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PRESENTER  ATTILA SZABO, Technology & Supplier Business, Manager EMEA, Arrow Electronics
DATE       Tuesday 8th October (JHB) or Thursday 10th October (CPT)
TIME       8H30 for 9H00 to 16H00
VENUE       JHB: Jet Park – Altron Arrow Offices
            CPT: Thomas Pattullo Building, 19 Jan Smuts Street, Foreshore
ADMISSION  FREE to selected attendees, light lunch & tea to be provided

Contact Robin Scholes - Field Application Engineer
on 083 226 6019 or rscholes@arrow.altech.co.za for more information and to book.
on the cover

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Human brain still better than AI (in some cases)

Technologies like artificial intelligence (AI), Internet of Things (IoT), biometrics and others are benefitting from an enormous amount of marketing hype these days, sometimes justifiably and sometimes not. In our Q&A with iPulse Systems on page 9, CEO Gary Chalmers explains how these technologies, together with cloud and as-a-service models, have completely changed the way the company works, allowing it to move its support teams from bakkies on the road to support centres from where they can do their jobs over the Internet.

At the iLegal conference I attended recently, one of the speakers was Mike Neville, a former policeman from England, made the point that no matter how far AI has become, it is still nowhere near as advanced as the human brain, even in the area of facial recognition technologies which have become really advanced of late. Neville established a British team of ‘super recognisers’ who have an uncanny ability to recognise faces, even across disparate circumstances or over long time periods. Some of these super recognisers successes include their contribution to the resolution of the Novichok and Cologne New Year’s Eve sex attacks, as well as several murders.

On the AI front, Africa might be half a world away from all the intrusive facial analytics and ‘social engineering’ we hear coming out of China, but the region is going to be affected by the AI revolution just as much as anywhere else. According to market research by the International Data Corporation (IDC), AI spending in the Middle East and Africa (MEA) is poised to reach $290 million this year, rising to $530 million in 2022. The global technology research and consulting firm expects investment in AI across the region to grow 42.5% year on year in 2019 and continue growing at a compound annual growth rate (CAGR) of 22.2% over the 2019-2022 period.

IDC’s research shows that the top three industries in terms of AI investment in 2019 will be banking, manufacturing and retail. These industries will remain the top three through 2022, although spending by federal/central governments across MEA will see the strongest growth of the region’s top five verticals, increasing at a CAGR of 26.3%. The three most popular use cases – automated customer service agents, automated threat intelligence and prevention systems, and fraud analysis and investigation – will account for a combined 31.4% of AI investment across MEA in 2019.

On a final note, we’ve revamped our Hot Chips page, which used to run on the last page, and moved it into the main body of the magazine. You’ll find it on page 24 in this particular issue. In its old place is an exciting new page we’re calling ‘open [re]sources’. This particular edition features webinars, an online training video and a couple of catalogues, but at times it will also highlight resources such as product and technology videos, development community resources, and more.

Subscribe online: www.technews.co.za
South Africa
• The Institute of Electrical and Electronics Engineers (IEEE) has awarded South Africa’s IEEE section the prestigious 2019 MGA Outstanding Medium Section Award. The award is in recognition of outstanding work in fulfilling the educational and scientific goals of the IEEE by promoting technological innovation for the benefits of humanity. This is the first time that South Africa has won such an award. Under the leadership of the CSIR’s Dr Albert Lysko, principal researcher at NextGeneration Enterprises and Institutions, South Africa’s IEEE section edged out over 300 other IEEE sections globally.

Overseas
Business
• Analog Devices announced financial results for its third quarter of fiscal 2019, which ended 3 August. Revenue was $1,48 billion, with business-to-business markets down 3 percent and diluted earnings per share down 10 percent year-over-year, but the company still managed to return over $300 million to shareholders during the quarter through dividends and share repurchases. Its forecast for the next quarter is pessimistic at around $1,45 billion in revenue.

Companies
• ams has launched a “voluntary public” bid to take over OSRAM Licht AG, the holding company of the multinational lighting manufacturer headquartered in Munich. ams’ offer of 38,50 Euros per share represents a 10 percent premium over the prior offer of 35,00 Euros from Bain Capital and The Carlyle Group. The deal, if it goes through, will create a global leader in sensor solutions and photonics with approximately 5 billion Euros of annual revenue. The offer is subject to a 70 percent minimum acceptance threshold and customary closing conditions.

Industry
• The Semiconductor Industry Association (SIA) announced that worldwide sales of semiconductors were $33,4 billion in July 2019 – 1,7 percent more than the June 2019 total of $32,8 billion, but 15,5 percent less than the July 2018 total of $39,5 billion. Regionally, sales increased on a month-to-month basis in Asia Pacific/All Other (3,1 percent), the Americas (2,5 percent), China (1,1 percent), and Japan (0,7 percent), but decreased in Europe (-0,5 percent). On a year-to-year basis, sales were down across all regional markets: Europe (-8,6 percent), Asia Pacific/All Other (-11,0 percent), Japan (-12,0 percent), China (-14,1 percent), and the Americas (-27,8 percent).

• Accelerating demand for embedded security in industrial and automotive segments is driving the market for technologies such as secure microcontrollers (MCU) and trusted platform modules (TPM). ABI Research forecasts that total global shipments of secure embedded hardware will double by 2023, surpassing the 4 billion mark. In parallel, emergence of secure varieties of microcontrollers for the IoT market is gaining traction, and is seeing demand in smart cities, homes and buildings, as well as in utilities and the industrial IoT. Improved processing and performance capabilities for MCUs has allowed the inclusion of security features that work well with embedded and deterministic imperatives.

• GlobalFoundries (GF) has filed several patent-infringement lawsuits in an effort to prevent semiconductors produced by arch-rival TSMC (Taiwan Semiconductor Manufacturing Company) from being imported into Germany and the USA. Defendants include TSMC itself, as well as, inter alia, Apple, Asus, Broadcom, Cisco, Google, HiSense, Lenovo, Mediatek, Motorola, Nvidia, Qualcomm and Xilinx. Distributors Avnet/EBV, Digi-key and Mouser are furthermore named in the lawsuits.

Technology
• MIT researchers have built a modern microprocessor from carbon nanotube transistors, which are widely seen as a faster, greener alternative to their traditional silicon counterparts. Having invented new techniques to improve fabrication of carbon nanotube field-effect transistors (CNFETs), they demonstrated a 16-bit microprocessor based on the RISC-V open-source chip architecture. The researchers’ microprocessor was able to execute the full set of instructions accurately, and also executed a modified version of the classic ‘Hello, World!’ program, printing out, “Hello, World! I am RV16XNano, made from CNTs.”

• Xilinx unveiled the world’s largest ever FPGA (field-programmable gate array), the Virtex UltraScale+ VU19P, boasting no less than 35 billion transistors. The chip features 9 million system logic cells, up to 1,5 terabits per second of DDR4 memory bandwidth and up to 4,5 terabits per second of transceiver bandwidth, and over 2000 user I/Os. It enables the prototyping and emulation of today’s most complex SoCs as well as the development of emerging, complex algorithms such as those used for artificial intelligence, machine learning, video processing and sensor fusion.
Hensoldt merges its SA subsidiaries

Hensoldt has merged its two South African subsidiaries, GEW Technologies and Hensoldt Optronics South Africa, into the consolidated Hensoldt South Africa brand. It is hoped the move will drive growth and expansion for the company’s products, services, sales and R&D.

“Consolidating GEW and Optronics under the Hensoldt brand is an important strategic step towards the future growth of our South African business,” said Thomas Müller, CEO of Hensoldt, at the formal announcement on 4 September. “We will leverage the power of the Hensoldt brand and our global footprint to open new market opportunities for our South African business.”

GEW has for decades been a highly-regarded specialist in spectrum dominance and electronic warfare systems, whilst Hensoldt Optronics is one of the world’s leading optronics suppliers, covering such things as airborne gimbals, submarine periscopes and laser rangefinders. Together, the two companies have more than 70 years of combined experience and proven industry success.

“This is a major step towards our Hensoldt South Africa growth strategy and the creation of a South African sensor solution house,” said Celia Pelaz, member of Hensoldt’s executive committee and responsible for the company’s strategic development in South Africa. “We are committed to further investing in the growth of our South African footprint and support president Ramaphosa’s announced investment drive. Our experience in the country shows that international investment and cooperation that has been added to local infrastructure, skills and capacity is the perfect mix for business success and local economy growth.”

GEW and Hensoldt Optronics have a combined turnover of more than R1.5 billion per annum, which is set to grow as Hensoldt invests half a billion Rand in South Africa, indicating the confidence the company has in this market. As it designs, manufactures and supports all its products locally, Hensoldt South Africa is a vital supplier of sovereign electronic warfare technology to the South African National Defence Force (SANDF).

Hensoldt does not only service the defence and security markets – for instance, the Independent Communications Authority of South Africa (ICASA) has been using its direction-finding equipment for spectrum monitoring and regulation for more than 20 years. It is also active in wildlife conservation, having developed a combined radar and electro-optical surveillance system that is protecting over a thousand rhinos in South Africa.

Towards its goal of becoming the leading defence and security electronics house in the region, it aims to expand its product portfolio and expand its market, particularly in Africa, the Middle East, Asia-Pacific, Latin America and Europe. It will continue to offer all of its existing products to customers whilst expanding its offering into the radar, data link, Identification Friend or Foe (IFF), customer services and business development fields, amongst many others as part of its ambitious growth blueprint.

Raynier Van der Watt, who founded Parsec in the mid-1990s and subsequently worked for Etion, the merged entity of Parsec and Ansys, has been appointed as managing director of Hensoldt South Africa. “We have the competency and capacity in South Africa to build a global organisation from the South African base. This includes organic and inorganic growth, with investment within Hensoldt and other businesses. As a hub of innovation and excellence, Hensoldt South Africa will match and exceed the best the world has to offer,” he stated.

Hensoldt South Africa is the largest industrial presence of the group outside of Europe, with 600 employees, who are all South African (Hensoldt has an international workforce of some 5000). With the company’s ambitious expansion plans, it is expecting to grow its skills base by several hundred mechanical, electronic and computer engineers.

“One of my goals is to make sure we are a responsible corporate citizen and follow the recently launched South African Defence Sector Charter. We will make sure this company has an improved good Black Economic Empowerment (BEE) rating,” Van der Watt said. This includes building suppliers and growing the local industry.

“In terms of how we want to innovate – what Hensoldt has realised, is that the future is not building weapons or platforms – it is about data and information. Our positioning is, we are a sensor solutions house. We want to be the number one sensor solutions house in the world, which means we design sensors that generate data, positioning ourselves closer to where the future lies, which is closer to the data.”
New African AI initiative at Wits University

The Molecular Sciences Institute (MSI) at the University of the Witwatersrand (Wits) in Johannesburg, in partnership with the Cirrus Initiative, recently announced plans for a new artificial intelligence (AI) research operation in Africa.

Announcing the Cirrus Initiative during the 2019 AI Expo Africa in Cape Town, Professor Zeblon Vilakazi, deputy vice-chancellor: Research and Postgraduate Affairs, said Wits is one of the leading institutions in machine learning and data science research in Africa, and that this collaboration will boost the University's efforts as it envisions a step change in the research and application of AI in the region.

Hosted by the MSI in the Wits School of Chemistry, the newly formed Cirrus Initiative will focus on the analysis of research data in chemistry, with a view to collaborate with physics, technology and engineering projects using machine learning.

Relative humidity (Rh) is a significant factor contributing to effective static control. When humidity in the working environment decreases, the human body and other insulators can easily charge with static electricity. For this reason, Rh needs to be maintained at over 30%.

