximum voltage on the other.

In the two operating modes, the output voltage can be set from 0 to 15 V and the current from 0 to 2.5 A; the input voltage range is 7 to 36 V. LEDs on the board indicate the voltage regulation mode, current regulation mode and a missing output voltage. The output voltage and output current are conveniently set via two potentiometers.

The reference design can be used as a driver for white, infrared and ultraviolet power LEDs or as a battery charger for lead, NiCd, NiMH or lithium-ion batteries. It can also be used as a supercapacitor charger and mini laboratory power supply.

For more information contact Jason Page, Würth Elektronik eiSos, +27 71 259 9381, jason.page@we-online.com.

Fingerprint sensor module

The One Touch Access 100-USB from NEXT Biometrics is a high-quality, bezel-less USB fingerprint area sensor module designed for integration into custom application products such as notebooks, tablets, USB peripherals, point-of-sale and access control terminals.

It relies on the NEXT sensor chipset mounted on a small printed circuit board for seamless hardware integration. The module connects to a USB hub or embedded USB host.

The fingerprint sensor module works with the patented NEXT Active Thermal principle. The sensor technology is tolerant against dirt, grease and varying environmental conditions. The large active area of the One Touch Access 100-USB allows stable imaging, intuitive user operation and is ideally suited for mass market applications in need of both security and convenience.

The NEXT technology enables an economical production process and makes a quality sensor available to price sensitive applications without compromising functionality or performance. NEXT Biometrics offers a turnkey biometric subsystem by providing hardware drivers and a complete biometric SDK (software development kit) based on a NEXT-certified partner algorithm for a variety of host platforms.

One Touch Access 100-USB is ready for WBF and Windows Hello. USB host drivers are available for Windows, Android and Linux.

For more information contact Renaldo Fibiger, Altron Arrow, +27 11 923 9600, rfbiger@arrow.altech.co.za.
SA security manufacturers going strong

By Brett van den Bosch.

The security sector is one in which South African manufacturers have held their own for many years, with a number of companies even having made big names for themselves internationally.

Centurion Systems

The vast majority of Centurion Systems’ products are manufactured locally; these include many of its gate motors, traffic barriers, GSM solutions, intercom systems, remote controls and receivers.

“From initial design right through to production, we ensure that our products are versatile and robust enough to serve virtually any market,” says communications coordinator Charl Mijnhardt. “We currently export to over 70 countries worldwide, which is testimony to how adaptable our products are. Our brand essence is to make life easier for both installers and the end consumer, so in terms of benefits, we count innovations such as easy setup via LCD interfaces and mobile apps, simplified maintenance and, of course, exceptional after-sales support.”

Currently Centurion Systems’ manufacturing facility has 20 production lines; these can be grouped into four main areas, namely computer numerically-controlled (CNC) machinery, surface-mount technology (SMT), electronics assembly, and mechanical assembly. Additionally, it has implemented advanced robotics which are used in the assembly of its access automation solutions.

Collectively, Centurion manufactures in excess of 272 000 sub-assemblies per month, which are required for final assembly. This in turn translates into 82 000 finished products per month, and considering that most products are hand-assembled on semi-automated production lines this is quite an impressive accomplishment.

Almost all the tools and jigs used for assembly are designed, built and maintained in-house by Centurion’s own production support department. This has led to a competitive advantage for Centurion as there is very little downtime while waiting for machinery to be repaired. In addition, it leads to the development of innovative ways to assemble and test finished products.

“Some years ago Centurion embarked on a production efficiency programme, run through the Department of Trade and Industry. This programme, called The Workplace Challenge, empowers our employees to be more involved in the decisions made in the business, drives innovation and leadership, and helps in the skills development and upliftment of the workforce.

“This has given Centurion the edge in terms of the quality and delivery of our products to the end-users. The employees go the extra mile to improve their work area and their productivity, and are proud to have their name associated with the individual products that they produce,” Mijnhardt says.

In what may come as a surprise to many, he says the company does not experience any particular challenges when it comes to recruiting qualified technical people. “South Africa has so many gifted people possessing diverse skills, that we have access to a vast pool of qualified individuals who each bring their own unique skills to the table. From our support technicians right through to our production staff, our people are as world-class as our products.”

With robust construction and using highly durable engineering polymers, Centurion’s products are built to withstand the harsh African climate. This has been a contributing factor in making its solutions suitable for export to other markets, for example South America, as well as installation on demanding sites such as mines. Since its products are frequently installed outdoors, it ensures that they are capable of weathering various environmental conditions.

“As with any undertaking, there will always be things that could make the running of the business easier,” Mijnhardt summarises “That being said, the company has thrived for the past 30 years despite the often tumultuous and unpredictable economic environment, so we have the adaptability and resilience to deliver industry-leading products even when faced with significant challenges.”

Zyteq Technologies

Zyteq Technologies can trace its origins back to the days of Ziton, a specialist fire detection company which was founded in Cape Town in 1969. After growing substantially over the years into an export business and a dominant player internationally, Ziton was sold onwards a couple of times, and the brand is currently under the ownership of UTC Fire & Security.

This left the plant in Cape Town at something of a crossroads. At its height it employed close to 300 people and exported 80% of what it made, and former management and staff now took it into their hands to start Zyteq Technologies. The company’s emphasis is still on the fire detection market, but it also has a contract electronics manufacturing (CEM) division that serves the broader South African electronics industry.

“We’re feeding the manufacture of our own fire detection products into our contract manufacturing lines,” explains managing director Mark Mundell, “so we’re essentially our own customer, which is exactly what we always wanted but it’s taken us a while to get to this point.”

Mundell says that, although it was a very stressful transition period when the Ziton business was lost, the DTI (Department of Trade and Industry) and the IDC (Industrial Development Corporation) stepped up and played a crucial role in enabling Zyteq’s future. “We’d already started engaging with the DTI to try and save that plant, and we were well supported in terms of funding to assist with the R&D. It didn’t cover all the costs but it did help that we got some funding to design our own products, and the IDC granted us a loan to fund our factory.

“So those two entities really helped us get off the ground and they’ve been very supportive through the process, because on the R&D side we decided to create a completely new, highly innovative platform.” That proved a lot harder than one might think, because there are no accredited testing houses in South Africa, meaning that although Zyteq’s products are designed and manufactured locally, they have to be sent to Europe for testing and certification.

The standard that governs these fire detection products is EN 54, which is effectively adopted in its entirety by the SABS (South African Bureau of Standards) in the form of SANS (South African National Standards) EN 54.

Since Zyteq was only founded in 2014 and brand new equipment was put in at that time, most of the effort and investment that’s happened over the years has been dedicated to addressing other business factors. “Where we have invested heavily is in our systems, processes and procedures, and there we’ve come a long way. We’re heavily invested in those areas, because we’re obviously ISO certified but we’re also EN 54,” Mundell says.

In terms of finding people with the right skills, he says it is generally not a problem, but the underlying reason for that is an unfortunate one. “All of our staff comes from our old factory, so in a way we’re lucky that we had an existing pool of people that we could bring over. Sadly though, when we employ contractors they are ex-Ziton people who are still unemployed five years down the line.”

The big push for Zyteq now is on the fire detection side, and Mundell believes there’s a big opportunity in the market. “It’s tight at the moment but that may play into our hands a little bit, because being a local manufacturer we can control our costs a lot better. On the contract manufacturing side, the security market is doing well – predominantly new-generation products with a focus on IoT (Internet of Things), rather than the old-school security stuff,” Mundell concludes.

For more information contact
Centurion Systems, +27 11 699 2400, charl.mijnhardt@centurionsystems.co.za; Zyteq Technologies, +27 21 761 3980, info@zyteq.co.za.
Since its inception in 2004, Laser Stencil Technology has grown into a prominent figure in the South African electronics manufacturing industry. Having been involved in circuit board manufacturing using the same photographic and etching technology since 1983, things changed for the company’s founder, Donovan Jeffery, when the first brass SMT stencil was produced and bonded directly to a steel frame. This led to the birth of Stencils CC in 1989, which ran concurrently with his involvement in PCB manufacturing.

