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When will we get our first quantum computers?

For the past few years, the buzz around quantum computing has been growing steadily louder, but it has mostly been coming from university laboratories and advanced corporate R&D facilities. Now household names are getting in on the action, and a number of technical milestones have either been reached or are imminent.

But what will the effects on mainstream computing be, and will it impact on those of us who design systems based on computer technology and/or use them in our everyday lives?

It would take a thesis to properly define the difference between how a quantum computer operates versus a traditional one, but as a very simple explanation, imagine a coin being flipped. Once it lands and comes to rest, we know it will either be a head or a tail, but while it’s in the air, we can’t know which outcome will transpire. In the world of quantum computing, that coin represents a qubit, or quantum bit, and, incredibly, it exists in both states at the same time – until we observe it, at which time it becomes fixed in one particular state. Confused? Most people would be, which is why it takes some of the best minds to come to terms with, and big budgets to put into practice.

In November 2017, IBM announced it had developed a 50 qubit quantum computer, and was making a 20 qubit system available through its cloud computing platform. These qubits are highly unstable though, as their quantum state is preserved for only 90 microseconds, which was nevertheless a record at the time.

Intel managed to fabricate a 17 qubit superconducting test chip for a laboratory in the Netherlands, and Microsoft has created a quantum programming language designed to work with its Visual Studio IDE. The IDE allows users to simulate problems that require up to 30 logical qubits using a PC, and Microsoft is also building a quantum computer of its own. Google, though, is widely considered to be at the forefront of the race to achieve ‘quantum supremacy’, which is to solve a computing problem demonstrably faster than a regular computer can.

So what are all these qubits good for? At this point, not much. They can and have been used to model simple molecules and simulate their behaviour at a quantum mechanical level. Classical computing can also be used for this purpose, but not nearly as fast. Still, it is estimated to require up to 160 qubits to model something as seemingly simple as a caffeine molecule, which is still beyond reach at this time.

Other potential applications include optimisation algorithms and artificial intelligence, but the most practical application is in data encryption – particularly topical in the current era of global cyberattacks. Since qubits have indeterminate states until they are observed, they can be used to encrypt data in such a way that it is almost impossible to crack the code. Unless, of course, a hacker has a quantum computer of their own, then it becomes an arms race all over again.

It is estimated that 2020 or 2021 will mark the first time that quantum computing will begin to start demonstrating advantages for real users, corporations and scientific research. Even then, the first commercial quantum computers will need a decent sized room to house them, and will cost several millions of dollars, so don’t expect to have one sitting on your desk anytime soon.

Dataweek, 21 February 2018
Overseas

Business

• Silicon Labs reported financial results for its fourth quarter ended 30 December 2017. Revenue in the fourth quarter ended at the high end of guidance at $201 million, up from $199 million in the third quarter, and establishing a new all-time record. Fourth quarter loss per share was $0.11, which includes an approximate $0.60 per share negative impact from US corporate tax reform. IoT revenue established a record, increasing to $109 million, up 10% sequentially and 28% year-on-year.

• In 2016, Cypress Semiconductor embarked on a business strategy it calls ‘Cypress 3.0,’ focusing on the fast-growing automotive, industrial and consumer markets and fuelled by the proliferation of IoT. That ploy seems to be paying off, as the company announced fourth quarter 2017 revenue of $597.5 million – a 12.7% increase – and record annual revenue of $2.33 billion. Diluted loss per share for 2017 was $0.28, compared to $2.15 in 2016.

• Texas Instruments reported fourth quarter revenue of $3.75 billion, net income of $344 million and earnings per share of 34 cents. In its core businesses, analog revenue grew 11% and embedded processing grew 20% from the same quarter a year ago. Earnings per share include 75 cents in tax-related expenses not in the company’s original guidance, primarily due to the recently passed US tax reform act.

• Samsung Electronics capped off a year in which it overtook Intel to become the world’s largest semiconductor supplier, by posting strong financials for the fourth quarter of 2017. Fourth quarter sales were approximately $61.4 billion and profit $14 billion, driven mainly by the company’s components division, with the largest contribution coming from the memory business that manufactures DRAM and NAND.