Humidity also needs to be controlled within electronics packaging to protect electronic components and devices from moisture damage or corrosion. Here are a few products designed to assist with this:

Humidity indicator cards
Humidity indicator cards change colour according to the level of humidity in the room. The cards consist of blue spots that contain certain chemicals. When the humidity increases past 30%, the spots change colour, presenting a lavender/pink colour. The colours indicate whether or not a critical Rh has been reached. Humidity cards must be used with desiccant bags.

Moisture barrier bags
Moisture barrier bags, also known as dry shielding bags, safeguard electronic components and devices against moisture, corrosion, ESD and EMI damage. These bags are heat-sealable and puncture-resistant, and comply with critical water vapour transmission and ESD-shielding requirements. Dryshield bags are made of strong, lightweight, dissipative material and suitable for vacuum or nitrogen-flushed packaging. According to EIA 583, dry shielding bags are incomplete without desiccant bags.

Desiccant bags
Desiccant bags and silica gel prevent condensation by absorbing and holding moisture. Desiccants also regulate the ambient humidity and prevent it from rising above a critical level. In order to reach an optimal low Rh, desiccant bags must be included in moisture barrier bags. Dri Bag desiccants are made up of a mixture of calcium chloride, clay, and breathable yet strong fabric. Desiccant bags must conform to IEC 61340-5-1 standards.

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.

Continued on page 6
Continued from page 5
addressing the challenges facing Africa have the potential to drive innovation in academia and industry and shape future societies. There is a growing need for talent, infrastructure and funding to support such innovation and to fully realise the opportunities presented in our technology and data-driven world.

“To become competitive in this new wave of innovation fuelled by AI and the Fourth Industrial Revolution, and with the substantial accumulation of resources and investments in new technologies in North America, Europe and Asia, requires efforts in southern Africa on a magnitude far greater than any previous endeavour spanning academia and industry,” says Vilakazi.

Cirrus aims to create a collaborative university and industry platform supporting an ecosystem that fosters innovation and entrepreneurialism. As the host university, Wits will lead the Cirrus Initiative's cooperation efforts with universities, institutes, Centres of Excellence and research groups in Africa. While Cirrus will initially focus on the research and application of AI in chemical, physical and biological systems, its capability will be extended to the benefit of other fields to foster the growth of a strong scientific ecosystem on the continent. Numerous direct and indirect employment opportunities for scientists and engineers will also be created.

“Combining Africa’s vibrant talent with the building of a globally competitive platform for leading scientific research and application will drive innovation and undoubtedly foster economic development in the region. In our pursuit of knowledge creation, it is also critical that Africans are the contributors, shapers and owners of the coming advances in artificial intelligence and machine learning,” says Vilakazi.

As part of the effort to foster collaboration, Cortex Group has entered into a cooperation agreement with the Cirrus Initiative to lead the establishment of Cirrus Foundry Cape, an operation focused on developing startups and helping them move from ideation to commercial operation. Their team has been at the forefront of collaborative AI efforts in Africa and, by working with Wits and Cirrus, will be able to unlock even more opportunities.

For more information visit www.cirrusai.net

u-blox sells 500 millionth GNSS receiver

u-blox recently sold its 500 millionth global navigation satellite system (GNSS) receiver. As the only technology capable of delivering absolute position anywhere on the planet, GNSS-based positioning has found its way into a wide range of consumer, industrial and automotive applications, allowing connected devices to efficiently qualify the origin of transmitted data with accurate time and position information.

u-blox’s portfolio of GNSS receivers targets a broad range of established and emerging applications and use-cases. Standard metre-level GNSS receivers, which are the dominant solution today, continue to become smaller, lower-cost and more power efficient. Meanwhile, the market for high-precision GNSS receivers for automotive and consumer applications is increasing rapidly. Additionally, we’re seeing the first automotive applications requiring functional safety for highly automated driving.

“It’s been thrilling to watch GNSS technology evolve over these past two decades from an expensive niche technology to one we use every day,” says u-blox CEO Thomas Seiler. “We’re excited to see how our GNSS technology will continue to empower our customers to develop innovative solutions for our connected future. Thank you to everyone at u-blox, to our many customers, and our investors for their trust and accompanying us along this unrelenting journey.”

For more information contact Andrew Hutton, RF Design, +27 21 555 8400, andrew@rfdesign.co.za
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Genuine traceable components
Simple Buying Solutions
Ready-to-ship inventory
Company profile: Harmony Electronics

The globalisation of the electronics industry over the last few years has seen tremendous growth in the shipments of semiconductor products worldwide, with more focus on connectivity. Access to components globally has resulted in the broad-line distributors consolidating as well as manufacturers doing mergers and acquisitions.

The end result is that amidst this flurry of consolidation, deep technical resources are scarce and customers are requiring technical support and training unparalleled by what the norm has been before. In 2014 Harmony Electronics was born to fulfil this much-needed role in the industry.

**Software/firmware**
Harmony’s key strength and core competency is providing specific bespoke training services on ARM, MIPS and related development tools, together with programming service in the electronics industry in South Africa on the various products, in addition to a fully qualified training prospectus on all microcontroller products – RISC and CISC – from leading semiconductor vendors such as STMicroelectronics and Microchip.

“The company strongly believes in learning by doing”
Harmony Electronics has extensive knowledge in the semiconductor arena, with experience in a wide range of electronic industry segments including industrial, consumer, telecom, power, security and military. “We are particularly recognised for our experience, expertise and in-depth technical knowhow on microcontroller products, thus delivering professional and excellent customer experiences, as well as building mutually beneficial relationships with our customers,” says the company’s founder, Arnold Perumal.

“Our expertise on microcontroller products allows us to offer more specialised services including firmware and hardware development for ARM-based and MIPS technology,”

**Training prospectus**
“Harmony Electronics Professional Education is a new educational concept provided by us. It is part of our mission to help engineers write high-quality embedded software. The education focuses on conveying best practices for producing high-quality software, to everyday embedded software development.

“Harmony Electronics has many years of experience in embedded systems development. We would like to share our knowledge to help you – the professional embedded software development engineer – perform your everyday work more efficiently and with less effort. This is the driving factor behind Harmony Electronics.”

Start your MCU learning journey today
Harmony Electronics offers a course to learn the ANSI ‘C’ embedded control language in just 10 weeks. The training takes place on Saturday mornings over three hours at a cost of R350 per hour (R1050 total per week).

Delegates can choose the environment that suits them best:
- Programming in ANSI C using MPlABX and XC32 compiler.
- Programming in ANSI C using Atollic Eclipse IDE.
- 1.3 Programming in ANSI C using the Arm version 6.10 compiler and Keil uVision.

The courses provide professional training by an accredited Arm trainer, allowing attendees to speed their time to market by developing professional C-code for portability. Delegates will learn shortcuts to improve development time, with faster, efficient coding, and learn to use the most popular world-class IDEs in the market: Keil by Arm, Atollic TrueStudio by STMicroelectronics and Microchip MplabX.

The courses are given in small classes for tailored, individualised attention, and ensure hands-on, interactive training for core concepts to aid in real-world applications. Multiple hands-on exercises are performed during each class. Each participant has to bring their own laptop with software installed prior to the course. The course material, exercises and their solutions (source code) will be provided to each participant on a USB stick.

For more information contact Arnold Perumal, Harmony Electronics, arnold.perumal@harmonyelectronics.co.za

Arnold Perumal.

The company strongly believes in learning by doing, so all courses thus have a significant amount of practical training exercises. A solid theoretical foundation is always included, as well as comprehensive course material for future reference.

All Harmony Electronics’ courses are hands-on workshops with students being capable of performing production design immediately after the training.

References
- Well over 200 trained customers to date.
Q&A with iPulse Systems

Powered by increasingly advanced technologies in areas such as biometrics, Internet of Things (IoT) and artificial intelligence (AI), the security and access control industry is seeing a dizzying array of new applications coming to market. We asked Gary Chalmers, the CEO of local developer and manufacturer iPulse Systems, to tell us what new and exciting technologies the company has been working on lately.

Dataweek: What are some of the latest technologies that your company is either actively deploying into its latest products, or researching for future products?

Gary Chalmers: iPulse was one of the pioneers of moving access control to the cloud. On the back of this, we have built an industry-leading ‘as-a-service’ range of products that include access control, time and attendance and identity management. Moving to cloud has opened up endless possibilities for rapidly integrating other products into our own, and providing uniquely synchronised solutions that were simply never available to disparate locally hosted solutions.

Some of the products we are focusing on include Bluetooth devices, modems and breathalyzers from a hardware perspective at the moment, and AI, machine learning and online matching algorithms from a software point of view.

For example, our devices have been linked to modems for years to connect to the Internet, however, with cloud-based technology, we have recently brought SIM management into our dashboard with a large mobile network operator, allowing our clients to monitor and recharge their SIM’s data from inside our IQSuite device dashboard.

Dataweek: Are there any particular technologies emerging or being researched in the field of access control and biometrics that you think will become game changers in the years to come?

Gary Chalmers: Cloud is definitely the game changer. The ease and speed of integration with other products, the ability to deploy remotely, and more importantly, provide remote support and maintenance of systems, have rendered older systems obsolete overnight.

When it comes to total cost of ownership, legacy systems require really large capital outlays upfront, followed by years of expensive and labour-intensive support. Cloud-based systems are typically offered as-a-service, with customers paying a monthly fee that includes all the hardware, software, service, maintenance, licensing and support. Typically these costs are as much as 75 percent lower than legacy systems over a three year period.

Dataweek: How do IoT and AI fit into the context of what you do? Are they just marketing hype, or are there practical examples of how they’re shaking things up?

Gary Chalmers: The entire IQSuite product set is built on IoT, with every device connecting directly to the Internet. IoT is required to offer anything as a service, and as such, it is most definitely the core factor in future systems. AI is coming into its own, offering unique solutions that were never available to clients before. For example, iPulse uses AI on Microsoft Azure to predict when biometric devices might fail, using millions of statistics available from hundreds of clients to calculate patterns. This allows us to replace a device BEFORE it fails, ensuring 100% uptime.

Another significant use of AI is in the prevention of fraud. The AI engine searches for patterns, and is able to pick up potential fraud, and mitigate it, in real time. For example, if a person typically clocks into work Monday to Friday, from around 7am in the morning till around 5pm in the evening, but then suddenly clocks in at 3am on a Sunday morning, IQSuite’s AI would immediately see this as a break in a normal routine, and alert the security desk or require a second-factor authentication.

Dataweek: How do you stay competitive with the likes of cheap imported products similar to yours?

Gary Chalmers: Cheap products are really difficult to compete against in a capital expenditure-based sale, as they always appear to have a much lower cost of entry than good products. Although companies soon discover that the cost of supporting these devices escalates rapidly, you have still lost the deal, and often end up replacing these products a year down the line with a customer who is disenchanted with biometric solutions as a result.

However, with the advent of our as-a-service solutions, this is no longer a problem. Because the client does not see the cost of the hardware as an individual line item, he simply gets given a service that he pays for over a period. We are able to compete very successfully against cheaper competitors as they cannot offer the same level of guarantee or service that iPulse can.

Dataweek: Have you made any significant changes/upgrades to your operations in the last year or so?

Gary Chalmers: The migration to cloud has been a total game changer for iPulse, requiring us to make our own previous-generation products obsolete, and re-engineer our entire business as a result. Our teams of support people in bakkies on the road have been replaced with a gigabit Internet line and remote support engineers, and our entire sales and operations engine has changed as well. iPulse now, versus three years ago, is a completely new business.

Dataweek: Do you see the bigger picture of social upheaval, load shedding, etc. as a hindrance or opportunity for the type of products you manufacture?

Gary Chalmers: Once again, cloud plays a massive role in this becoming a non-event for iPulse. Our devices run on battery backup, and there are no servers to crash or go offline — data centres are online 24/7, so any interruption at a local site is only temporary, and never results in a loss of data.

The current economic woes have played into our hands, with more customers wanting to manage their workforce intelligently, and reduce these costs. This has resulted in significant growth in our business during these times.