Over time, stencil durability became an issue and brass was replaced with stainless steel, and by then the stencils were being bonded onto frames stretched with polyester mesh. This manufacturing method began to show its limitations around 2002 as technology became more advanced and customers began to express their need for smaller and more precise apertures. It was at this point that the inevitable decision had to be taken to purchase a stencil laser, and so the search began to find the best machine for the job. Together with the procurement of the new equipment, a new company was formed and Laser Stencil Technology (LST) was born.

In 2005, the company became the sole agent for Zelflex pneumatic frames, which proved to be substantially more cost effective for its customers by eliminating the aluminium frame, mesh and bonding costs. What is more, a stencil could now be engineered, cut and delivered within hours of the order being placed.

LST purchased the distribution licence for Vectorguard Stencil Foils in South Africa in 2010, giving its customers the choice of two systems to meet their specific assembly requirements. In the same year, a second stencil laser was purchased to improve production time during peak demand, as well as to provide redundancy in the event of downtime on the first laser.

July 2015 saw the company move into its own building in Strijdom Park, one of the busiest industrial centres in Johannesburg and conveniently positioned with easy access from the highway.

“As we know in this industry, nothing stands still, and in recent years new technology has presented many challenges to the assembly industry,” Jeffery muses. “There are occasions where PCB designs contain a large variety of parts including fine-pitch devices that require a thinner stencil and larger parts that require a thicker stencil. In this case it is possible for a multilevel or ‘stepped’ stencil to be designed and manufactured on our recently acquired laser which is unsurpassed in terms of capability and accuracy.”

Step-up areas are created by adding material to the stencil and are used to increase the volume and height of the solder paste in selected areas – useful for ‘pin in paste’ and large format devices. Step-down areas are created by removing material from the stencil and are used to reduce the volume and height of the solder paste deposit in selected areas. The multilevel stencil enables one to deposit the correct volume of paste for every device and therefore achieve optimum results.

“In June 2019, Laser Stencil Technology celebrated its 15th year of serving the South African electronics industry with an uncompromising attitude towards service and quality. One thing is certain, and that is that we could not have achieved what we have done without the loyal and unwavering support of our customers,” Jeffery concludes.

For more information contact Laser Stencil Technology, +27 11 793 1318, stencils@lstec.co.za, www.lstec.co.za
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The only constant is change

By Mike Goodyer, CEO of Microtronix Manufacturing.

We have used the above slogan a few times over the past 25 years at Microtronix and each time we apply it, it becomes even more relevant than before. Change means different things to different people and organisations. It can mean the challenging of paradigms, disrupting performances that are embedded in comfort zones, seeking a better way, constant learning and improvement, and much more.

Currently at Microtronix it means ‘renewal’ and ‘rejuvenation’ as we embark on an energised programme to reassess our performance standards, measured against best practice, customer expectations, changes in our environment and competitive landscape, whilst also maximising our efficiencies. The past six months have seen significant changes within the Microtronix group of companies as we gear ourselves to remain relevant in the years ahead.

To drive this initiative, we brought on board a new CEO, Allan Snyman, in May 2019, who has extensive management and leadership experience, gained over 30 years in corporate and entrepreneurial environments. His primary mandate is to align all our teams and companies behind a common purpose that is clear and compelling.

Having already crystallised our vision, mission and values, we are now redefining our processes and structures to align behind the execution of the strategy. Joining Allan in the executive is Mike Goodyer, in the role of chief technical officer, Adam Cox as chief financial officer and Shaun Rampursad as chief operating officer. Furthermore, we have brought on board a few new management members into our stores, operations and finance divisions to integrate with the existing team and thereby obtain a blend of experience, organisational memory with new energy and ideas.

The re-focused stated purpose for the Microtronix group of companies is to ‘grow our company by consistently delivering excellent quality products for our customers, within agreed timelines, by providing passionate service with pride’. In doing so, we will endeavour to be a trusted leader in the provision of turnkey electronics contract manufacturing solutions in Africa.

Another significant development has been the second tranche of shares being issued to our BEE partners in BUA/Microtronix, bringing it up to a 51% black-owned status and thereby attaining a Level 3 under the new BEE codes. This is very significant progress for our company. Also very exciting is the executive decision taken to develop and support our small factory in Centurion, SM Tech, to become a wholly owned and black empowered entity owned and managed by dedicated, loyal, long-serving staff who have worked at Microtronix for almost twenty years. When this transaction is concluded in the coming weeks, we anticipate that it will attain a Level 1 BEE code rating.

Our strategy of having three factories, i.e., small (SM Tech), medium (Microtronix) and large (BUA/Microtronix), appears to remain a successful draw-card for our clients, enabling us to offer our services across the spectrum of their requirements.

On the production and quality front, we have also made a few significant changes. One of these has been the recent acquisition of a Mydata MY600 jet printer which replaces stencils for solder paste printing on small to medium-sized runs. It also allows us to print new smaller-technology parts down to micro BGA and 0201 parts with ease.

This machine also helps our existing customers save money and time producing prototypes and low-volume runs cost-effectively. It also improves yields on tight and more complicated assemblies, and therefore contributes materially to meeting the challenge of striving for a level of excellence. It is always extremely difficult to achieve the last 3% improvement over 97%. To attain pass rates of between 95-97% is relatively easy, but as you approach the 99.5-100% target the improvements required become infinitely more difficult.

Concurrently, the BUA/Microtronix factory has also undergone a massive operational reorganisation within the SMD department, where six of our large Universal lines were realigned into three continuous top and bottom combinations, allowing printed circuit boards (PCB) to be processed by doing the bottom side first and soldered, and then whilst still in the line the PCB is flipped, pasted and then continues down the line where the top side of the board is populated.

This adjustment has led to faster and more efficient production times with zero human handling and intervention of boards, hence yielding a significant quality improvement with pass rates of 99.7% to 99.9% now not uncommon on larger-volume runs.

The full SMD department was also revamped and extended to allow for the relevant changes for the extension of the three lines to around 35 metres each, and now being able to produce well in excess of 5000 complicated, dual-side, populated PCBs per 24-hour shift at extremely high first-time pass rates.

As inevitably happens with significant change and improvement,
there are challenges affected by big equipment moves and installation setups while still endeavouring to do full production runs. Consequently, there were intermittent delays and other frustrating challenges, but we are confident that by the end of July 2019 everything will have settled down and we will be ready and well equipped to take on the third and fourth quarter surge that we usually experience towards the end of the year.

These changes have served our STB (set-top box) customers well and BUA/Microtronix is currently completing its allocation of the government-supplied STB boxes intended for free allocation to the lower-income sector of the market as part of the digital migration project.

Microtronix is also gearing up for the next phase of production of electricity and water prepayment meters as the government and Eskom place more emphasis on the prepayment distribution strategy. The demand from our loyal customers in the tracking and security industries remains buoyant and we look forward to sustained work flow from this sector.

In the past year, in the Microtronix group of companies we have employed over 100 first-time, first-job youngsters to give them a chance. We want to continue being able to do so but we fear it won’t be sustainable if our government and leaders aren’t committed to the common vision for our country.

Meanwhile we continue to embrace change, choose to demonstrate a great attitude and endeavour to be the very best we can be, and thereby contributing to a vibrant and sustainable electronics manufacturing sector and the South African economy.

For more information contact Microtronix Manufacturing, +27 11 792 5322, mike@microtronix.co.za

Laminates for 5G active antenna arrays

Rogers Corporation has introduced UL 94 V-0 antenna-grade laminates manufactured with standard profile electro-deposited copper foil to meet present and future performance requirements in active antenna arrays and small cells, specifically for IoT and 5G systems.

With the option of multiple copper foil offerings, design flexibility increases, and rounds out the performance versus cost portfolio.

The RO4730G3 ceramic hydrocarbon laminates were originally introduced with a standard profile, low-loss LoPro copper foil option. While LoPro copper foil provides excellent passive-intermodulation (PIM) performance (typically better than -160 dBc) and has gained popularity for intermodulation (IM)-sensitive, high-frequency antennas, as 5G designs evolve, PIM has become less important in some applications. RO4730G3 laminates with standard profile electro-deposited copper provide an attractive blend of price, performance and durability.