• Maxim Integrated Products reported net revenue of $623 million for its second quarter of fiscal 2018 ended 30 December 2017, an 8% increase over the prior quarter and a 13% increase over the same quarter of last year. However, the company suffered a net loss of $75.01 million, compared to a net income of $154.53 million in the prior quarter, primarily due to $244 million in charges due to US corporate tax reform.

• Net sales for Microsemi’s first quarter of fiscal year 2018 were $468.7 million, up 7.6% from the $435.5 million reported in the first quarter of 2017. Net income was $47.9 million or $0.40 per diluted share for the first quarter of 2018, compared to $19.5 million or $0.17 per diluted share for the first quarter of 2017. The company expects net sales in the second quarter of fiscal year 2018 of between $477 million and $502 million.

• The European Union hit Qualcomm with a $1.2 billion fine for violating antitrust laws in its dealings with Apple. The EU’s antitrust commission accused Qualcomm of paying Apple billions of dollars between 2011 and 2016 to use its chips exclusively in the iPhone and iPad. Qualcomm announced that it will appeal the fine.

• Companies

• Broadcom has made what it described as its “best and final offer” to acquire Qualcomm, with an increased bid of $82 per share, amounting to a total purchase price of $121 billion. The improved offer is contingent upon Qualcomm either closing its acquisition of NXP Semiconductors for the disclosed terms of $110 per share, or terminating the transaction.

• Industry

• Annual semiconductor sales reached a record high of $411.2 billion in 2017, the Semiconductor Industry Association (SIA) has announced. That was a 21.6% increase over 2016, and came off the back of a record December and fourth quarter, based on numbers compiled by the World Semiconductor Trade Statistics (WSTS) organisation. Memory was the largest semiconductor category by sales with $124.0 billion in 2017, and the fastest growing, with sales increasing 61.5%. Logic ($102.2 billion) and micro-ICs ($63.9 billion) – a category that includes microprocessors – rounded out the top three product categories in terms of total sales. Annual sales increased substantially across all regions: the Americas (35.0%), China (22.2%), Europe (17.1%), Asia Pacific/All other (16.4%) and Japan (13.3%).
Industry urged to submit waste management plans

By Bubele Nyiba, CEO of the ROSE Foundation.

In December 2017, the government issued a gazette requiring the paper and packaging, electric and electronic, and lighting industries to prepare and submit Industry Waste Management Plans within nine months of the publication of the gazette. The three industries must submit their plans by 6 September 2018.

In addition, all producers in these industries must register with the department of energy within two months of the publication of the gazette.

All this is happening against a backdrop of the dismal history of failures in the plastic bag and tyre waste sector systems. The plastic bag initiative was government driven, while the tyre initiative was industry driven. One hopes that lessons have been learnt and future plans will mitigate against another unsuccessful implementation of a sector plan.

Levies and job creation

The latest call for industry waste management plans is a step in the right direction to achieve government’s goal of zero waste to landfill. The government must be lauded for enforcing responsibility for the full product lifecycle with manufacturers and importers. This is a worldwide practice, and South Africa should be no exception. It is a huge opportunity to create job opportunities in the collection, transportation, storage and processing of waste.

Industry waste management plans reduce the opportunity for fence-sitting. They eliminate free riders and convoluted conspiracy theories, which are the Achilles heel of voluntary schemes. Hopefully, they will also kill off the unfortunate notion that industry should pay to have waste collected in voluntary schemes. Both public and private sector role-players regrettably subscribe to this view that is not supported by evidence, but continues to influence behaviour and practice.

On the other hand, the call for industry waste management plans could have a negative impact on those who will ultimately bear the brunt of regulated levies for waste collection and disposal. The negative comes only if it is not foreseen that the cost of recycling will be borne by the ultimate consumers of the products.