For more information contact iPulse Systems, 0860 478 573, info@ipulse.co.za
The wireless technologies that will define the IoT era

As Internet of Things (IoT) applications proliferate, so do the wireless technologies that enable them. It is hard keeping track, because there are just so many possible options, with a constant stream of updates and further additions to factor in too.

This article aims to give a comprehensive overview of the different wireless technologies relating to the IoT – covering both emerging and established protocols.

**Bluetooth beacons**

Bluetooth 5 launched back in December 2016. It incorporates Bluetooth Low Energy (BLE) mode, and introduced an optional new interface that doubled the previous top data rate to 2 Mbps. Its faster transmission has meant there is a need for higher transmission power (+20 dB) in low energy mode – power is still conserved overall, however, as the data takes considerably less time to transmit.

Using the 2 Mbps mode is likely to reduce the range, but as Bluetooth 5 has a theoretical range that is roughly four times that of Bluetooth 4.2 BLE (up to almost 244 m), it still represents a major improvement.

The standard has now elevated beacon performance markedly. Though previously the data payload was limited to 31 Bytes, Bluetooth 5 supports a payload of up to 255 Bytes/packet. This means that beacons can send more information within a single broadcast message, so the user’s device doesn’t need an app or an Internet connection to access it.

Bluetooth 5 presents an eight-fold increase in broadcast efficiency, thus being capable of supporting far more devices. Beacons can, as a consequence, be used to cover whole buildings – for both domestic and commercial automation systems. Bluetooth 5 may also support low-quality video and audio streaming, plus short bursts of high-volume data (such as for transporting images).

**Thread mesh networking**

Thread was built to support robust IoT infrastructure, and was intended to become the standard for the smart home. Progress on this low-power mesh networking technology has been somewhat disjointed, though. The Thread Group, set up in 2014, attracted big names, but without gaining the corresponding market traction. Last August, Apple joined the group, and it was widely assumed that the company would include Thread in its HomeKit accessories and the devices that control them. However, there is no news on that front as yet.

The advantage of Thread’s mesh approach is that if one node fails, the other nodes can still connect to each other. Also, it can support over 250 devices, in multiple hops, and is so power-efficient that devices running on AA batteries will last for years.

This means a Thread network of battery-powered devices still works during a power cut, which would be a boon for security and monitoring applications. This is not least because all of Thread’s transmissions are encrypted end-to-end, adapted for low-power devices.

ZigBee and Z-Wave incorporate AES encryption too, but Thread also uses banking-class, public-key cryptography to back it up.

In January 2019, the ZigBee Alliance and Thread Group completed the Dotdot 1.0 specification and the Dotdot-over-Thread certification programme to make the two rival networking standards interoperable and accelerate their uptake in the currently fragmented home automation market.

Then in February, Nest was the first of Alphabet’s ‘Other Bets’ to be folded back into Google to become part of the hardware division that makes Pixel smartphones and Google Home speakers. Rick Osterloh, head of that division, said of the move: “The goal is to supercharge Nest’s mission: to create a more thoughtful home … built with Google’s artificial intelligence and the Assistant at the core.”

Thread’s mission is to enable devices to talk to each other without an intermediary hub, such as Google Assistant. Nevertheless, it is likely to remain part of the mix as it has a lot to offer, and Nest (which supplies two of the few products that directly support Thread) communicates with devices using a combination of Thread, Wi-Fi and Bluetooth.

It is true that only a handful of products have Thread built in – this is by design, though, as any device based on the 802.15.4 protocol can download software to gain support for it, and so it is not necessarily a hindrance.

**LoRaWAN**

LoRa stands for ‘long range,’ and like most of the pioneering, non-cellular low-power wide-area network (LPWAN) protocols, LoRaWANs run in the industrial, scientific and medical (ISM) spectrum band. These frequencies are reserved internationally for organisations in those sectors, and are free to use, as well as being positioned to avoid interference from mobile communication networks.

Typical applications are asset tracking, supply chain, agriculture, smart cities, intelligent buildings, home automation and smart metering. Installations do not need wiring or a power source, as the devices run on batteries – which can last up to two decades.

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<td>Range</td>
<td>&gt;200 m (but mainly for beacons)</td>
<td>&lt;35 m (but for mesh networking)</td>
<td>5 - 10 km</td>
<td>&lt; 10 km</td>
<td>&lt; 10 km</td>
<td>&lt; 10 km (though will be much shorter for sub-GHz bands)</td>
</tr>
<tr>
<td>Power Consumption</td>
<td>Ultra-low</td>
<td>Relatively low</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
<td>Significantly lower than LTE-M/NB-IoT</td>
</tr>
<tr>
<td>Latency</td>
<td>Relatively low</td>
<td>Relatively high</td>
<td>High</td>
<td>Low</td>
<td>Low</td>
<td>Ultra-low</td>
</tr>
<tr>
<td>Frequency Band</td>
<td>2.4 GHz</td>
<td>2.4 GHz</td>
<td>868 MHz ISM</td>
<td>Multiple bands</td>
<td>Multiple bands</td>
<td>Multiple bands</td>
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<tr>
<td>Service Cost</td>
<td>Free</td>
<td>Free</td>
<td>Free</td>
<td>Charged service</td>
<td>Charged service</td>
<td>Charged service</td>
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<tr>
<td>Data Rate</td>
<td>2 Mbps</td>
<td>0.25 Mbps</td>
<td>10 kbps</td>
<td>10 Mbps</td>
<td>250 kbps</td>
<td>1-10 Gbps</td>
</tr>
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</table>

Table 1. Overview of the various wireless protocols serving the IoT sector.
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The LoRa Alliance is responsible for updating and defining the LoRaWAN protocol to ensure interoperability among devices and networks – it is a not-for-profit, collaborative association with more than 500 members involved. The alliance claims LoRa deployments increased by over 60% in 2018, with almost 80 million LoRa-enabled end nodes being installed over the course of the last year.

LoRaWANs are widely implemented within buildings, as they can penetrate dense building materials – reaching into basements and other below-ground-level locations – and have a transmission range of up to 10 km. The integral AES-128 encryption makes them more secure than Wi-Fi, and fewer gateways are needed than with Wi-Fi too (because a single gateway can cover a whole IoT system spanning an entire building or underground parking lot).

As LoRaWANs rely on different frequency channels and data rates by encoding packets, messages are less likely to collide, which increases the gateway’s capacity. One gateway can support millions of messages, making LoRaWANs suitable for public network operators simultaneously attending to many customers.

Critics say this is not really an open system – as the LoRaWAN stack relies heavily on chipsets from Semtech (which bought the technology from French company Cycleo in 2012). The proprietary nature of many of the established LPWAN protocols (such as LoRa and Sigfox) could count against them in the longer term, now that cellular IoT technologies have started to come onto the market. They have been developed by the telcos, and thus have the might of these companies (and their expansive global infrastructure) behind them.

**LTE-M**

LTE (Cat-M1) is usually referred to simply as LTE-M. It is the first LTE-based protocol designed for low-power, low-cost IoT applications, and employs the 1.4 MHz (as opposed to the 20 MHz) spectrum. Its average upload speeds are between 200 Kbps and 400 Kbps.

Using a transmit power of 20 dBm, batteries can last for up to ten years. Nodes can ‘sleep’ while in power saving mode (PSM), but remain registered with the network, or ‘wake up’ periodically – referred to as extended discontinuous reception (eDRX).

Numerous LTE-M industrial IoT use cases are currently being explored – including connected vehicles, fleet/asset management, smart pallets, container monitoring and smart shelving. In some instances, devices transmit many times daily, in others only once. For certain applications, the device will only ‘wake up’ when a threshold is reached, such as a predefined temperature.

End devices connect to the network without a gateway, thus reducing cost. Furthermore, operators do not have to replace antennas, just update their software. End devices come with lower price tags than full LTE devices, because the chips are cheaper to make – being half-duplex for narrower bandwidth.

The service costs less too. This is down to the low bit rate and the fact that periodic traffic takes up little network capacity. Another deployment option could be using short-range connections, like Bluetooth, for asset tracking backhauled over LTE-M.

**NB-IoT**

NB-IoT (Cat-M2) has similar goals to LTE-M, but uses low-bandwidth signals to communicate within GSM and LTE networks by exploiting bandwidth that is unused at any given time. Possible applications include smart parking, tracking livestock, smart metering, retail, vending machines, fire sensors and smart lighting, as well as the monitoring of pollution, soil acidity and moisture levels.

An advantage that LTE-M has over NB-IoT is that it supports higher data rates and greater mobility. In addition, it can carry voice over the network. That said, it needs greater bandwidth and costs significantly more.

**The 5G future**

LTE-M and NB-IoT are late arrivals compared to the non-cellular pioneers, but they are progressing fast. The GSMA claims that cellular LPWAN technologies are future-proofed for 5G communication – which should be regarded as a ‘network of networks,’ rather than a complete new overlay (like previous generations of mobile technology). They will support 5G and co-exist with it.

Conflating the availability of globally standardised cellular LPWANs and 5G is a good marketing ploy, reinforcing the notion of ongoing continuity – and that those networks will be here for decades to come. This is a tough argument for the proprietary technologies to counter.

ABI Research reckons that cellular and non-cellular LPWAN connections will ramp up globally at a 53% compound annual growth rate (CAGR) until 2023, driven by demand for smart meters and asset trackers (neither of which need 5G). From then onward it is anticipated that the prevalence of non-cellular LPWANs will wane, with NB-IoT and LTE-M accounting for around 55% of connections. Even so, assuming there is no sudden, massive collapse of confidence in the non-cellular technologies, they are likely to operate alongside cellular IoT networks for years.

The effect of advanced cellular technologies on IoT is hard to accurately predict. Many IoT applications do not need the attributes and (at least initially) the additional costs that will be associated with 5G. Others, like autonomous vehicles, will be dependent on its ultra-low latency and the flexibility that comes through network slicing. Making viable business cases will be critical and – as ever in technology – reality will take some time to catch up with the hype.

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**Read-only SD card adaptor**

ATEK Access Technologies launched its new Datakey read-only DFX PC adaptor, the latest addition to the DFX RUGGEDrive Series of Secure Digital (SD) memory devices.

It works to prevent accidental deletion or modification of recorded data without the need for a read/write switch. The adaptor functions much like an SD card reader, except that it works with Datakey DFX RUGGEDrive memory tokens, which are SD cards moulded into Datakey’s proprietary RUGGEDrive token form factor. When plugged into a computer’s USB port, the adaptor prevents modifications or deletions to the data stored on the inserted memory token. The combination of the memory token and read-only adaptor gives embedded designers a removable memory solution that safeguards logged data once the token has been removed from the embedded host.

“Some markets, like defence, have negative impressions of USB Flash drives and SD cards due to security and durability concerns,” said Paul Piltzweilt, senior product manager for the Datakey product line. “However, a removable memory device is often an ideal solution for many applications. The RUGGEDrive line addresses this challenge by providing removable memory devices with USB Flash drive or SD card functionality that are solid over-moulded into tamper-evident, non-standard form factors.”

The non-standard form factor of the RUGGEDrive memory tokens limits the opportunities for the memory devices to be used in inappropriate ways. If a memory device doesn’t plug in directly into a computer, tablet, smartphone or camera, it is much less likely that the data on that device will be accidentally deleted or modified.

Of course, sometimes it is necessary to transfer data from the proprietary memory device to a computer. For these occasions, Datakey offers adaptors that plug in to a USB port. The standard adaptors allow read/write access, whereas the new adaptor only allows read access.

The protection afforded by the proprietary form factor of these devices is only effective if access to the adaptors is limited, so ATEK controls the availability of its Datakey products by only selling direct to qualified OEM customers domestically and through special authorised distributors internationally. This allows OEMs to control which memory tokens and adaptors their end-users have access to.