These laminates provide a low dielectric constant (Dk) of 3.0 favoured by antenna designers, held to a tolerance of ±0.05 through the thickness (z-axis) when measured at 10 GHz. They are 30% lighter than PTFE circuit materials and feature a high glass transition temperature (Tg) of better than +280°C for compatibility with automated assembly techniques.

RO4730G3 circuit laminates exhibit a low z-axis coefficient of thermal expansion (CTE) of 30.3 ppm/°C from -55°C to +288°C for reliable plated through-holes (PTH) in multilayer circuit assemblies and are lead-free-process compatible.

For more information contact Andrew Hutton, RF Design, +27 21 555 8400, andrew@rfdesign.co.za
In two and a half years, Polish SatRevolution evolved from scratch to developing and producing shoebox-sized satellites. On April 17th it launched its second CubeSat, and Elmatica’s contribution was invaluable in helping it achieve this, according to Tomasz Poźniak, chief development officer at SatRevolution. “As a newcomer in the industry, you have to be creative, achieve your milestones yourself and seek advice by experts when necessary,” he explains.

Since its founding, SatRevolution has rapidly evolved from an R&D division developing mobile applications, VA and AR interfaces, into a high-tech producer of nanosatellites. “The speed of technology, availability of components and parts at a lower cost than earlier makes it possible to produce satellites, even if the budgets start at a smaller scale,” says Poźniak.

Focus on what you do best
The company added new members to the team with experience in electrical engineering, software development, mechanics and robotics, and started testing and developing from scratch. It also involved Elmatica in the product development.

“Our strategy is to ameliorate our strengths, focus on what we do best and involve experts for special input, like Elmatica with their expertise on the PCB level. Whereas some fields might not be rocket science, it’s still some pretty harsh conditions these satellites need to face, affecting both the design and of course the PCB, keeping it alive,” says Poźniak.

Analysing is key to success
“When designing for the space industry, it’s important to remember that there is no way to fix anything if problems occur after launch. Therefore it’s important to think about each element on the PCB and how it will affect the rest of the product, taking into account a lot of variables which may occur, and possibly destroy the module/satellite, like radiation, temperature, vibration or outgassing,” says spacecraft division specialist at SatRevolution, Mateusz Keller.

Keller explains that a challenge the team faced was to make a PCB with all assumptions and calculations taking into account at the outset – creating a system which works even if parts of it do not. Designing for space sounds really complicated but Keller thinks there is learning in everything: “The best way is to analyse all parameters, find the biggest threats and then try to design the PCB in a way so it will be resistant to most of them.”

A giant leap for mankind
“Working with SatRevolution has been a pleasure and educational for both parties. As the moon landing was explained as a small step for man but a giant leap for mankind, the launch of SatRevolution’s first satellites might have been a small step into space, but a giant leap for them. We are so proud to be part of this project, sharing our knowledge and experience about PCB design for space,” says Poland country manager for Elmatica, Rafal Stankiewicz.

The advice to young designers eager to get involved in the space industry is simple from SatRevolution: “Keep on moving forward no matter what and keep in mind that manufacturing CubeSats is not rocket science,” Poźniak finishes.

For more information visit https://elmatica.com/contact/
Benchtop soldering robot

Weller’s new WTBR 1000 benchtop robot aims to synergise precision, reliability and productivity of soldering tasks. It is equipped with Weller’s high-performance ‘Technology Line’ soldering tools, ensuring consistent quality of solder joints. The solder feeder is designed to be in close proximity to the workpiece (PCB), pulling the wire rather than pushing it through the feeder tube. The robust and sturdy construction ensures that no sudden movements or vibrations negatively affect the workpiece, the components or the tools.

A double drawer system allows continuous production for higher process throughput, improving productivity and offering flexibility. According to Weller, the WTBR 1000 can provide up to 50% cost saving versus hand soldering.

The robot is operated with easy-to-learn and easy-to-use software, enabling operators to start using the unit comfortably and quickly. It is simple to switch from one operator to another, with minimum time lost and without unnecessary training expenses.

Being a fully enclosed system with integrated fume extraction, the WTBR 1000 allows customers to achieve a high level of safety – protecting the operator, the workpiece (PCB) and the machine. The fully enclosed system provides a complete and CE-compliant solution.

For more information contact Allan McKinnon & Associates, +27 11 704 3020, info@testerion.co.za

New 3D detector for X-ray system

The X Line 3D Series 400, an inline X-ray system from Goepel Electronic, has a new detector option for high-resolution 3D X-ray inspection of electronic assemblies. The MultiAngle Detector 3 combines the high image quality of the StingRay Detector introduced last year with the rapid inspection speed of a scanning image acquisition.

The 3D X-ray images are captured in motion. The system is particularly suitable for AXI inspection of multi-panel PCBs and complex assemblies with many concealed solder joints. This represents an advantage over conventional AXI systems with flat panel detector technology.

In addition to image quality and inspection speed, the resolution in the Z-direction has been increased significantly. Even thinner reconstructed layers (3D technology) allow complete separation of the top and bottom assembly sides, allowing complete fault detection. A clear separation is indispensable, especially for PCBs assembled on both sides.

Customers who only require single-sided assemblies to be inspected have a further advantage with the new detector. The number of angled projections for generating a 3D image is variable with the MultiAngle Detector 3. This means that single-sided PCBs can be inspected with fewer projections, which increases the inspection speed. In addition, the uniform component library can continue to be used with this procedure and the time for creating the test program can be significantly reduced.

The X Line 3D is delivered with the programming software Pilot AXI 3.4 as well as the machine software Pilot Inspect 3.4. This allows the system to automatically monitor itself and to create usage-based maintenance plans in advance. This predictive maintenance function reduces maintenance and machine downtimes and thus also costs.

For more information contact MyKay Tronics, +27 11 869 0049, mykay@iafrica.com
Conformal coatings for challenging operating environments

Modern electronic assemblies are increasingly expected to survive hostile operating environments and work reliably in conditions of prolonged high temperatures in the presence of thermal shock and high humidity, and where the assembly may be subject to condensation, corrosive agents or other types of chemical attack. Despite this, weight-saving measures have reduced the robustness – and therefore the protective properties – of enclosures and at the same time, environmental legislation continues to limit the use of those considerably more versatile solvent-based protective materials.

In response to these challenges, a new generation of solvent-free, high-performance, two-part conformal coatings has been developed to provide a level of protection that is compatible with that offered by an encapsulation resin, but having the ease of application of a conventional coating. Electrolube’s 2K product series is a prime example of this and will be discussed in more detail, later in this article.

A conformal coating provides that essential secondary line of defence beyond that of the enclosure, so in order to achieve long service life for an assembly deployed in a harsh operating environment, it is useful to consider the common modes of attack and, ultimately, how they may be tackled.

When selecting a suitable conformal coating material for harsh environments, the following issues must be addressed: the potential for corrosion and condensing conditions and/or immersion in water, component spacing and tin whisker formation.

**Corrosion**

Corrosion is a complicated, diffusion controlled, electrochemical process that takes place on an exposed metal surface. Despite the range of potential mechanisms and causes, in the majority of cases, three requirements must be met in order for corrosion to take place:

- The presence of intrinsically electrochemically dissimilar metals (e.g. gold/silver and nickel/tin), or the creation of an anode and cathode by application of applied bias.
- The presence of an ionic species (salts, halides, hydroxides and so on).
- The presence of mono-layers of condensed water to dissolve the ionic species, producing an electrolyte solution.

Preventing corrosion involves the removal of at least one of these prerequisite conditions (Figure 1).

Choice of metals is limited to those used in the solder and solder finish chemistries (which are dissimilar), and there will always be areas of potential difference due to the nature of an electronic assembly. Cleaning can help remove ionic species, but cannot prevent their re-deposition from the operating environment.

Conformal coatings help prevent the formation of electrolytic solutions by acting as moisture barriers. All metal surfaces on a printed circuit board (PCB) need to be sufficiently well coated to prevent exposure to a potentially corrosive environment; even small voids in the coating that expose the metal surface can actually accelerate corrosion under certain environmental conditions. The conformal coating challenge is to achieve an appropriate level of coverage of all exposed metal surfaces across the three-dimensional, complex topography that defines the modern PCB.