Whenever the government or industry imposes a levy on a product, the producers merely add the levy to the cost of production. To illustrate this point, consider the price of a litre of petrol. All the levies are tabulated separately and form part of the cost structure for the litre the consumer buys at a service station. The more the levies increase, the more expensive litre the consumer buys at a service station. The levies are tabulated separately and are an element of the cost structure for the litre of petrol. All the levies are tabulated separately and form part of the cost structure for the litre the consumer buys at a service station. The more the levies increase, the more expensive litre the consumer buys at a service station.

Industry managed schemes. In the industry managed scheme, an industry association effectively coordinates and facilitates all the recycling activities of that industry’s waste stream, and also collects its own levies directly from producers (indirectly from consumers). Naturally, but not always obviously, the customer is still the ultimate payer of the levy.

Alternatively, there would be a government managed scheme run directly by government or more likely by an organisation directly under government supervision. Under the government managed scheme, the government collects the levies, via Treasury.

There are three very significant downsides to a levy collected via central government. The first is that the government will impose an administrative fee of up to a quarter of the collected levies. So from the get-go, the recycling kitty reduces by 25% as a function of who collects the funds. Second, and most worrisome, there is no guarantee that the funds for recycling will be ring-fenced towards the purpose for which they were collected. Lastly, the consumer will ultimately pay more per kilogram for the recycling of waste. To achieve the same goals as the industry managed schemes, the customer must have the burden of an administered price from which there is no escape. No matter how much we could try, incorrect strategies implemented correctly could never achieve the best results.

If it is true that all solutions somehow have winners and losers, then it is fair to say that in the government managed scheme, the customer is the loser and the national focus is the winner. In the industry managed scheme, the opposite is true, if the scheme is efficiently managed.

It is not difficult to understand why industry managed or government managed schemes should work in collaboration with the Waste Bureau from the Department of Environmental Affairs. The government needs to have sight of what is happening within each waste stream, and that could be done easily and without much fanfare.

Producer responsibility and planning

The development and implementation of industry waste management plans have to be the responsibility of producer industry associations. Industry has to be responsible for the collection and disbursement of levies under tight governance controls. Generally, industry associations have a long history of robust corporate government without any one player allowed to exercise dominance.

The place for creativity, craftsmanship, and business skills should be exercised somewhere else down the value chain. The collection, transportation, storage, and processing of waste is a large enough space to allow for entrepreneurs to apply their skills and experience to earn a living and to create employment.

The anomaly in the tyre industry should be considered a misstep that should not be repeated. Placing producer responsibility organisations in self-interested companies or private hands, however disguised, is a recipe for disaster.

Similarly, independent non-profit organisations that are removed from the producers is an opportunity to manufacture malfeasance and news grabbing practices that are not related to reducing waste to the landfills and protecting the environment. The interface with the Waste Bureau is a good step so that the government is always in the loop regarding the activities of each waste stream. Otherwise the government will have a complete outsider view of what is happening and base its decisions on assumptions rather than what is the real situation.

We have to view these latest developments as an opportunity to create the right systems and architecture for the waste industry. We have an opportunity to do it right and minimise any unintended consequences of our actions. We have the hindsight of having implemented two incorrect approaches incorrectly, and not surprisingly, both haven’t been a resounding success. Now is a perfect opportunity to implement the correct processes correctly. We owe it to the future of our environment and future generations.

For more information contact the ROSE Foundation, www.rosefoundation.org.za
Webb and Telegärtner connection strengthens

In spite of tough economic conditions globally, Germany’s international telecommunications and data solutions provider Telegärtner’s business with leading local telecommunications ancillary product specialist, Webb Industries, continues to grow from strength to strength.

Cornelius Bredenhann, Webb key accounts manager, says that business with Telegärtner has grown substantially over the past three years, which is impressive in these trading conditions. He says there are many reasons for this, including the excellent relationship over the years between Webb and Telegärtner, their growing popularity in the local market and, importantly, the superior quality of Telegärtner products.

“At Telegärtner, there are no compromises in terms of quality: although DIN EN ISO certified, standards and guidelines represent only a basic metric which Telegärtner is dedicated to surpassing. This is reflected in quality-conscious procurement and quality-oriented production processes ending up with the highest quality products that meet all quality standards worldwide,” Bredenhann says.