For more information contact IPD Electronics, +27 12 345 3619, info@ipdelectronics.com

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**Bluetooth modules based on Nordic SoC**

Laird Connectivity has selected Nordic Semiconductor’s nRF52840 Bluetooth 5/Bluetooth Low Energy (Bluetooth LE) multiprotocol system-on-chip (SoC) to power two products in its BL654 Series: the power-amplified BL654 PA module and the BL654 USB adaptor.

The BL654 PA module comes in a 22 x 10 x 2.2 mm form factor and enables OEMs to utilise Bluetooth 5 for secure, extended range in IoT product designs. The integrated nRF52840 SoC provides full Bluetooth 5 support including 2x on-air raw data bandwidth (2 Mbps); 4x range; 8x broadcasting ability with advertising extensions that increase the advertising packet payload size to 251 Bytes; and an improved channel coexistence algorithm compared with Bluetooth 4.2.

The SoC’s new radio architecture with on-chip PA provides –95 dBm receive sensitivity (at 1 Mbps in Bluetooth LE mode), a maximum output power of 8 dBm, and a total link budget of 103 dBm. In the Laird Connectivity module, the SoC’s sensitivity is boosted by the Skyworks PA/LNA to -98.5 dBm (at 1 Mbps in Bluetooth LE mode) with maximum output power of +18 dBm for a link budget of 116.5 dBm. The increase in link budget further boosts the module’s range.

The BL654 USB adaptor is a production packaged and fully certified version of Laird Connectivity’s standard BL654 module series. It comes in an 18.39 x 50.74 x 11 mm form factor with an integrated antenna and the ability to support applications directly developed with either Nordic’s nRF5 SDK or Zephyr, for true production rollouts of end-devices supporting a USB port.

The adaptor is a complete, embedded wireless solution with processing capability supported by the Nordic SoC’s 64 MHz, 32-bit Arm Cortex M4F processor with a 2.4 GHz multiprotocol radio (supporting Bluetooth 5, ANT, Thread, Zigbee, IEEE 802.15.4, and proprietary RF protocol software) with 1 MB Flash memory and 256 KB RAM. It concurrently supports Bluetooth 5, Thread and IEEE 802.15.4 protocols.

Both the BL654 PA module and BL654 USB adaptor are qualified over the full industrial –40°C to 85°C operating temperature range and are designed to serve various applications such as IoT devices and sensors, beacons and proximity applications, secure medical peripherals, industrial monitoring, and Bluetooth mesh. They provide development flexibility and enable OEMs to maintain stable, robust Bluetooth LE connections in harsh RF environments and use cases.

For more information contact Andrew Hutton, RF Design, +27 21 555 8400, andrew@rfdesign.co.za
**SoCs and software for smart home and IIoT**

Silicon Labs has introduced the next generation of its Wireless Gecko platform, Series 2, designed to make Internet of Things (IoT) products more powerful, efficient and reliable. Building on the RF and multiprotocol capabilities of the Wireless Gecko portfolio, the initial Series 2 products include small-form-factor system-on-chip (SoC) devices with a dedicated security core and an on-chip radio delivering extended wireless range.

The first products in Silicon Labs’ Series 2 portfolio include EFR32MG21 SoCs supporting multiprotocol, Zigbee, Thread and Bluetooth mesh networking, and EFR32BG21 SoCs dedicated to Bluetooth Low Energy and Bluetooth mesh. These SoCs provide ideal solutions for line-powered IoT products including gateways, hubs, lights, voice assistants and smart electric meters.

Performance figures include: +20 dBm output power and up to +124.5 dB link budget; a robust wireless radio with improved blocking performance; powerful processing with an 80 MHz Arm Cortex-M33 core with TrustZone technology; and low active current (50.9 µA/MHz) to meet stringent green energy requirements.

The multiprotocol SoCs, which come in a 4 x 4 mm QFN package, provide enhanced security features that enable developers to implement robust security in connected products. A dedicated security core enables faster, lower-power encryption than software techniques, while a true random number generator (TRNG) strengthens device cryptography. Secure boot loading ensures authenticity of firmware images and over-the-air updates, and secure debug access control helps OEMs prevent unauthorised access to end-products.

Future pin- and software-compatible Wireless Gecko Series 2 SoCs and modules with additional dedicated security technologies will enable developers to create next-generation connected products with enhanced security features, helping to increase consumer trust and drive mass IoT adoption.

With Series 2, designers can bring secure, next-generation IoT products to market by taking advantage of Silicon Labs’ Simplicity Studio integrated development environment (IDE). The Simplicity Studio IDE accelerates time-to-market with a suite of tools, including a unified wireless development kit, SDKs, energy profiler, patented network analysis, application demos and mobile apps.

For more information contact NuVision Electronics, +27 11 608 0144, gdeklerk@nuvisionelec.co.za

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**Indoor LoRaWAN gateway**

The LPS8 from Dragino Technology is an open-source LoRaWAN gateway that lets the user bridge a LoRa wireless network to an IP network via Wi-Fi or Ethernet. The gateway’s LoRa wireless technology allows users to send data and reach extremely long ranges at low data rates.

The LPS8 uses a Semtech packet forwarder and is fully compatible with the LoRaWAN protocol. It includes an SX1308 LoRa concentrator, which provides 10 programmable parallel demodulation paths. The gateway features pre-configured standard LoRaWAN frequency bands to use for different countries. Users can also customise the frequency bands to use in their own LoRa network.

Targeted applications include smart buildings and home automation, logistics and supply chain management, metering, agriculture, smart cities and smart factories.

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

www.dataweek.co.za
Electromagnetic interference (EMI) is caused by unintentional emissions from electronic equipment. Compared to natural sources of EMI, such as lightning and solar storms, engineers are more concerned about man-made, unintentional EMI emissions. Devices that emit these range from modern cellular communication systems and broadcasting systems to a host of electrical components, which generate burst, pulse, CW or modulated signals.

To gain global market access for their products, the manufacturers of electronic devices must comply with region- or country-specific EMC (electromagnetic compliance) directives and ensure that their devices are compliant.

The value of EMI pre-compliance testing

Reduce the risk of failing EMI compliance at the end of a project

Most manufacturers prefer to have their products certified by an authorised third-party service provider that is familiar with global standards and requirements. EMI compliance testing would ensure that products are completely certified.

However, EMI compliance tests are usually conducted at the end of project.

Referring to the product development cycle chart below, you can see that 90% of tests and measurements (including EMI diagnostic tests) happen during the prototyping and pilot run phases. EMI compliance tests, on the other hand, comprise only 10% of the process and occur at the end of a project.

EMI compliance test failures can be costly for a project team, time- and money-wise. Therefore, you should take the opportunity during the early stages of a product development cycle to minimise the risk of failing an EMI compliance test by conducting EMI diagnostic tests or pre-compliance tests.

Identify exact EMI sources

It can be difficult to tell where EMI failures are coming from since compliance tests themselves won't tell you where exactly the source of the problem is. Radiated emissions may come from a USB port, a LAN port, the seam of a shield, a cable, a buffer, a clock or even a power cord.

You need to either troubleshoot yourself or obtain troubleshooting services from a lab or a third party. In this situation, near-field tests are the only way to locate such emission sources and are typically performed using a signal analyser and a set of near-field probes.

The functionality of an EMI receiver and a general-purpose signal analyser optimised for EMI emissions measurement applications is similar. EMI pre-compliance tests can be covered by either EMI receivers or signal analysers with basic EMI features such as CISPR 16-1-1 compliant detectors and resolution bandwidth. Signal analysers are usually less expensive than EMI receivers.

EMI compliance testing also requires conformance to a standard testing environment, which is hard for the majority of companies to achieve.

In short, EMI receivers enable you to do full compliance testing. They have been designed with all the compliance standards in mind and most organisations recommend using an EMI receiver for EMI applications.

On the other hand, general-purpose signal analysers can be used for pre-compliance testing. Signal analysers are a versatile tool and can be optimised to be used for EMI testing. If you are an RF engineer in the early R&D product development phase, a signal analyser equipped with basic EMI features will provide just enough functionality for pre-compliance testing.

Conclusion

The advantage of running an EMI pre-compliance test with a signal analyser is that you can make a good estimation of the EMI performance of your new product and reduce the risk of failing EMI compliance at the end of a project.

For more information contact Tshiamo Mogakwe, Concilium Technologies, +27 12 678 9200, info@concilium.co.za.
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Exploring MagAlpha magnetic angle sensor technology

The ability to detect position or speed is a fundamental requirement in the control and monitoring of many mechanical systems. Slow speed position measurement in applications such as motorised actuators has historically used resistive potentiometers.

In high-speed applications such as servo motors, optical encoders have typically been used.

Though potentiometers are inexpensive, they suffer from the drawback of being a moving contact-based assembly, which brings the associated issues of mechanical contact wear and susceptibility to damage from external environmental factors including moisture and dirt ingress. Optical encoders offer high accuracy, but come at a higher price due to the complex nature of their construction. Engineers can solve this dilemma by using contactless rotary magnetic angle sensors that implement Hall-effect sensing.

MagAlpha sensors from Monolithic Power Systems (MPS) offer the following benefits:

- Angle resolutions from 8 to 14 bits, with SPI, ABZ, PWM and UVW interface options.
- Contactless magnetic sensing for high reliability and long application life.
- Cost-effective, space-saving packages.
- Mechanical flexibility with end or side of shaft magnet support.

MPS MagAlpha sensors utilise a proprietary array of vertical Hall plate elements that sense the horizontal vector of the magnetic field being measured. This field typically comes from a dipole, diametrically polarised magnet situated above or to the side of the sensor. The sensing technique of the MagAlpha Hall array supports a number of magnet-to-sensor positions (see Figure 1).

The sensor front-end contains a proprietary arrangement of Hall elements with different orientations. This array is sampled continuously at high speeds (every 1 µs) and produces an internal signal waveform, which has an approximate sinusoidal form.

The phase angle at the zero crossing point of this waveform directly relates to the angle being measured. The angle samples are digitised using a fast counter, whose value reflects the phase of the zero crossing point in each measurement period. Figure 2 illustrates the typical sampled waveform.

These accumulated samples are passed to a low-latency digital filtering block that averages out the noise and increases the resolution at the sensor output. Depending on the filter depth, resolutions up to 14 bits (3-sigma) are possible.

MPS calls this proprietary ‘phase-to-digital’ technique SpinAxis. It differs from the conventional X-Y Hall plate and arc tangent calculation technique in several ways. Traditional arc tangent based algorithms can have latencies of many hundreds of microseconds, resulting in significantly more angle lag (reported angle vs. real mechanical angle). Because of the fast sampling rate of the front-end and the low-latency design of the digital filter, the angle lag from front-end capture to the angle information being available at the output interface is typically only 10 µs.

This allows MagAlpha sensors to capture angles with low latency at very high rotation speeds. Because the latency is fixed at about 10 µs, the lag at a constant rotation speed is simply 10 µs x the rotation speed (in degrees per second). For example, at 50 000 rpm, the angle lag from acquisition to output would be 300 000 degrees per second x 10 µs = 3 degrees.

The SpinAxis technique also supports a wider range of magnetic field strengths compared to competing magnetic solutions, such as those using gross magnetoresistance (GMR) or anisotropic magnetoresistance (AMR) based materials. MagAlpha sensors can support field strengths from 15 mT to over 100 mT. This gives greater design flexibility in magnet material choice and magnet-to-sensor positioning.

The SpinAxis technique also supports a wider range of magnetic field strengths compared to competing magnetic solutions, such as those using gross magnetoresistance (GMR) or anisotropic magnetoresistance (AMR) based materials. MagAlpha sensors can support field strengths from 15 mT to over 100 mT. This gives greater design flexibility in magnet material choice and magnet-to-sensor positioning.

Digital filter block

The digital filter block is optimised in each MagAlpha sensor type to match the target application. The filter depth (number of samples processed vs. time) affects the sensor’s final output resolution, with a greater filter depth (more samples) giving a higher resolution.