In addition to this ‘perfect’ coverage, the coating also needs to provide a barrier against moisture while achieving good adhesion to the substrate to prevent delamination. Once a coating is delaminated, moisture ingress will occur, ultimately producing an electrolytic solution from contact with any pre-existing ionic contamination – another very good reason for thorough cleaning the board prior to conformal coating application.

**Condensation**

Where there is a significant level of humidity, certain areas of an assembly may drop below the dew point and water will condense on the PCB surfaces, significantly reducing insulation resistance. While pure water is not a particularly good conductor of electricity, any ionic impurities present on the PCB surface will become solubilised to form a conductive pathway. As well as leading to corrosion as described above, these conditions will severely test the insulation resistance of the coating.

For all intents and purposes, these are immersion conditions, and water will very quickly find weak spots or voids in the coating. If the coating is thin in certain areas or non-existent, the insulation provided will be negligible – certainly less than optimal. Any conductive solution will enable the passage of electrical current from one weak spot to another, resulting in temporary failure (reversible when the board dries out), or irreversible failure if conductive corrosion products, dendrites or other permanent forms of conductive pathways are deposited on the surface of the coating.

**Component spacing**

Although air is normally an excellent insulator, it can break down in the presence of an electric field greater than 3 kV/mm and become partially conductive. Breakdown voltage in air will depend upon the separation of components populating the PCB. If the potential difference between adjacent components is sufficiently high, a complete electrical breakdown in air will culminate in an electric arc that bridges the entire gap between the components.

Conformal coatings provide additional insulation resistance and designers can use them to achieve more compact assemblies by placing components closer together than would otherwise be possible without a coating.

**Tin whisker formation**

Conformal coatings can also be used to prevent problems posed by tin whisker formation which can lead to localised short circuits (Figure 2). Although current research has shown it to be unlikely, a tin whisker eruption needs to puncture and penetrate out through the coating. And in order to produce a short circuit, the protruding tin whisker must either meet another protruding tin whisker from an

![Figure 1. Conditions for corrosion.](image)

![Figure 2. Tin whisker formation.](image)
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alternative polarity or penetrate back through the coating to a place of opposite polarity.
Computer modelling reveals that as long as there is adequate coverage and thickness of conformal coating on conductive surfaces, it is unlikely that tin whiskers will penetrate the coating once, and to do so twice would be a practical impossibility. That leaves the only real potential failure mechanism as two protruding tin whiskers meeting and forming a short circuit, which is a statistically insignificant probability.

**The two-component approach**
For conventional liquid-applied materials and application processes, achieving good coverage and thickness has been shown to be problematic. For example, in a recent IPC ‘state of the industry assessment’, which contained an analysis of literally thousands of cross-sections, it was reported that little or no coverage was obtained on many common component leads and bodies for all material/process combinations.

Given the importance of edge-coverage and thickness, and the need to achieve both while still maintaining other performance requirements, such as thermal shock resistance and tolerance of thermal cycling, a new coating concept was developed to meet these challenges.

Electrolube developed its 2K conformal coatings series to provide a solution to common problems faced by manufacturers experiencing performance issues with current coating solutions for harsh environments. The two-part conformal coatings series offers capacity for greater coating thickness and enhanced edge coverage while being VOC-free, fast curing and a more economical, solvent-free alternative to silicone materials. Moreover, many of the coatings in the 2K range are hydrophobic and therefore provide excellent protection against water immersion, salt mist and humidity, making them ideal candidates for automotive sensors and under-hood electronics.

2K materials comprise two components: a resin and a cross-linker, both remaining stable when kept separate. Once mixed in the correct ratio, a chemical reaction occurs to form a solid polymer. By adjusting the resin and hardener chemistries, a wide variety of polymers can be produced, ranging from soft rubber-like materials to high-strength glass-like materials.

Traditionally, many of these 2K materials are solvent-based to extend their workable life and enable the use of existing application methodologies. However, with growing restrictions on solvent usage, the industry’s efforts to produce solvent-free solutions have gathered pace.

**Solvent-free**
Electrolube’s move to a solvent-free 2K system required a new approach to mixing and delivery. With coating applications, controlling the flow rate at a suitably low level whilst also maintaining the correct mix ratios, was the key challenge and has recently been overcome by the use of specially developed, low-volume flow-rate delivery. With coating applications, controlling the flow rate at a suitably low level whilst also maintaining the correct mix ratios, was the key challenge and has recently been overcome by the use of specially developed, low-volume flow-rate delivery. With coating applications, controlling the flow rate at a suitably low level whilst also maintaining the correct mix ratios, was the key challenge and has recently been overcome by the use of specially developed, low-volume flow-rate delivery.

Electrolube’s 2K850 two-part, UV cure coating combines the speed and convenience of UV cure, enabling an immediate tack-free coating, with the benefits of Electrolube’s 2K conformal coating system, enabling complete cure at room temperature within 24 hours, compared to the minimum industry average of about 8-14 days.

In rigorous testing, these new two-part systems demonstrate impressive performance when compared with other coating types. The fact that they can be applied thickly (as much as 300 µm) without suffering from cracking during thermal shock testing, enables a greater degree of component lead coverage to be achieved.

This, in turn, results in improved performance during powered salt-spray testing, mixed flowing gas (MFG) testing and condensation testing using the NPL’s new condensation test method – all gruelling test regimes commonly used during automotive qualification campaigns. A good example is a recent test of 2K coated automotive engine control unit assemblies which were subjected to 1000 thermal shock cycles from -40°C to +140°C without stress cracking.

In other Electrolube experiments, undertaken during the 2K development project, a surface insulation resistance (SIR) test board was tested uncoated, selectively coated with a solvent-based acrylic and selectively coated with a 2K material to evaluate NPL’s new condensation test method. The results show that for both BGA and SOIC component types, the SIR results with the 2K coating remained two orders of magnitude higher and hardly varied, irrespective of whether the material was covered with condensed water or not (Figures 3, 4 and 5). There was a fairly significant difference for the acrylic, depending on whether the material was under condensing conditions or not, while for the BGA device evidence of dendrite formation showed up in the uncoated evaluation.

2K conformal coatings provide reliable sharp-edge coverage and while they are normally applied thinly (50-75 µm), they have also been designed, formulated and tested to be applied at much greater thicknesses (250-300 µm) to facilitate superior encapsulation of components and component leads without incurring issues associated with thick coatings, such as cracking during thermal shock testing.

The extreme protection provided by the increased thickness and the coverage capabilities of Electrolube 2K materials will be valued by many automotive and aerospace suppliers struggling with increased demands from OEMs for improved performance in terms of condensation resistance and the integrity of powered-up sea-water immersion applications.

For more information contact Vepac Electronics, +27 11 454 8053, sales@vepac.co.za
Low-cost IoT technology is driving the launch of devices such as smart lighting systems, smart locks, smart thermostats, voice control products, smart alarms, garage door openers, smart fan control, smart plugs and many more.

Wireless mesh networks (WMN) are an ideal solution for these types of applications, offering cable-free, low-power and low-cost methods of connecting multiple devices within an area, such as a large single-floor or multi-floor dwelling or office. The emergence of WMN protocols such as Zigbee, Thread and, more recently, Bluetooth, have further enhanced the appeal of WMNs, by simplifying the configuration and management of WMNs.

Wireless mesh networking

In a mesh topology the network nodes connect directly to as many other nodes as possible, cooperating with one another to route data across the network. This topology allows the creation of very large networks of interconnected, low-power devices and also has the advantage of being 'self-healing' due to the multiple possible paths that data can take through the mesh.

The exact functionality of the network nodes varies depending on the specific WMN protocol (as shown in Table 1, page 24) but a node can either function as a network routing element, receiving and transmitting data bound for another node, an end-point device, such as a sensor, or a combination of both. A WMN will also include at least one gateway device, enabling connectivity beyond the mesh, e.g. for Internet ‘backhaul’.