It is no surprise then that last year Telegartner was a recipient of the Quality Excellence Award from the CAQ AG, which for more than 30 years has been dedicated to the development and production of powerful software solutions for modern quality and environmental management.

The award is given to a select group of companies that fully recognise the importance of quality and show exceptional focus and dedication to quality management and quality assurance. The CAQ awards committee said: “Telegärtner has consistently provided invaluable feedback and support regarding the purposeful application of computer aided quality assurance solutions in their individual field of business. They also command an exemplary CAQ system and integrate the relevance of CAQ and QM within their companywide communications.”

On the issue of the Webb/Telegärtner relationship, a Telegärtner spokesman says that Webb’s exceptional performance has not only been good for business in South Africa, but it has also laid the foundation for expansion into the rest of Africa, especially the sub-Saharan region. “Although many other African countries are showing good growth, many global companies understand the necessity of having a strong presence in South Africa as a prerequisite to conducting successful business on the continent,” he said.

Telegärtner’s range of products is vast and includes coaxial connectors, network components, high-precision turned parts, plastic injection mouldings, industrial electronics and cable assembly. In South Africa, the range includes the 4.3-10 connector series.

Telegärtner MD, Hartmut Gärtner, shows the 4.3-10 connector series.

Continued on page 6
Otto Wireless Solutions has introduced its range of high-gain LTE antennas, aptly named ‘Ottennas’, into the market. “The first two models have been strategically chosen to cater for a wide variety of customers, catering for industrial and commercial needs,” explains the company’s sales and marketing director, Chris Viveiros.

With the addition of a small RF adaptor, the Ottennas become compatible with most of the popular commercial LTE routers, and provide users with an immediate enhancement to their signal strength, leading to an improvement in download speeds and general wireless connectivity stability. “Otto Wireless Solutions has used its extensive experience in the industrial connectivity and IoT market to select and introduce these products to the commercial market,” Viveiros says. “In order to solve the problem of how to install the antenna, we have taken the market initiative, and ensured that the product is presented to the customer well packaged, with all installation instructions simplified and printed on the side of the box.”

The first products are available for sale at www.otto.co.za and a short introductory video, which was filmed when the first product arrived, can be viewed at https://youtu.be/FElMhtfcmFE. The first models in the range are a directional MIMO, 11 dB device (part number LTE-MD-11) and an omnidirectional MIMO, 6 dB device (part number LTE-MO-6).

For more information contact Otto Wireless Solutions, +27 (0)11 791 1033, wireless@otto.co.za.

Otto Wireless Solutions launches ‘Ottennas’ range
The Tshwane University of Technology’s (TUT) electrical engineering department recently undertook a major refurbishment of its electronic engineering laboratory. This involved scrapping the older, outdated instruments and replacing them with Tektronix AFG 1022 arbitrary waveform generators, Tektronix TBS 1052B-EDU digital storage oscilloscopes, and GW Instek GPE 3323 DC power supplies.

The newly configured laboratory is used by a total of around 450 Electronics 1, 2 and 3 and design project students, with 42 students accommodated per laboratory session for electrical measurement experiments and projects. Prof. Josiah Munda, HoD PrEng, and associate dean of the faculty of engineering and the built environment commented, “Our newly equipped laboratory is what any university of technology worth its salt should have. We would like every laboratory at TUT to have state-of-the-art equipment for the betterment of students in this region of our country.”

A very important component of the success of this lab model is the enlisting of two undergraduate students to mentor, monitor and assist Electronics 1, 2 and 3 and design project students during the laboratory classes. “Mentoring and the assistance of students by fellow students during lab sessions has been found to be the most effective method yet of teaching in our labs,” added Prof. Munda.

Undergraduate students Jackson Chokoe (electrical engineering/bio-medical engineering) and Remmington Seima (electrical engineering/digital technology) who, in addition to conducting student lab sessions, also undertake the general and ongoing maintenance of the laboratory equipment. Remmington Seima says, “With new equipment, everything is so much easier and much more advanced. For example, we are able to monitor every scope and instrument individually while the class works. The big advantage is being able to assist and correct or change settings with students in real-time. Maintenance is also so much easier.”