A follow-up effect of a deeper filter depth is that the filter bandwidth decreases as resolution increases (since it takes longer to process more samples). Likewise, as the bandwidth decreases, the associated time constant of the filter increases. This has an effect on the loop response time and determines how the sensor performs when used in systems where the rate of angle change or speed of rotation changes dynamically.

The filter time constant (tau) for the MagAlpha family ranges from 1 ms to 16 ms. This value can be used to compute the resulting angle lag error during acceleration or deceleration. The angle lag error under speed change is the rate of speed change in degrees per second per second (i.e.

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the acceleration/deceleration) multiplied by the square of the tau value.

**Sensor families**

Several ranges of MagAlpha devices have been created with different performances and output interface types, based on the intended application. All MagAlpha sensors output the digital angle value on an SPI bus and, in some devices, also on an SSI. In addition, specific variants offer an incremental quadrature ABZ encoder output, PWM output, or UVW commutation signals for motor control. Other features include selectable magnetic field detection thresholds to check magnet position and field strength, output linearisation registers for side shaft mode, and a programmable zero position offset.

Side-shaft linearisation allows the sensor to adjust the gain in the X or Y axis of the Hall array to compensate for the additional magnetic field vectors present in this mode, and to regain a linear output response. The zero offset adjustment means that no manual alignment of the magnet poles to the sensor’s orientation is required.

The offset can be adjusted in software for the required zero angle position. All programmable features can be stored in a non-volatile, on-chip EEPROM memory. These settings are automatically loaded after each power-on. Figure 3 shows the generic block diagram of a MagAlpha sensor.

The MA7xx family features SPI output resolutions from 9 to 14 bits, and supports SSI, ABZ and PWM interfaces. This family is suited to any general angle-sensing or speed-sensing applications including actuators, encoders and field-oriented motor control (FOC). New additions to the family include the MA732, which allows user programming of the digital filter parameters for resolution, time constant, and startup times, as well as adjustable ABZ hysteresis.

The MA780 and MA781 are designed for applications requiring low average power consumption, such as battery-powered devices. They feature low-power modes with automatic sleep, wake, and sample periods. The MA780 comes in a 3 x 3 mm QFN package, whilst the MA781 comes in a tiny 2 x 2 mm QFN package.

The MA3xx family features SPI output resolutions from 9 to 14 bits, and supports ABZ and UVW interfaces. The UVW interface can replace the motor commutation signals generated by the three individual Hall sensors found in many three-phase brushless motors. Using a simple dipole magnet, the MA3xx family is able to emulate the waveforms of three Hall sensors and generate UVW outputs supporting rotors with 1 to 8 pole pairs.

Using this combination of SPI angle or ABZ encoder output with UVW commutation allows for very compact brushless servo motor implementation. This is useful in very small diameter micro-motors where it would not be possible to embed three Hall switches in the stator windings.

The MA330 allows greater programming of the digital filter parameters for loop bandwidth optimisation in servo motor control, and adjustable ABZ hysteresis to support higher pulse-per-turn counts for a given resolution setting.

For non-servo applications that just wish to replace the three Hall sensors, the MA102 is a minimal-feature solution that only provides the UVW signals. These are provided with complementary output polarities for greater signal-to-noise performance from the sensor wiring loom back to the motor controller.

For automotive applications, the MAQ470 and MAQ430 are AEC-Q Grade-1 versions of the MA702 and MA302 12-bit angle sensors, respectively. These support -40°C to +125°C operation, and are suitable for use in cabin and body sensor electronics in vehicle applications. Typical applications include infotainment controls, HVAC flap angle control, and pop-out door handles.

Lastly, for simple rotary user interface applications, the MA8xx family of 8-bit parts provides a cost-effective way to replace mechanical rotary switches or potentiometers. These also have the magnetic field threshold detection feature available in all MagAlpha parts, which allows for the implementation of a push-button action into the rotary knob design.

All MagAlpha sensors come in a space-saving 3 x 3 mm QFN package (with the exception of the MA781 in 2 x 2 mm QFN), and operate from a 3.3 V supply. Current consumption is typically in the 10 mA to 13 mA range, with micro-amp average currents possible in the new MA780 and MA781 low-power parts.

For more information contact NuVision Electronics, +27 11 608 0144, gdeklerk@nuvisionelec.co.za

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<thead>
<tr>
<th>Applications</th>
<th>Part</th>
<th>Features</th>
</tr>
</thead>
<tbody>
<tr>
<td>All-purpose angle encoders actuators</td>
<td>MA704</td>
<td>10-bit high bandwidth (3 kHz) – suitable for dynamic, closed-loop control applications</td>
</tr>
<tr>
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<td>MA702</td>
<td>12-bit medium bandwidth (390 Hz) – suitable for general purpose control</td>
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<tr>
<td></td>
<td>MA710</td>
<td>12-bit at low field, low bandwidth (90 Hz) – optimised for side shaft mode / low field</td>
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<td></td>
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<td>14-bit low bandwidth (23 Hz) – high resolution, slow-speed applications</td>
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<tr>
<td></td>
<td>MA732</td>
<td>9 to 14-bit with configurable filter bandwidth – tuneable to the application</td>
</tr>
<tr>
<td>All-purpose angle encoders for BLDC (UVW outputs)</td>
<td>MA302</td>
<td>Same as MA702 but with UVW commutation signals for brushless motors</td>
</tr>
<tr>
<td>Servo motors &amp; actuators</td>
<td>MA301</td>
<td>Same as MA710 but with UVW commutation signals for brushless motors, optimised for side shaft mode / low field</td>
</tr>
<tr>
<td></td>
<td>MA330</td>
<td>9 to 14-bit with configurable filter bandwidth, tuneable to the application, UVW for brushless motors</td>
</tr>
<tr>
<td>Replacement of three Hall switch for BLDC commutation</td>
<td>MA102</td>
<td>UVW outputs, 1 to 8-pole pair emulation</td>
</tr>
<tr>
<td>Low-power applications</td>
<td>MA780</td>
<td>8 to 12-bit with automatic sample cycling, 3 mm x 3 mm QFN</td>
</tr>
<tr>
<td></td>
<td>MA781</td>
<td>8 to 12-bit with automatic sample cycling, 2 mm x 2 mm QFN</td>
</tr>
<tr>
<td>Human machine interface, speeds &lt;200rpm</td>
<td>MA800</td>
<td>8-bit SPI output</td>
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<tr>
<td></td>
<td>MA820</td>
<td>8-bit SPI output, 64 pulse per turn ABZ</td>
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<tr>
<td></td>
<td>MA850w</td>
<td>8-bit SPI output, PWM output</td>
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</table>
32-bit MCUs for IoT edge devices

Renesas Electronics announced four new RX651 32-bit microcontrollers (MCUs) supplied in ultra-small 64-pin BGA and LQFP packages. The new lineup expands the RX651 MCU group with a 64-pin (4.5 x 4.5 mm) BGA package that reduces footprint size by 59% compared to the 100-pin LGA, and a 64-pin (10 x 10 mm) LQFP that offers a 49% reduction versus the 100-pin LQFP. The MCUs address advanced security needs for endpoint devices employing compact sensor and communication modules in industrial, network control, building automation, and smart metering systems operating at the IoT edge.

The RX651 MCUs integrate connectivity, Trusted Secure IP (TSIP), and trusted Flash area protection that enable Flash firmware updates in the field through secure network communications. The increase in endpoint devices operating at the edge has increased the need for secure over-the-air (OTA) firmware updates. The new devices support this reprogramming requirement with integrated TSIP, enhanced Flash protection, and other technology advancements that offer a more secure and stable solution than other available solutions on the market.

The small 64-pin MCUs are based on the high-performance RXv2 core and 40 nm process that provide superior performance with a 520 CoreMark score at 120 MHz, and strong power efficiency with a 35 CoreMark/mA score as measured by EEMBC benchmarks. The integrated dual-bank Flash memory enables engineers to realise high root-of-trust levels through a combination of TSIP that protects the encryption key; encryption hardware accelerators including AES, 3DES, RSA, SHA and TRNG; and code Flash area protection to protect boot code from reprogramming. The dual-bank Flash function supports both BGO (Back Ground Operation) and SWAP, making it easier for manufacturers to execute in-the-field firmware updates securely and reliably.

Optimised for connected industrial environments, the MCUs’ network connectivity features monitor the operating state of machinery from both inside and outside the factory, enabling data exchanges to change production instructions, and reprogram MCU memory to update equipment settings.

For more information contact Jody Botha, Hi-Q Electronics, +27 11 894 8083, jody@hi-q.co.za

X-capacitor discharge ICs

Power Integrations announced CAPZero-3, the latest generation of the company’s energy-saving X-capacitor discharge ICs. Two-terminal CAPZero-3 ICs enable designers to meet IEC60335 safety approvals for major appliances, and cover all capacitor values from 100 nF to 6 µF.

IEC60335 is the discharge safety standard for all appliances. To protect the user from an electrical hazard, it requires the voltage across the input X capacitor to discharge to less than 34 V within less than one second after the AC is removed. CAPZero-3 ICs block current flow through the X-capacitor discharge resistors when the AC voltage is connected, and automatically discharge X capacitors through those resistors when the AC is disconnected. They thus simplify EMI filter designs while permitting the use of larger X capacitors, which in turn enables smaller inductive components to be used with no resulting change in power consumption.

CAPZero-3 ICs can be placed before or after a system’s input fuse. Devices deliver high common-mode surge immunity so that no external ground connection is necessary, and feature a high differential surge withstand due to 1000 V internal MOSFETs. Creepage on the package and PCB is maintained at >4 mm.

For more information contact MB Silicon Systems, +27 11 728 4757, info@mbsiliconsystems.co.za.
Minimising power consumption for external Flash

By Paul Hill, senior marketing director, and Gordon MacNee, EMEA applications manager at Adesto.

With any low-power design, the designer has the choice between choosing low-power components or switching off the power to peripheral devices. When considering the choice of non-volatile Flash memories, the designer has these same two options available to them – each of which has its pros and cons from system operation, power consumption and reliability perspectives.

However, there is another low-power solution available that has the added benefit of simplifying your system design and improving reliability.

Typical design using external Flash memory

Despite the proliferation of microcontroller (MCU) devices with embedded Flash and a wealth of low-power modes in which they can operate, more and more systems still require an external Flash memory device to supplement the on-chip Flash for expansion reasons. Over-the-air (OTA) updates, datalogging, user profiles, and other applications all contribute to this.

For many basic applications, a typical design as shown in Figure 1 is an acceptable solution. In this solution, the power is continuously supplied to the Flash device. When the Serial Flash Chip Select Signal (/CS) is not asserted and the memory is in standby mode, standby current is typically about 10 µA to 20 µA. There is also an option to go into the command-driven Deep Power Down mode, which reduces standby power even more, to typically 2 µA – 5 µA.

However, in some other systems, such as energy harvesting or small battery-powered devices, even 2 µA may still represent too high a current consumption value. And, if the Flash is accessed infrequently or very rarely used, 2 µA standby for extended periods may represent an excessive drain on the power supply and energy reserves – reducing overall battery/system operating life.

External Flash with simple power switching control circuit

To improve the system battery life, designers often implement a simple power switching control circuit as shown in Figure 2. The power to the Flash device is managed under software control through a spare MCU GPIO pin so that serial Flash is only powered when required.

Don’t get too comfortable! The inclusion of the MOSFET to completely switch off the serial memory VCC will reduce the standby power of the memory to zero, but the MOSFET itself has a potential leakage current and drain current, in some cases up to 1.5 µA, which is only 500 nA better than the memory in normal standby at up to 2 µA.

Reliability concerns

The solution utilising an external FET or LDO with control gate to manage power to a peripheral device VCC pin is becoming more common; however, this does also require an extra MCU GPIO pin.