WMN protocols

Four main WMN protocols have emerged in recent years: Z-Wave, Zigbee, Thread (based on 6LoWPAN) and, most recently, Bluetooth mesh. Each protocol has its own characteristics, such as maximum network size, throughput and latency, but all four support the creation of low-power, low-data networks and are ideal for home and building automation applications.

Zigbee, the most established, has the largest ecosystem, including manufacturers such as Amazon Echo Plus, Philips Hue, Comcast Xfinity, IKEA and Samsung SmartThings. Thread’s legacy, based on its reputation for enhanced security levels, is in the industrial sector but, backed by Google (through Nest Labs), and with organisations such as Apple joining the

Continued on page 24
economy, the popularity of the protocol is set to grow.

As each protocol evolves, however, the performance differences between them are likely to decrease; Bluetooth mesh in particular is likely to quickly gain support due to the overwhelming number of manufacturers and devices using previous versions for classic point-to-point applications.

WMN application design considerations

One of the most important factors to be considered when choosing a protocol for an application is the ecosystem. Based on its maturity and popularity, Zigbee has the most devices using the protocol, with a large library of pre-developed software available.

Bluetooth’s ecosystem, on the other hand, is potentially huge, due to its ubiquitous use in smartphones, tablets, etc., and more and more Bluetooth mesh network applications are being developed. Bluetooth also has the benefit of being easier to scale for large networks.

Out of the three protocols, Thread is the only one based on IPv6, providing unique benefits, such as end-to-end routing and addressability on the same network or across networks, without the need for additional translation layers to be implemented.

Other factors to consider include maximum network size, throughputs and latencies. Comparative studies show that all three perform similarly in small networks under small payloads, with Bluetooth lagging the other two as payload and throughput needs increase. Whilst latency for all three protocols increases with network size, Bluetooth mesh latency increases the most.

A growing number of multi-protocol WMN modules is appearing on the market, which brings interoperability advantages and also enables network devices to combine functionality, such as the networking characteristics of Zigbee with the beaconing and direct control functionality of Bluetooth.

Example wireless module

The Taiyo Yuden EYSKBNZWB is an example of such a multi-protocol device, capable of running the Bluetooth 5.0 and 802.15.4 stacks concurrently, supporting Bluetooth as well as Zigbee or Thread, and enabling interoperability between protocols.

By acting as a gateway, the EYSKBNZWB enables newer devices running Bluetooth to be added to existing networks based on Zigbee or Thread. This gateway functionality simplifies the extension or upgrading of existing home or building networks as new devices and applications can easily be added without having to replace existing networks.

The module also provides valuable end-user benefits by enabling smartphones to interact directly with network devices such as light bulbs, without the need for a multi-standard gateway. NFC is also supported by the EYSKBNZWB, which offers further pairing options as well as supporting applications such as smart locks.

The module is based on the Nordic nRF52840 chip and, as Nordic is the market leader in Bluetooth, application developers have access to an extensive library of pre-developed software. Although small, the EYSKBNZWB is a full-spec Bluetooth 5.0 module with an onboard antenna and is unique in that it supports high data rates, up to 2 Mbps, and long range, with output power up to +8 dBm.

Summary

Three main WMN protocols have emerged as contenders for the smart home and building market, each with its own pros and cons, depending on the needs of the specific application. Multi-protocol modules such as the Taiyo Yuden EYSKBNZWB enable the developer to achieve interoperability and also combine features of more than one protocol on a single device.

For more information contact Avnet South Africa, +27 11 319 8600, sales@avnet.co.za.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Bluetooth Mesh</th>
<th>Zigbee</th>
<th>Thread</th>
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<td>Established</td>
<td>2017</td>
<td>2002</td>
<td>2015</td>
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<td>Mesh type</td>
<td>Flooded mesh</td>
<td>Routed mesh</td>
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<td>Network size (theoretical limit)</td>
<td>32768 addressable elements. No limits on relay nodes</td>
<td>Up to 65,000</td>
<td>1 leader; 32 routers, 511 per router end device</td>
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<td>Distance</td>
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<td>Up to 300+ m (line of sight)</td>
<td>20 to 30m</td>
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Exploring the embedded systems of the future

The embedded systems market is at a key point in its evolution.

Smart electronic products are becoming fundamental to the way people live, and embedded systems now permeate everyday life. Microprocessors and microcontrollers can be found in practically every electrically powered product that we use. This ubiquity is helping to shape some of the key trends in embedded systems development, driving both functionality and ease of use.

“Devices will lean on other devices,” says Geoff Lees, NXP Semiconductors’ senior vice president and general manager for microcontrollers, pointing to the way that embedded devices can make use of the network interfaces many of them now have. They can use their ability to communicate with each other not just to extend their functionality but also to provide them with the ability to learn from interactions with users. The use of networked intelligence will shape the future of embedded systems in many different sectors. But there will be key markets that drive those changes.

Andy Harding, director of broad-based solutions at Renesas Electronics, sees the smart home as being one of the prime applications for networked embedded systems with the ability to learn: “It’s connected to the Internet and [the user’s] smartphone. So, it knows when he comes and goes. It also knows the weather forecast.” The smart home can use that information to make practical decisions on when to start and stop the heating system and save quite a lot on energy costs as a result.

Devices such as Google Home represent new classes of smart, embedded systems. But electronic intelligence will reach into existing products that are, today, extremely simple. The changes will lead to novel ways of approaching the market, says Oivind Loe, senior manager of strategic marketing at Silicon Labs. “Lighting is an area where we expect to see new business models.”

LED technology has reinvented the light bulb, Loe explains. At one level for lighting manufacturers, this is a challenge because “now people don’t buy multiple bulbs.” But it is also an opportunity. Through technologies such as Bluetooth and Li-Fi, the manufacturers of light bulbs now have the opportunity to become fundamental to the smart building revolution in both homes and commercial properties.

The lighting grid can, through wireless communications technologies, host a network that spans the building and provide access to IoT sensors no matter where they are in the structure. They can apply new business models that include a variety of digital services that are provided on a subscription basis, from location services to security.

“The smart city is also a very interesting area. For example, smart meters in the UK enable people to make better decisions on how to use energy, for example turning off lights when no one is around,” Loe adds.

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“Factories are moving at a very fast pace now. I see really big potential in this market.”

For Lees, the ability to use networked intelligence to gauge the health of industrial equipment in real time is key. That information will lead to greater uptime through preventive maintenance and advanced failure diagnostics. “Because of the cost of line-down situations, I think that the number of diagnostics will be very significant,” he says.

The diagnostics and services provided by industrial controllers will be supported by much more intuitive user interfaces that, in turn, require less training for the operators who program them. These interfaces will make use of the same kinds of speech and movement recognition facilities that are moving into a range of home-based devices.

“Alexa, Cortana and Google Home are all examples of this trend,” says Adrian Fernandez, microcontroller development experience manager at Texas Instruments. Although the first generation of speech-enabled home systems is represented mainly by smart speakers, the technology is set to become a feature of many other products. Thermostats and washing machines could become much easier to use if armed with speech recognition facilities. “At TI, we are already contributing with a voice recognition plugin that allows key phrase recognition,” Fernandez adds.

AI is not restricted to the user interface. Similar technologies will underpin the ability of industrial devices to recognise when failures are likely to occur. “We’ve not seen a lot of machine learning except voice and facial recognition in embedded applications,” Lees says, but this is set to change with a widespread shift towards the use of heuristics and machine learning. NXP is helping to support that move, initially supporting voice recognition functions.

“Working with a range of cloud providers has enabled us to deliver voice services to NXP customers. We are also working on reference designs, helping with machine learning and producing AI developers’ kits. AI will become part of software engineering, not a separate field, but it could change the way software is developed,” Lees says.

Alongside their benefits, there are also potential issues raised by the greater capability and accessibility of smart networked devices. Jack Ogawa, senior director of marketing in the microcontroller business unit of Cypress Semiconductor, says: “Now that connectivity is ubiquitous, data and network security are vital.”

Loe agrees: “We will see a lot of focus on security for the next five years.” He argues that it will be vital to think about the security of the full lifecycle of the product and how it can be put into practice. “Both technical solutions and ease of implementation are important.”