More importantly, care must be taken when multiple peripheral devices share a common SPI bus and where the individual devices have switched VCC pins. In the configuration shown in Figure 2, if the VCC to the Flash is switched off and VCC = 0 V, continuing to access the other SPI-controlled devices (e.g. DAC/ADC/Display) on the SPI bus will result in bus signals also appearing on the serial Flash SPI pins.

In this scenario, the high VCC on peripheral SPI bus pins when VCC for the Flash (or other devices) is at zero would result in the I/O protection diodes being forward-biased, and the device will potentially draw power through the I/O pins themselves. This could lead to short-term or long-term reliability concerns and operational problems.

For all situations where any other devices that might be powered on while the Flash is turned off, stray capacitance should also be minimised so that the voltage on any pin does not exceed the voltage on the VCC pin. Alternatively, the designer could consider a more cumbersome solution and add a separate SPI bus for the serial memory where VCC can be turned off.

Careful hardware and software design and implementation can overcome all of these challenges and concerns. However…

The Ultra-Deep Power Down (UDPD) option

…a more efficient solution is achieved by integrating the power control circuitry into the memory device itself and allowing the master device (MCU) to control the power mode through the serial Flash SPI command.
interface. This saves the GPIO pin for other purposes. See the diagram in Figure 3.

Benefits to this solution are:
- It consumes much less power than standard Deep Power Down.
- It does not require an external MOSFET.
- It allows the designer to use the same SPI bus for other peripherals and therefore simplify the design.
- It mitigates reliability concerns as the VCC pin is always connected to VCC, and power is controlled internally.

Additional benefits to this solution are:
- It saves a GPIO pin that would be used for switching the external MOSFET or LDO.
- It simplifies the software because it eliminates the surplus MOSFET/LDO control routines.
- It provides for a cleaner PCB design and reduced bill of materials.

The Adesto Fusion, FusionHD (AT25XExxx) and DataFlash (AT45DBxxxE/F) Flash memory devices offer this Ultra Deep Power Down mode in addition to Standby and Deep Power Down modes. Standby and Deep Power Down modes result in a current consumption similar to or lower than other industry-standard Flash devices.

The Ultra Deep Power Down mode takes the quiescent current down to less than 200 nA for Fusion, 100 nA for FusionHD and less than 400 nA for DataFlash.

Conclusion
Choosing the proper low-power memory can be a critical system design factor for energy harvesting or small battery-powered devices. Understanding and managing the interaction of components on your SPI bus is also essential to improving functionality and reliability. By considering how memory is implemented in real-world systems, Adesto’s serial Flash memory solutions offer designers the option to simplify the design, reduce risk, improve reliability and save on external components, greatly simplifying the circuit and reducing bill of materials cost.

For more information contact Conrad Coetzee, Altron Arrow, +27 11 923 9600, ccoetzee@arrow.altech.co.za

Controllers for new PoE standard

ON Semiconductor is supporting the IEEE 802.3bt standard with a growing portfolio of compliant products and technologies. Using the new IEEE 802.3bt standard, Power over Ethernet (PoE) can be used to deliver high-speed connectivity and up to 90 W of power over Local Area Network (LAN) connections.

ON Semiconductor’s solutions not only support the new standard power limit, but extends it further to 100 W for systems including telecommunications and digital signage.

The IEEE 802.3bt standard has the potential to transform every vertical market touched by the IoT, by enabling more sophisticated endpoints operating across larger networks. The standard optimises energy management through the new ‘Autoclass’ feature, which enables Powered Devices (PDs) to communicate their specific power needs to the Power Sourcing Equipment (PSE). This in turn allows each PSE to allocate just the right amount of power to each PD, maximising both the available energy and bandwidth.

With up to 90 W of power available, compared to the 30 W provided by the IEEE 802.at standard (PoE+), IEEE 802.3bt can provide both power and connectivity to new applications that would otherwise require a dedicated and typically off-line power source. PoE will simplify network topologies and provide a more robust ‘plug and play’ user experience.

Forming the foundation of ON Semiconductor’s PoE-PD solutions, the NCP1095 and NCP1096 interface controllers incorporate all of the features needed to implement a PoE interface, including detection, auto-classification and current limiting. The controllers employ either an external (NCP1095) or internal (NCP1096) hot-swap FET. The integrated hot-swap FET in the NCP1096 features the lowest on-resistance available in a Type 3 or Type 4 PoE controller.

The controllers are complemented by the NCP1566 DC-DC controller, the FDMC8622 single MOSFET and the FDMQ8203 and FDMQ8205A GreenBridge quad MOSFETs, which have been developed to provide a more efficient alternative to a diode bridge in PoE applications. Together, these devices enable highly efficient PoE interfaces with up to the standard limit of 90 W of power or to a proprietary 100 W solution if more power is needed.

For more information contact EBV Electrolink, +27 21 402 1940, capetown@ebv.com.
Battery protectors with integrated fuel gauges

Designers concerned about battery safety now have access to an advanced battery protector with integrated fuel gauges from Maxim Integrated Products. The newest 1-cell, pack-side ICs in this portfolio are the MAX17301 and the MAX17311, which offer a host of configurable settings for battery safety and allow fine-tuning of voltage and current thresholds based on various temperature zones.

These ICs also offer a first-of-its-kind secondary protection scheme in case the primary protection fails. This secondary protection scheme permanently disables the battery by overriding a secondary protector or blowing a fuse in severe fault conditions.

All ICs in the family are equipped with Maxim’s patented ModelGauge m5 EZ algorithm that delivers enhanced state-of-charge (SOC) accuracy. These fuel gauges also offer very low quiescent current and feature SHA-256 authentication to safeguard the systems from counterfeit batteries.

For more information contact CST Electronics, +27 11 608 0070, sales@cstelectronics.co.za.

Flexible digital power-factor controller

Combining the flexibility of digital power with the responsiveness of analog algorithms, STMicroelectronics’ STNRGPF12 dual-channel interleaved boost-PFC (power factor correction) controller is easily configured and optimised using the company’s eDesignSuite software.

Suited to applications over 600 W, the STNRGPF12 enhances efficiency and reliability in equipment as diverse as industrial motor controls, charging stations, uninterruptible power supplies, 4G and 5G base stations, welding machines, telecom switches, home appliances, and data-centre power supplies.

The chip operates in continuous-conduction mode (CCM) at fixed frequency with average-current-mode control. The best of both digital and analog worlds meets in the STNRGPF12’s inner and outer control loops. The inner current loop utilises a hardware analog Proportional-Integral (PI) compensator, while the outer voltage loop is performed by a digital PI controller with fast dynamic response. This enables the STNRGPF12 to manage cascaded control of the voltage and current loops to regulate the output voltage by acting on the total average inductor current.

For more information contact Robin Scholes, Altron Arrow, +27 11 923 9600, rscholes@arrow.altech.co.za.

Low-power SDRAMs

Alliance Memory has further grown its portfolio of low-power SDRAMs for mobile and embedded systems in the automotive, consumer, industrial and medical spaces. The latest additions include two new 256 Mb LPDDR2 devices: the AS4C8M32MD2A-2582CN and AS4C8M32MD2A-258CN.

Operating from 1,8 V, the company’s LPDDR SDRAMs are available in densities of 128 Mb, 256 Mb and 512 Mb, in 54-ball and 90-ball FBGA packages. LPDDR devices operate from 1,7 V to 1,95 V and come in densities of 256 Mb, 512 Mb, 1 Gb and 2 Gb, in 60-ball and 90-ball FBGA packages. Enabling ultra-slim designs, LPDDR2 SDRAMs offer 1,2 V/ 1,8 V operation and densities of 256 Mb, 1 Gb and 4 Gb, in the 134-ball and 168-ball FBGA packages.

For designers of mobile devices tasked with providing more functionality in tighter spaces while using less power, Alliance Memory’s low-power SDRAMs offer a variety of power-saving features, including auto temperature-compensated self-refresh (TCSR) to minimise power consumption at lower ambient temperatures. In addition, their partial-array self-refresh (PASR) feature reduces power by only refreshing critical data, while a deep power down (DPD) mode provides an ultra-low power state when data retention isn’t required.

For more information contact Brabek, +27 21 706 3162, info@brabek.co.za.

MCU-based solution for offline face recognition

NXP Semiconductors unveiled the world’s first microcontroller (MCU)-based solution for adding offline face and expression recognition capabilities to smart home, commercial and industrial devices. Built on NXP’s latest crossover MCU, the i.MX RT106F, running FreeRTOS, the solution enables original equipment manufacturers (OEMs) to quickly, easily and inexpensively incorporate face, expression and emotion recognition into a diverse range of IoT products.

The i.MX RT106F leverages the power of NXP’s Oasis face processing engine, using a neural network to perform face detection, recognition and anti-spoofing without the need for cloud connectivity. OEMs can take advantage of the hardware and software-based platform to offer advanced human machine interface (HMI) capabilities that can anticipate and personalise the end user’s experience with smart edge devices such as smart appliances, thermostats, lighting, alarms and power tools.

NXP is now engaging with OEMs to provide early access to the evaluation and development kit for this solution and broad market availability is expected to begin in the first quarter of 2020.

For more information contact EBV Electrolink, +27 21 402 1940, capetown@ebv.com.
18-slot PXI Express chassis

Schroff nVent has expanded its Schroff product range for PXI systems by adding an 18-slot Schroff PXI Express system with a modular structure which is used in complex measuring and simulation applications.

The new 18-slot system is based on a modular RatiopacPRO enclosure with an intelligent ventilation concept and integrated fan control. The system features a system slot, a system timing slot for feeding in very precise clock signals, and 16 hybrid slots for PXI Express or PXI cards laid out over a width of 84 HP (19" wide). The hybrid slots make the system completely backward-compatible and make it easier to change over from PXI to PXI Express in phases.

The backplane of the 18-slot PXIe system has been given a predominantly passive design. The necessary PCI bridge, PCIe switch and clock functions are implemented with the same separate modules that are used for the smaller 8-slot PXIe system. There are more of them integrated here: two PCI bridge modules for 2 x 8 PCI connector positions to ensure the system can be started or shut down by means of the push button. The button is equipped with an LED ring that can be used to display various system states, e.g. ‘Proper function’ (LED lights up green) or ‘Temperature critical’ (LED flashes red). This is implemented using an additional microcontroller on the backplane. This function has been retrofitted for the smaller 8-slot PXIe system, which means that users have useful system information easily accessible.

For more information contact Actum Electronics, +27 11 608 3001, sales@actum.co.za.

Plastic enclosures with mounting flange

Available from Gainta is a range of plastic enclosures for mounting and assembly of general electronic applications. The bases of the cases have a mounting flange and incorporate a tongue and groove sealing system with a neoprene gasket; this sealing system is used for the lid as well.

The bosses inside the bases are designed for M3 self-tapping screws, while the flanged wall mounting holes are designed for either M3 or M4 pan head machine screws, depending on the model. Internal guide slots are also provided for vertical mounting of printed circuit board assemblies. The cases offer IP65 protection according to IEC 529 and NEMA 4.

The G3xxMF series is supplied in dark grey made from high-impact ABS and is suitable to operate in temperatures ranging from -20°C to +80°C. The G2xxMF (light grey) and G2xxCMF (light grey with clear lid) series are constructed from polycarbonate and are suitable for temperatures between -40°C and +120°C. All series are available in sizes ranging from 64 x 58 x 35 mm to 222 x 146 x 75 mm.

For more information contact Sivan Electronic Supplies, +27 11 887 7879, elecsupp@global.co.za.

Table-top instrument enclosures

The Evotec range of table-top plastic enclosures, made by OKW, is suitable for for tough working environments in applications such as measurement and control engineering, IT, medical, laboratory and environmental technology. Evotec can also be wall mounted for access control. These enclosures feature elegant and ergonomic soft contours but are built to be robust. They are moulded from ASA+PC-FR (UL 94 V-0) for enhanced UV stability and can be specified with a sealing kit for IP65 protection.

There are three variants: Version I has a flat top with a large operating area for switches, push buttons and touch displays. Version II features a smooth sloping top for desktop applications. Version III also has a sloping top but is recessed to accommodate a membrane keypad or product label. All three versions have PCB screw pillars in the top and base. Rubber feet ensure stable positioning on flat surfaces. Torx assembly screws prevent tampering – perfect for medical applications.

Evotec is available in one size (7.87” x 4.88”) and in one standard colour: off white (RAL 9002). Accessories include an IP65 seal, wall mounting kit and self-tapping screws for fitting PCBs.

OKW can customise Evotec on request. Services include custom colours, RFI/EMI shielding; CNC machining; lacquering; water transfer, tampo or digital printing of logos and legends; installation and assembly of accessories; display windows; plastic and aluminium panels.

For more information contact Quatraine Domoney, Avnet South Africa, +27 11 319 8600, quatraine.domoney@avnet.eu.
USB and utility plastic boxes

Gainta’s G19XX series of utility boxes and USB boxes come in a range of materials and a variety of designs to meet an array of application requirements.

The G1901G/G1901C and G1911G/G1911C are ideally suited for USB-type memory card or wireless products; the G1903, G1906, G1908 and G1910 are suitable for general electronic product use; and the G1905 is a utility box with an external mounting bracket.

The boxes can be supplied in polycarbonate (transparent) for the G1901C and G1911C, high impact ABS (UL94-HB) for the G1901G, G1905 and G1910, and flame retardant ABS (UL94-V0) for the G1903, G1906, G1908 and G1910.

For more information contact Sivan Electronic Supplies, +27 11 887 7879, elecsupp@global.co.za.

Die-cast enclosures in extended lengths

The 1590 die-cast enclosures family from Hammond Manufacturing consists of 41 different sizes in the standard rectangular and Stomp Box, painted variants.

Stomp boxes, colour coded to provide quick visual identification on stage, are the housings of choice for leading stomp box manufacturers. Also known as guitar effect pedals, they are the housings for foot-operated equipment used by electric guitarists to produce preset effects such as distortion, wah-wah, delay, chorus and phaser. Two sizes, the 1590 BX2 (254 x 70 x 35 mm) and 1590 BX (254 x 70 x 51 mm) have been added to the range to allow multiple pedals to be mounted in a single enclosure.

The two sizes have also been specified in a completely different requirement: a radio antenna splitter, where multiple local feeds are broken out from the incoming aerial. In both applications, the intrinsic RFI shielding, the mechanical strength and the environmental sealing of the 1590 were important requirements.

A lap joint seals the units to IP54, protecting against the ingress of dust and water, and the painted finish is only applied to the external surfaces, maintaining RFI integrity. The 1590 is available as standard in natural finish or with a satin black painted finish.

All sizes can be supplied factory modified with machining and silk screening to the user’s specification. AutoCAD files and PDF dimensioned drawings can be downloaded from www.hammondmfg.com/dwg.htm.

For more information contact Electrocomp, +27 11 458 9000, andrew@electrocomp.co.za

Conductive rubber gaskets

A range of conductive O-profile silicone rubber gaskets is available from Holland Shielding Systems, developed for high-performance shielding up to 18 GHz and used where environmental and EMI screening is required but little space is available.

Four kinds of extrusion types are available: hollow, solid, cell rubber and rectangular. These extrusion cores can be covered with metallised fabric foil or they can be made out of conductive rubber. For optimal shielding performance a compression of 5-10% is recommended for solid elastomers and 10-50% for hollow extrusions and sponge rubbers.

Benefits of using these O-profiles include ease of fitting into grooves, deflection up to 50% and low closure force.

For more information contact Conical Technologies, +27 66 231 1900, daniel.haywood@conical.co.za
Balancing performance, speed and cost for rugged interconnects

Ensuring signal integrity is not an easy task in challenging environments such as railways, military, aerospace and industrial. Interconnect technologies used in these environments have to be as reliable as possible while dealing with extreme temperatures, rapid temperature cycling, vibration, shock and the risk of contamination from dangerous fluids.

Demands from the system side are increasing in terms of signal speed, size, weight, signal integrity, power throughput and cost, while maintaining the ruggedness that these applications have come to expect. System designers want the smallest and lightest possible connectors for use in aerospace and military electronics, while industrial and transportation electronics are expected to deal with the same harsh environments at more competitive cost points.

Connector manufacturers are working hard to come up with innovative new products to meet the growing system demands for harsh-environment connectors.

Lightweight aerospace
The aerospace sector is particularly challenging for connector technologies. Aerospace engines, in particular, expose electronics to some of the harshest conditions experienced anywhere. Stainless steel is typically used in engines, as it is more resistant to the high temperatures that standard plated aluminium alloys can’t take. Steel is also very strong. However, it’s a lot heavier than aluminium, which is obviously undesirable in aircraft applications.

To address this dilemma, Amphenol has invested in state-of-the-art turning centres in the UK and India so that titanium connectors can be produced in shorter time frames. The result is a new range of titanium HTC connectors that are designed to meet the requirements of Rolls-Royce specifications ESC20 and ESC21. These connectors are 30% lighter than steel ones, with comparable performance, and they come in shell sizes from 08 to 24. The new turning facilities can also produce titanium versions of MIL-DTL-38999 connectors in titanium, as well as hermetically sealed titanium connectors.

Amphenol’s titanium HTC connectors are designed to meet Rolls-Royce specifications.

Commercial vehicles
Molex has been working closely with the society for automotive engineers (SAE) on new connectors that meet SAE J2839. This standard sets out the requirements for heavy-duty, high-speed data links such as Ethernet in vehicles. The result is a brand new heavy-duty Ethernet connector that is Cat 5e compliant for 10/100 Mbps Ethernet speeds and can withstand the harsh environments found in heavy-duty vehicles such as commercial vehicles and off-highway machines.

Molex heavy-duty M12 connectors’ performance allows Cat5e 10/100 Mbps Ethernet connections in commercial vehicles and road machinery.

The new series of connectors, called the Brad Micro-Change M12 heavy-duty Ethernet connector system, is the first M12 system to meet SAE J2839. It includes the heavy-duty M12 (HDM12) connectors, which can withstand 444 N cable pull force, and patent pending heavy-duty extreme M12 connectors (HDM12EX) that can withstand 1334 N of cable pull force: this is 10x greater than ordinary M12 connectors. They can operate in the temperature range -55°C to +125°C and are sealed to IP67 and IP69K. They are also backward compatible with standard Brad M12 connectors from Molex.

Also suitable for commercial and agricultural vehicles is Aptiv’s harsh environment series which includes circular connectors, terminals and headers. The circular design is perfect for making connections in a vehicle sheet metal firewall pass-through location, so they are ideal for engine compartments and the headers can be mounted directly on the engine.

Aptiv’s HES Series includes circular connectors, terminals and headers.

Aptiv HES circular connectors have a recessed 3-rib design to extend sealing capability to IP67. Operating temperature is -55°C to 125°C. They come in six terminal configurations between 19 and 47 terminals. Compared to standard pin and sleeve systems, HES connectors offer higher current capability, higher terminal retention and a significant cost advantage.

Heavy machinery
Manufacturers of construction equipment, farm machinery and mining vehicles design their machines to work 24 hours a day, seven days a week. The increasing electronics content in heavy machinery, such as GPS and camera systems, demands high-quality signal transmission despite exposure to vibration, moisture, dirt and dust. Typical techniques that connectors use to perform reliably under these conditions include hermetic sealing and secure locking mechanisms.

TE Connectivity’s Deutsch DT connectors are ideal for this application. These robust connectors have thermoplastic housings to withstand harsh temperatures, combined with silicone wire and interface seals to prevent moisture ingress and an integrated latch mechanism to resist vibration. Multiple size-16 contacts can be used, each with 13 A continuous current capacity for power connections.

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Sealed plastic connectors

The UTL series from Souriau is a plastic connector suitable for outdoor industrial applications thanks to a high sealing performance (IP66/IP69K) and an extreme UV resistance with F1 material per UL746C. The UTL series guarantees extended outdoor life, making them ideal lighting connectors.

**TE Connectivity’s industrial RJ45 Cat6A plug supports bandwidths of up to 500 MHz.**

High-speed mezzanine

For reliable performance in demanding, high-speed (28+ Gbps) applications such as mezzanine card connections in data centres and telecoms applications, aerospace, defence and medical equipment, the SEAM and SEAF open-pin-field array connectors from Samtec are part of the SEARAY series of 1,27 mm high-density, high-speed board-to-board interconnects. These connectors are rated at 12,5 GHz @ -3 dB insertion loss for single-ended systems or 13,0 GHz @ -3 dB insertion loss in a differential-pair system.

**The Samtec SEAF series is for 28+ Gbps mezzanine card applications.**

Designed and qualified according to the UL1977 and IEC61984 standards, the UTL connector series offers a 5 VA flammability rating, hot wire and current breaking capacity to meet all standards of industrial equipment. Its moisture-proof capability is due to a technical design that prevents condensation ingress into the equipment that can cause damage to systems. Available as an option, this feature will prevent moisture from penetrating into a system over time.

In addition, the UTL series has a push-and-press-to-release coupling system which allows the user to connect quickly, even in blind conditions and provides a secure connection due to an audible click which guarantees the proper connection. The UTL is compliant with RS-485, DMX and DALI protocols.

**Available with a large choice of shells and contact types, screw contact termination allows the user to terminate their cable assembly in the field with only one screwdriver. A standard cable assembly offering provides a complete interconnect solution to simplify customers’ supply chain.**

For more information contact TRX Electronics, +27 12 997 0509, info@trx.e.com.

**ITT Cannon has a portfolio of harsh-environment fibre-optic interconnects.**

Fibre-optics

Fibre-optic connectors are, of course, also required to enable high data rates in harsh environments. For example, aircraft in-flight entertainment systems require reliable, accurate high-speed data transfer while maintaining compact dimensions and light weight.

For this type of application, ITT Cannon has a portfolio of harsh-environment-suitable ARINC 801 fibre-optic connectors, terminals and cable harnesses that are designed for commercial and military aircraft and shipboard navigation systems. Connectors in this series have a scoop-proof design that offers alternative keying positions and end-finishes in both APC and PC single-mode and multimode configurations. The connectors allow transmission speeds of 10 Gbps and higher. The alignment sleeves are removable so connectors can be cleaned in the field.

**For more information contact Avnet South Africa, +27 11 319 8600, sales@avnet.co.za.**
Isolated industrial drive switches

Silicon Labs has introduced a family of compact, robust isolated smart switches designed to drive any load, even in the harshest industrial environments. The new Si834x isolated switches are ideal for driving resistive and inductive loads such as solenoids, relays and lamps used in industrial control systems including programmable logic controllers (PLCs), I/O modules, relay drivers and servo motor controllers.

Each switch is galvanically isolated for safety using Silicon Labs’ CMOS-based isolation technology, offering better reliability and performance than legacy optocoupler-based isolation, including high common-mode transient immunity (CMTI) of more than 100 kV/μs.

The Si834x family supports high-side and low-side switch options, low on-resistance (145 mΩ), up to 700 mA of continuous current compliant with the IEC 61131-2 standard, comprehensive protection and diagnostic reporting, and advanced configuration, monitoring and control for industrial automation systems. The switch logic interface can be as simple as four low-power CMOS digital inputs or as rich and flexible as a full serial peripheral interface (SPI) capable of controlling up to 128 channels with four MCU (microcontroller) pins.

Sophisticated switch and load monitoring techniques combined with fast responses to changing conditions make the Si834x switches highly robust, flexible solutions for driving a wide range of loads. Each switch can detect an open-circuit condition and is protected against over-current, over-voltage from demagnetisation (inductive kick or flyback voltage) and over-temperature conditions. A multi-voltage smart clamp efficiently handles an unlimited amount of demagnetisation energy.