Ogawa says security awareness spans chips, firmware and application software, not just locally but in the cloud. Furthermore, programmability is a key requirement for effective deployment. “There are three properties of a secure embedded design: policy, cryptography and secure asset protection. Policies are user-defined, so you need a programmable solution to support them.”

Sensors will also help support better security. “Many policies now rely on multiple-factor authentication, using a traditional secure asset like a certificate and a physical factor such as location, proximity or fingerprint,” Ogawa explains. Support from cryptographic accelerators will help ensure embedded devices have the performance to handle secure functions. But, overall, a holistic approach is needed. “If there were an easy way to assess the security of an IoT device and identify corrective actions that meet cost and performance requirements, that would be very valuable,” he notes.

Lees says standardisation will be important. “It’s an industry problem: individual manufacturers can’t do it alone. We also need certification.”

With the greater level of capability being introduced to embedded devices, their energy use is potentially larger and definitely more complex. Speech processing, for example, needs to be stratified so that the processor-intensive AI code is not attempting to process silence or noise from home appliances.

Fernandez says: “It’s important to allow some level of power consciousness in these applications: you don’t want the main processor always on listening to everything. The ‘Alexa’ or ‘Ok Google’ commands tend to be recognised by low-power, lower-performance processors, the TI MSP432 for example, which allows all other processors to stay off to save power.”

Lees says: “Today low power is an intrinsic: a must-have. But you also have a spectrum of performance targets. Each of them has a stratum of low power to achieve. We use design techniques across all families to get the right balance.” The focus on low-power design will enable the creation of devices that use energy harvesting from the environment to supply all the power they need, Lees adds. These systems will use fine-grained power sequencing to ensure they consume no more than the absolute minimum needed at any time to complete their tasks.

The greater complexity of processing inside the embedded devices of the future need not translate into more difficulty for the developer. Suppliers are keen to expand their user base through simpler programming. “I’d like to offer tools that would allow anybody to use and program our products without the need to learn a computer language such as C or C++,” Vera says.

Henry Wiechman, director of embedded processor software marketing and strategy at TI, says manufacturers are making it easier to develop code by harnessing the power of the cloud. This avoids the need to buy licences, install software on local computers and perform lengthy setups. Instead, developers can simply call on services running in the cloud. “We are already seeing more and more development in the cloud. Cloud-based development will allow teams to innovate more quickly as a result of better collaboration,” Wiechman claims.

Easier access to development, coupled with more capable hardware and AI algorithms, will open up markets, Loe concludes: “We’ve not scratched the surface of what’s possible. In the next ten years we will see things that we can’t yet imagine. We see so much potential: more convenience and value for consumers, and return on investment for industrial applications.”

For more information contact Farnell element14, 0800 111 057, info-za@farnell.com, http://export.farnell.com/welcome-south-africa
Modular fibre-optic patch panel

The latest from Webb Industries is Telegärtner’s Fibre Termination Box (FTB) – a modular fibre-optic patch panel system which facilitates customised cabling in locations where large numbers of apartments or buildings have fibre optic outlets installed. Each apartment or building unit is connected to its own module. This allows extensions and modifications to be carried out to the up-and-running network without disturbing the links already in operation.

There are diverse applications where customised construction and extension of the fibre-optic network have a clear economic benefit over wide-area cabling for the user. For example, owners and tenants of apartments are not required to invest in fibre-optic cabling until they are really sure they want fibre-to-the-home (FTTH).

The robust metal housing of the FTB with just one height unit holds 10 slim space-saving modules, and the four height unit version holds 60 modules. The tool-free mountable plug-in modules are shipped with adaptors, a splice cassette, a splice holder for crimp and micro heatshrink splice protectors, as well as pre-installed pigtail that are ready to be spliced.

Each module slots into its own compartment in the housing, which means the fibre-optic links do not interfere with each other, even during extensive installation work. Dummy modules cover up unused compartments. The optional FTB divided storage panel safely takes up cable slack and can also be used for cable management.

CompactPCI Serial board

The Pentek SY8-Cyclone is a CompactPCI Serial peripheral board, equipped with a powerful FPGA and up to ten RJ45 connectors for 100BASE-TX Ethernet.

With its PCI Express x4 interface, the Cyclone-V FPGA can be used, for example, as an Ethernet NIC, switch, router or gateway. Industrial Ethernet real-time protocols and custom specific applications may be integrated.

The 4HP front panel width solution provides five RJ45 connectors. As an option, the board is available with ten Ethernet ports in an 8HP width front panel. A reference design based on Quartus is available as a starting point for customers.

The Intel (formerly Altera) SCGXFC7C6F2317N Cyclone-V FPGA operates over the industrial temperature range and contains 150K logic elements, and also hard IPs for the PCI Express controller. In addition to non-volatile iC memory, 512 MB DDR3L soldered RAM is wired on-board to the Cyclone-V FPGA.

As an option, the SY8-Cyclone card can accommodate a mezzanine module with a secondary, identical FPGA. This would allow either safety-critical applications by redundancy, or additional logic elements for custom specific solutions.

For more information contact Rugged Interconnect Technologies, +27 21 975 8894, sales@ri-tech.co.za.

Embedded system for aerospace/defence

Connect Tech has added a rugged embedded system to its Nvidia Jetson AGX Xavier line of products.

The Jetson AGX Xavier is a powerful ‘AI’ computer that allows for quick release if the removal or replacement of a Sentry-X compute module is needed.

For more information contact Rugged Interconnect Technologies, +27 21 975 8894, sales@ri-tech.co.za.
Cost-effective tools for makers and small businesses to innovate

Technology is fascinating and, as well as the many people that make a career in this area, there is an increasing number of individuals who regard designing and developing electronics projects to be their hobby.

Some do it to solve a problem where there is no commercially available product, while others have an idea that may eventually spawn a successful business venture.

In fact, some of the most innovative ‘out of the box’ concepts come from this sector. All too often, major companies have very strict and structured screening processes relating to their R&D activities. These can preclude assigning resources to high-risk or niche projects where it is unclear if there will be a return on the investment.

Unencumbered by such processes, the so-called ‘makers’ are fuelled by passion for an idea and often set out to develop it by working in a spare room or garage. There are numerous examples of major businesses that were started in this way (HP and Apple being among the most famous) and many successful companies of the next decade probably already exist in a small room somewhere.

Starting a software- or service-based business is relatively easy as all that is required is an initial idea, a computer (or tablet) and some software that can be freely downloaded. The barriers to entry here are consequently very low.

However, in the world of hardware, things are different. Technologies such as 3D printing have reduced the costs of prototyping mechanical parts and housings, but there remain some areas of significant cost. Apart from the basic materials required to build a prototype, there is a need to test and prove the prototype and this often requires relatively sophisticated instrumentation.

Obtaining funding for projects has become somewhat easier in recent years due to online crowdfunding platforms such as Kickstarter. However, makers are not able to list their project in order to seek financial backing until they can demonstrate the existence of a working prototype – which will require test equipment.

While there are a number of ways that makers can access test equipment including renting, these can prove expensive as maker prototypes are often developed on a part-time basis and can require several iterations, elongating development timescales. There really is no substitute to owning test equipment, so as to become familiar with its operation – including any quirks that it may possess. In fact, many consider ownership essential, but struggle to cover the expense, especially in the context of a project that is months or possibly years away from generating any appreciable revenue.

The need for affordable test equipment is not limited to the maker community. As more colleges and universities provide courses based around electronics and technology to prepare students for a career in the industry, the cost-per-head of providing relevant instrumentation is a concern. In many cases, students are required to share equipment working in groups, although there is clearly an educational benefit to providing equipment to each student.

Even within large companies, funding constraints exist, meaning that functions such as field service or applications engineering are required to book-out portable equipment, meaning that service levels are lower than if each employee had their own kit – at least for the basic everyday items. Fortunately, some manufacturers are recognising the need to address this market sector, and affordable yet highly capable test equipment can now be obtained.

One tool that provides fairly significant functionality at an acceptable price point is SparkFun’s popular STEMtera platform. The units each combine a breadboard with an Arduino Uno equivalent (still featuring the standard 32-bit ATmega microcontroller that would be expected), in order to give plenty of scope for all manner of plug-and-play experimentation.

The LEGO compatible bottom allows LEGO bricks to be accommodated within the design, so that various different structures can be assembled without difficulty. Thanks to the platform’s Arduino compatibility, the user can benefit from access to a plethora of shields already on the market. Multi-IDE support is another advantage that should also be factored in.

The Red Pitaya STEMLab Ultimate Kit is aimed at the educational market and contains all of the elements needed to use the Red Pitaya STEMLab 123-14 board as an oscilloscope, spectrum analyser, LCR meter, Bode analyser, tesla meter or LTI DSP workbench.

The main board is based around a dual-core ARM Cortex-A9 processor and a Xilinx Zynq FPGA MCU with 512 MB of RAM that can be expanded to 4 GB. A microSD card slot allows the addition of a further 32 GB of system RAM. On-board connectivity includes USB and gigabit Ethernet, with Wi-Fi being provided via a dongle.

The board has two RF inputs with a 125 Msps rate and 14-bit resolution that feature ESD and overload protection. A pair of RF outputs offers the same sample rate and resolution along with short circuit protection. Extension connectors include 16 digital I/Os and four 12-bit analog inputs as well as I²C, SPI and UART communication interfaces.

This multifaceted kit includes the Logic Analyser Pro that turns the STEMLab board into an 8-channel logic analyser, as well as the LCR meter board for a highly affordable LCR meter. An expansive range of diagnostic accessories is also supplied – including two oscilloscope probes, two SMA to BNC adaptors, two 50 Ω terminations, two SMA T-adaptors and a Wi-Fi dongle.

Designed as a multi-function device to measure, visualise, generate, record and control

By Mark Patrick, Mouser.
Mixed-signal circuits, the Digilent Analog Discovery 2 is small enough to fit in a pocket, yet powerful enough to replace several key items of lab instrumentation. It is aimed at students and hobbyists but is equally suitable for service personnel or anyone who wants a highly-featured solution that can be used anywhere. The Analog Discovery 2 can be used as a 2-channel 100 MSps, 30 MHz bandwidth oscilloscope, a 2-channel 14-bit arbitrary function generator, a 16-channel digital logic analyser, a 16-channel pattern generator or as a 16-channel virtual digital I/O for logic training applications. Other functionality includes a single-channel AC-DC voltmeter, a network analyser, a spectrum analyser, plus the ability to analyse digital busses like SPI, PC and UART. Waveforms software is available for free to allow the tool to be driven from a PC and data to be analysed.

**Summary**

In addition to professional engineers, makers and hobbyists are now able to contribute significantly to innovation in our modern world – as they can develop ideas with passion and without the financial and logistical constraints that often stifle ideas in large corporations. Nevertheless, test equipment can form a substantial obstacle in such endeavours – as the capital costs for traditional instruments are high when purchasing and long project timescales might make renting/leasing impractical.

Sniffer software gets J-Link RTT terminal plugin

Despite being fans of the Real-Time Trace (RTT) feature in Segger’s J-Link debug probes, engineers at Tibbo found that Segger’s own RTT Viewer software was a bit too simple for their needs, and so created an RTT terminal plugin for IO Ninja.

IO Ninja is Tibbo’s all-in-one terminal emulator, protocol analyser and I/O monitor, and the new plugin can be used with the J-Link Probe to take advantage of all the features offered by IO Ninja, including its ability to accumulate and navigate massive logs.

IO Ninja can monitor serial traffic on a remote device (such as a Raspberry Pi board) through an SSH connection. The latest release adds the ability to first record the serial communications dump, and then view it in the tool.

Layers exist to extend the functionality of IO Ninja session plugins. For example, the user can start a serial session and add a Modbus analyser layer to it. The same Modbus analyser layer can be added to other sessions (serial monitor, serial tap, TCP flow monitor, etc.), which is why the tool’s layers exist independently from session plugins. The improvements added to release 3.11 allow users to start sessions with required layers already added; apply layers to log (*.njlog) files; change the order of layers; and add and remove several layers at the same time. It also makes it easy to run an IO Ninja session as Administrator, for example to monitor devices such as serial ports or named pipes.

For more information contact Andrew Hutton, RF Design, +27 21 555 8400, andrew@rfdesign.co.za.

Unified STM32 programming tool

Making life easier for STM32 microcontroller (MCU) and microprocessor (MPU) users, the latest version of the STM32CubeProgrammer from STMicroelectronics gathers the capabilities of multiple device programmers into one universal tool. STM32CubeProgrammer lets users program their devices through any convenient connection, choosing from the MCU’s JTAG or single-wire debug (SWD) pins, a UART, or USB, SPI, I²C or CAN interfaces.

The new multi-OS software replaces several tools including ST Visual Programmer (STVP), DFuSe USB Device Firmware Upgrade programmer, Windows-only STM32 Flash loader, and software utilities for use with ST-Link. From now on, new STM32 products will be supported only by STM32CubeProgrammer.

Built-in features include the STM32 Trusted Package Creator, which protects OEMs’ intellectual property by encrypting firmware using an AES-GCM key and working with the STM32HSM-V1 companion Hardware Security Module (HSM). The HSM manages authentication and licensing, with counter-limited Secure Firmware Install (SFI) allowing OEMs to restrict the number of devices that can be programmed.

For more information contact EBV Electrolink, +27 21 402 1940, capetown@ebv.com.

Subrack configuration software

Schroff has launched the EuropacPRO Subrack Configurator, an intelligent online design tool that enables users to configure individual EuropacPRO subracks for vertically-installed applications.

This configurator forms part of nVent, which Schroff describes as its overarching digital empowerment strategy which aims to optimise and automate the customer journey, from design through to product delivery.

The configuration tool features an intuitive interface and guides the user through the necessary steps in the subrack design process. Users only need to select the necessary features from a list of options, some of which include EMC shielding, board height and depth, and board arrangement.

The online configurator converts the user’s individual requirements into a compatible subrack configuration which can be further modified through easy 3D drag-and-drop visualisation. For each newly configured design, the necessary documentation, such as CAD files, 3D and 2D drawings and bill of materials files, will be available for download.

EuropacPRO Subrack Configurator is free to access (via the short URL https://bit.ly/2Q8msQ7), without registration or software installation.

For more information contact Actum Electronics, +27 11 608 3001, sales@actum.co.za.
Low-profile U-channel PSU

XP Power has launched a new range of 180 Watt U-channel AC-DC power supplies (PSU) that are intended for space-constrained medical (BF), industrial and IT applications. The low-profile devices are just 29,5 mm high and occupy a small 107,6 x 62,8 mm footprint, allowing them to be used in high-density designs. The units are suitable for Class I and Class II operation and offer 2 x MOPP (Means of Patient Protection) isolation while delivering up to 94% efficiency.

The UCP180 series PSUs have an integrated 12 V, 500 mA fan output, eliminating the need for any external driver circuitry. When used in conjunction with a fan delivering 10 cfm airflow, they can deliver 180 W of power to a load. They are also suited for use in convection-cooled applications where they deliver 120 W. The U-channel construction provides a robust housing, and an optional cover is available for applications where the unit may be user-accessible.

Suitable for medical applications, the PSUs are approved to EN60601-1 and offer 2 x MOPP isolation (4 kV) and low leakage current (50 µA), making them suitable for use in BF applied part applications. Additional approvals including IEC60950-1-1 and IEC62368-1, and EMC performance that meets EN61000-4, make them suitable for a wide range of applications including IT and industrial.

There is a total of seven variants in the series offering single outputs of 12 V, 15 V, 18 V, 24 V, 28 V, 36 V and 48 V. All devices have a universal input range of 85 to 264 V a.c. and offer up to 94% efficiency while consuming less than 0,5 W with no load. The operating temperature range is -40°C (-20°C for 180 W load) to +70°C with no derating required below +50°C in either forced-cooled or conduction-cooled applications.

For more information contact Vepac Electronics, +27 11 454 8053, sales@vepac.co.za.