The switches achieve enhanced load-driving performance and safer overload protection by employing rapid manipulation of switch impedance and clamp voltage. While other solutions entering into a fault state may shut down, the Si834x switches can continue operation in a constrained but functional state with reduced channel performance, improving system uptime.

The isolated switches feature a logic interface with eight separate diagnostic reports. Diagnostics are configured, monitored and cleared through SPI or exposed on active-low, open-drain indicator pins for easy access. Diagnostic communication is independent of the switch control signals across the isolation barrier.

For more information contact NuVision Electronics, +27 11 608 0144, gdekker@nuvisionelec.co.za

Automotive Ethernet testing software

Tektronix has released two new software packages that greatly simplify Automotive Ethernet testing, debug and protocol decode for use with its 5 and 6 Series mixed-signal oscilloscopes (MSO).

Using the new Signal Separation software, automotive engineers can now perform Automotive Ethernet testing without disrupting the ECU system or cutting the Ethernet cable to install a directional coupler, while the PAM3 analysis package provides in-depth insight into signal characteristics at the system level.

As the move toward Automotive Ethernet or IEEE 802.3bw (formerly BroadR-Reach) technology in vehicles accelerates, comprehensive design validation is vital to ensure interoperability and reliable operation across multiple ECUs. Current Automotive Ethernet testing solutions require engineers to install a directional coupler to separate the full duplex signal. This adds insertion and return loss and makes it difficult to determine if an error is a result of the system or the additional hardware.

To eliminate these problems, Tektronix’ Signal Separation software separates the full duplex signal by looking at voltage and current waveforms from both master and slave test points, and provides separated signals using a proprietary algorithm. This method displays true ECU signals without the need for a directional coupler and provides full protocol debug of master and slave ECUs simultaneously.

The software is easy to use, reduces testing costs and improves measurement accuracy. It supports full life-cycle Automotive Ethernet testing from design through service. Users can use solutions for in-car testing, as well as signal integrity testing during cranking or other scenarios.

“Vehicles are quickly becoming data centres on wheels, with proven IT technologies finding their way into automotive networks,” said Sudipto Bose, general manager, Automotive and Time Domain Solutions at Tektronix. “Because safety and reliability are so critical, testing has become more complicated and time consuming. As these new software offerings demonstrate, we are aggressively developing innovative full life-cycle solutions to simplify and accelerate system testing and product development for automotive engineers – while reducing test times and costs.”

The three levels of PAM3 in Automotive Ethernet introduce additional complexity in signalling and place new demands on test methodology, in part because the three amplitudes produce two eyes diagrams. The Tektronix PAM3 analysis package provides a comprehensive set of measurements with software clock recovery that offer greater insight into signal characteristics, speeding up validation and characterisation of PAM3 designs with different cable lengths, noise conditions or ECU configurations. The solution also enables eye opening measurements, eye mask testing, jitter separation and bit error rate (BER) plotting in a real ECU environment.

The PAM3 Analysis along with Signal Separation solutions have been tested and validated by leading automotive OEMs and tier-1 companies. In addition to signal and protocol analysis, the Tektronix solution also includes Automotive Ethernet physical layer compliance testing as per the Open Alliance TC8 specification with full test automation and detailed pass/fail reporting.

Tektronix 5 Series MSO and 6 Series MSO oscilloscopes offer up to 8 GHz analog bandwidth, 25 Gsamples per second at 12-bit analog to digital converter (ADC), delivering the performance needed to capture waveforms with the high signal fidelity and resolution needed to view small waveform details in Automotive Ethernet signals.

For more information contact Comtest, +27 10 595 1821, sales@comtest.co.za
High-temperature TVS MLVs
The new TransGuard VT Series multilayer varistors (MLV) made by AVX are rated for transient voltage suppression (TVS) applications operating at very high temperatures. They provide reliable, bidirectional over-voltage protection across operating temperatures extending from -55°C to 175°C with zero derating across the entire range. They are qualified to AEC-Q200, and are currently available in compact, surface-mount 0603 and 0805 cases sizes.

The components also provide some broadband EMI filtering in their off state, which further extends their utility in sensitive automotive circuits by reducing the need for discrete MLCC capacitors. Application suitability for these MLVs extends to circuit protection in other markets as well, and additional performance characteristics include high current and energy handling capabilities, low leakage current, and multi-strike capabilities per IEC 61000-4-2.

The initial release of the series is comprised of 0603 MLVs with 0.1 J energy, 18 V working voltage, and 42 V clamping voltage ratings; 0603 MLVs with 0.1 J energy, 31 V working voltage, and 67 V clamping voltage ratings; and 0805 MLVs with 0.3 J energy, 18 V working voltage, and 65 V clamping voltage ratings.

For more information contact Marian Ledgerwood, Future Electronics, +27 21 421 8292, marian.ledgerwood@futureelectronics.com

Test unit controls access to ESD protected areas
In the electronics manufacturing industry, an electrostatic discharge (ESD) can cause irreparable damage to electronic components. This micro-lightning bolt can burn holes through insulating layers and metal of microcircuits, causing it to malfunction. A discharge as miniscule as 60 V can destroy electrical components and negatively impact revenue streams.

An electrostatic protected area (EPA) is the designated space where no items or activity are able to cause ESD damage. The EPA consists of a grounding ecosystem where various conductive and dissipative materials and components work together to control static charge build-up. These components include wrist straps, grounding cords, dissipative flooring, ESD clothing and footwear, as well as testing equipment.

The SmartLog Pro is a static access control and testing unit that verifies the functionality of an operator’s grounding devices to ensure it is functional and compliant before entering the EPA. If the operator fails the static compliancy test, SmartLog will not allow access into the EPA. “This is a next-level access control unit. It not only provides ESD testing, but offers time management of personnel as well. It makes auditing much easier. It is easy to install and can form part of a turnstile, sliding door, or function as a standalone item. SmartLog can operate on biometrics and a card system with adjustable settings for different people who need to access the EPA,” explains Actum Group ESD specialist, Nick Sibanda.

This testing unit features a five-inch colour touchscreen with an intuitive user interface for easy test operation and a clear indication of test results. The operator average test time is only two seconds. It can generate and e-mail automated reports to track short-term and long-term corrective actions.

For more information contact Altico Static Control Solutions, +27 11 608 3001, sales@actum.co.za

LoRa temperature and humidity sensor
The Dragino LHT65 temperature and humidity sensor is a Long Range (LoRa)-enabled device with an external connector to connect to external sensors such as a temperature sensor, soil moisture sensor, tilting sensor, etc.

The LHT65 allows users to send data and reach extremely long ranges through its use of ultra-long range spread spectrum communication and high interference immunity whilst minimising current consumption. It targets professional wireless sensor network applications such as irrigation systems, smart metering, smart cities, building automation, and so on.

Fully compatible with the LoRaWAN v1.0.2 protocol and able to work with a standard LoRaWAN gateway, the LHT65 has a built-in 2400 mAh non-rechargeable battery which can be used for more than 10 years. It can store 3200 data records with date- and time-stamps, which can be retrieved for further analysis.

For more information contact Renaldo Fibiger, Altron Arrow, +27 11 923 9600, rfibiger@arrow.altech.co.za
Webb Industries has introduced the new AMJ-S Module 2G from Telegärtner, optimised and redesigned to provide demanding applications with operational reliability under extreme mechanical and electrical conditions. It offers extensive headroom and is approved for use with four-pair Power-over-Ethernet with currents of up to 1000 mA.

The module is not only suitable for use in office buildings and data centres. The multiple shielding connection in the mating face also guarantees constant high-level shielding, for example, in industrial and traffic control applications where vibrations, oscillations and electromagnetic interference prevail but reliable transmission is essential.

Operational reliability is even guaranteed where technical building equipment restricts the space available for installation. A typical scenario is the supply of power to end-devices over the data cable. The latest version of this technology, known as 'Four Pair Power-over-

**Connector module for 4PPoE**

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**High-voltage rack-mount PSUs**

XP Glassman Power has introduced a series of rack-mount, high-voltage DC power supplies (PSU) able to supply up to 60 kV. Aimed at laboratories and OEMs, the EY series of 1200 W power supplies feature flexible embedded controls with low ripple and noise. They are air-insulated, fast-response units with tight regulation and extremely low arc discharge currents.

For use in the medical, industrial and general high-voltage areas, the most important applications for the EY series are in vapour deposition, ion implantation, glow discharge, electrostatics, plasma sources, cyclotrons, X-ray and other vacuum tubes.

The EY series comprises of 16 models from 0-1 kV to 0-60 kV at 1200 W output power. Typically, ripple is less than 0.02% RMS of rated voltage at full load and off-the-line pulse-width modulation provides high efficiency and a reduced parts count for improved reliability. The first four models in the range respectively feature reversible polarity, and the others can be purchased as positive or negative polarity units.

The units feature automatic crossover from constant-voltage to constant-current regulation, providing protection against overloads, arcs and short circuits. The power supplies’ arc quench feature ensures that the HV output is inhibited for a short period after each load arc to help extinguish the arc, whilst their remote analog and digital control via RS-232 and USB offers flexibility of integration with customers’ systems. Similarly, optional Ethernet control provides the possibility of control and monitoring from remote locations.

The EY series’ bench/2U rack-mount format makes them suitable for location on a test bench or for integrating with other equipment in a standard 19-inch rack, and featuring embedded microcontroller control, front panel digital encoders on the units provide high-resolution local adjustment of voltage and current programme.

The power supplies can operate from single-phase AC supplies of 180 to 264 V, and are fully RoHS and CE compliant.

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

For more information contact Stephen Hands, Webb Industries, +27 11 719 0000, webb@webb.co.za
Different levels of failure analysis exist, from the very basic with virtually no equipment, to the use of a full failure analysis laboratory. Often simple analysis methods can point engineers in the right direction, but proving the root cause of failure often needs the electronic ‘pathologist’ with all his investigation tools. When conducting any failure analysis, it is important the results prove the cause of the fault. The true reason for failure needs to be clear and proven with hard facts, not just opinions.

In his webinar entitled ‘Practical Failure Analysis Methods in Printed Board Assembly’, Bob Willis will address these issues by covering topics such as optical and X-ray inspection, solder joint crack detection, microsectioning, component opening techniques, surface analysis, and shear testing, followed by a question and answer session.

The webinars are limited to 100 delegates/companies. A copy of each of the slides presented will be provided after the webinar.

STMicroelectronics has released a massive open online course (MOOC) on the STM32G0, its first mainstream 90 nm MCU that only needs one power line, thus simplifying PCB designs. The course doesn’t assume any experience with microcontrollers as the first training video starts by looking at the installation of STM32CubeMX, STM32CubeProgrammer, the Keil IDE, and the necessary firmware and libraries, such as STM32CubeG0, as well as a terminal emulator. The course uses a NUCLEO-G071RB, but in the vast majority of cases, the concepts will apply to other microcontrollers of the same family.

To find out more or to order any of the components needed for the course, contact Robin Scholes, Altron Arrow, +27 11 923 9600, rscholes@arrow.altech.co.za.

http://www.bobwillis.co.uk

Test probes catalogue

Running to 194 pages, the latest edition of PTR’s Test Probes catalogue features up-to-date information covering the company’s test probes and accessories. Technical information is provided for the full range of test probes, which includes ICT, rotating, ying, switching, high-current, pneumatic, battery and coaxial models, among others. Selection and other advice is also provided.

Wiltron Agencies, +27 12 940 9475, wiltron@global.co.za.

Electromechanical components catalogue

The latest catalogue of Würth Elektronik’s electromechanical component range runs to 1098 pages. The new edition of the directory, available in English, lists information on 12 standard product groups, including many innovations. All components featured in the catalogue can be ordered from stock anytime and no minimum order quantity is needed.

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