Shielded power inductors

High-temperature power inductors from Coilcraft are available with inductance values from 22 to 47 µH, current ratings up to 5,5 A, and low direct current resistance (DCR).

The inductors in the XAL7050 series measure 7,2 x 7,5 x 5,0 mm. They have a rugged, composite construction that provides magnetic shielding and minimises audible buzzing. They are qualified to AEC-Q200 Grade 1 standards, operating between -40°C and +125°C, and exhibit no thermal ageing issues, for automotive and other harsh environments. Soft saturation characteristics allow the components to withstand high current spikes.

The XAL7050 features RoHS-compliant tin-silver (96,5/3,5) over copper terminations and offers a maximum reflow temperature of 260°C. COTS Plus tin-silver-copper and tin-lead terminations are also available. For lower inductance values, Coilcraft offers a lower-profile companion, the XAL7030, with an identical footprint and inductance range of 0,16 to 10 µH.

For more information contact Andrew Hutton, RF Design, +27 21 555 8400, andrew@rfdesign.co.za.

High-intensity colour LEDs

Würth Elektronik has expanded its LED portfolio with a particularly compact model family. The WL-SMCC series of SMT chip LEDs, available in 0402 and 0603 packages, is characterised by a full-surface lens design and a remarkably high light intensity. Both package types are available in five colours: red, yellow, light green, green and blue.

Their small size and the full-surface lens make the LEDs ideal for miniaturised layouts of mobile devices. The ultra-thin 0603 version – at just 0,2 mm high – is also appealing for space-saving backlighting, such as in dashboards, entertainment consoles and industrial switches.

The WL-SMCC series LEDs are optimised for good solderability, high performance and durability. The contacts are 2,5 µm gold-plated.

For more information contact Jason Page, Würth Elektronik eiSos, +27 71 259 9381, jason.page@we-online.com.
High-speed fuses to protect critical power electronics

Littelfuse high-speed (semiconductor) fuses protect critical power electronics from over-currents that may cause damage to electronic equipment. The company’s high-speed fuses are reliable, very fast-acting products that can reduce the amount of short circuit current and improve the life of power semiconductor devices.

Its POWR-Speed fuses feature an innovative bridge design, arc-quenching material and a robust element to provide fast, extreme current limitation exactly where it’s needed.

The square body PSR fuses in this family are specifically designed for protection of power semiconductor devices such as diodes, triacs, IGBTs, SCR’s, MOSFET’s and other solid-state devices that are typically designed into power conversion and power conditioning equipment. Variable frequency drives, inverters, UPS, rectifiers and soft-starters are examples of typical equipment designed with sensitive power semiconductor devices that cannot withstand any line surge or over-current conditions and require high-speed protection.

POWR-Speed PSR series products offer optimised circuit protection at the extremely fast speed required to protect modern-day power conversion devices. Such products are commonly found in numerous applications including pulp and paper industries, cranes and heavy-lifting equipment, processing industries, wastewater treatment plants and various large factories and MRO facilities.

The new round-body QS series fuses have reduced the energy let-through by up to 70% over previous generation high-speed semiconductor fuses. They have high-performance silver fuse elements that combine with a hardened silica filler to provide enhanced system protection.

For more information contact Jeva Narian, Altron Arrow, +27 11 923 9600, jnarian@arrow.altech.co.za.

Hinged 4G LTE antenna

The hinged Apex II TG.35 wideband dipole antenna from Taoglas has been designed to cover all cellular, ISM and Wi-Fi working frequencies in the 600-6000 MHz spectrum. It has been primarily designed for use with 4G LTE modules and devices that require high efficiency and peak gain to deliver high throughput on all major cellular (2G/3G/4G) bands worldwide for access points, terminals and routers. High efficiency is vital for applications such as high-speed video and real-time streaming, or high-capacity MIMO networks on public transportation.

This slim-line antenna is ground plane independent, meaning it does not need to be connected to the ground plane of a device to radiate efficiently; on the other hand neither is it seriously detuned by connecting to a ground plane, thus avoiding a problem notorious to smaller antennas. It comes with an SMA (M) connector and swivel mechanism that allows the antenna part to be rotated to fit in tight environments. The 90° hinge structure has been improved and strengthened so that the antenna in a 90° position would not fall down to 180° in an environment subject to vibration.

The Apex II is backward compatible with 3G and 2G cellular applications such as HSPA, GSM, GPRS, UMTS, Wi-Fi, and has GPS included for Assisted GPS and/or E911 applications.

For more information contact Andrew Hutton, RF Design, +27 21 555 8400, andrew@rfdesign.co.za.
Microchip Technology announced four new 20-output differential clock buffers that exceed PCIe (PCI Express) Gen 5 jitter standards for next-generation data centre applications. The ZL40292 (85 Ω termination) and ZL40293 (100 Ω termination) are specifically designed to meet the new DB2000Q specification while the ZL40294 (85 Ω termination) and ZL40295 (100 Ω termination) are designed to meet the DB2000QL industry standard. These new devices also meet PCIe Gen 1, 2, 3 and 4 specifications.

Each buffer is an ideal complement to chipsets where distributed clocks are required across several peripheral components, such as central processing units (CPUs), field programmable gate arrays (FPGAs) and physical layers (PHYs) in data centre servers and storage devices, along with many other PCIe applications.

For more information contact Dirk Venter, Altron Arrow, +27 11 923 9600, dventer@arrow.altech.co.za.

The STMicroelectronics STDRIVE601 three-phase gate driver for 600 V N-channel power MOSFETs and IGBTs provides enhanced ruggedness against negative voltage spikes down to -100 V and responds to logic inputs in just 85 ns.

Featuring smart-shutdown circuitry for fast-acting protection, the chip turns off the gate-driver outputs immediately after detecting overload or short-circuit, for a period determined using an external capacitor and resistor. Designers can set the required duration, using large C-R values if needed, without affecting the shutdown reaction time. An active-low fault indicator pin is provided.

All outputs can sink 350 mA and source 200 mA, with gate-driving voltage range of 9 V - 20 V, for driving N-channel power MOSFETs or IGBTs. Matched delays between the low-side and high-side sections eliminate cycle distortion and allow high-frequency operation, while interlocking and dead-time insertion are featured to prevent cross-conduction.

For more information contact EBV Electrolink, +27 21 402 1940, capetown@ebv.com.

u-blox has announced the SARA RS series of LTE M and NB-IoT modules for low-power wide-area (LPWA) IoT applications.

The secure element is compliant with EAL5+ High common criteria certification, which makes the module well suited to protect sensitive assets and communications. It also features a lightweight and low-power pre-shared key (PSK) management system that is tailored to the needs of IoT applications, along with a comprehensive set of security features.

SARA RS comes in two product variants. Featuring a built-in M8 GNSS receiver, the RS11M targets mobile applications in the automotive, fleet management, tracking and telematics sectors. The GNSS receiver’s chip-down design includes a dedicated GNSS antenna interface and can run in parallel with the cellular connection.

The second product variant, SARA RS10M, is optimised to deliver the lowest achievable power consumption, drawing less than 1 μA of current in power save mode, making it ideal for metering, smart city, connected health, security and surveillance, remote monitoring and other battery powered applications.

For more information contact Andrew Hutton, RF Design, +27 21 555 8400, andrew@rfdesign.co.za.

MACOM Technology Solutions announced a new wideband distributed amplifier with the introduction of the MAAM-011238, offered in both bare-die and surface-mount packaged formats. Well suited for use in 5G test and measurement equipment, it gives system designers the agility to leverage a single amplifier for 5G applications spanning sub-6 GHz to mmW (millimetre-wave) frequencies.

The amplifier supports wideband operation from 100 kHz up to 50 GHz (67.5 GHz for the bare-die version) with typical gain of 14 dB at 30 GHz. The input and output are fully matched at 50 Ω with typical return loss of 10 dB across the band.

The overall ease of use for customers is enhanced utilising a positive gate bias, thereby eliminating the need for a negative voltage supply and bias sequencer. The MAAM-011238’s integrated power detector further simplifies system designs while preserving valuable board space.

For more information contact Andrew Hannay, Rfiber Solutions, +27 82 494 5466, sales@rfibersolutions.com.
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