Darius Opperman, Comtest account manager responsible for the supply of the instruments, says, “Probably the greatest value of the new equipment to the lecturers is the ability to globally manage and monitor students individually during lab sessions. Every instrument in the lab can be tracked while the student is performing set tasks. Not to mention the time-saving aspect of updating all the firmware to prepare for a specific class. Instead of updating each instrument individually, this can now be done from the server, with Tektronix SmartLAB software. This represents an appreciable return on investment, in time alone, for TUT.”

Livhuhani Ntsandeni, section head of department, commented, “It is way more functional and advanced than what we had previously. The students and lecturers, alike, are most impressed. We have now had two semesters using new lab equipment. The equipment allows us to produce appreciably more relevant electrical engineering graduates.”

For more information contact Comtest, +27 (0)10 595 1821, sales@comtest.co.za.
IoT sensor dev kit wins top prize

Nordic Semiconductor announced that its Nordic Thingy:52 IoT Sensor Kit was named winner of the highly competitive development kit category by the judges of the 2017 Annual Creativity in Electronics (ACE) Awards.

The ACE Awards – held in Silicon Valley in conjunction with Embedded Systems Conference – are a renowned awards programme which showcases the industry’s most innovative electronics products.

Nordic Thingy:52 is a development tool targeted at IoT wireless sensor projects and based on Nordic’s nRF52832 Bluetooth Low Energy (Bluetooth LE) system-on-chip (SoC) and S132 SoftDevice RF software protocol.

The sensor kit enables an app developer with no firmware coding expertise or high-level development tools to quickly design and demonstrate Internet of Things (IoT) devices, and associated mobile device and Internet apps.

The functionality of the Thingy can be configured over-the-air via a Bluetooth API. That makes it possible to create demos and prototypes without actually programming the board itself. The Thingy is built around the nRF52832 Bluetooth 5 SoC. It connects to Bluetooth-enabled mobile phones, laptops, tablets and similar devices, and sends data to/from its sensors and actuators to an app and to the cloud. It comes with the accompanying Nordic Thingy:52 app for iOS, Android and a web app.

Nordic Thingy:52 was shortlisted in the development kit category, alongside three other major semiconductor vendors from the USA and Japan, but was adjudged by a panel of 15 industry experts as the winner against criteria including timeliness and suitability for target market, breakthrough technology and community interest.

For more information contact Andrew Hutton, RF Design, +27 (0)21 555 8400, andrew@rfdesign.co.za.
MPLAB® Mindi™ Analog Simulator reduces circuit design time and design risk by simulating analog circuits prior to hardware prototyping. The simulation tool uses a SIMetrix/SIMPLIS simulation environment, with options to use SPICE or piecewise linear modeling, that can cover a very wide set of possible simulation needs. This capable simulation interface is paired with proprietary model files from Microchip, to model specific Microchip analog components, in addition to generic circuit devices. Finally, this simulation tool installs and runs locally, on your own PC. Once downloaded, no internet connection is required, and the simulation run time is not dependent on a remotely located server. The result is fast, accurate analog circuit simulations.

Key Benefits
- Perform AC, DC and transient analysis
- Validate system response, control and stability
- Identify problems before building hardware
SiP for low-power cellular IoT

Nordic Semiconductor recently provided a ‘sneak peek’ of its upcoming nRF91 series low-power cellular IoT solution. During an event in Oslo, the company also demonstrated the nRF91 operating on the Verizon Wireless Network in the US and on the Telia network in Norway.

Explaining the rationale behind the development of the new module family, Nordic said, “The Nordic nRF91 series is all about taking the unique value proposition of cellular and bringing simplicity and appeal to a broader market.” That concept manifests as a highly integrated, low-power, global multimode LTE-M / NB-IoT system-in-package (SiP). The SiP integrates a complete low-power cellular IoT system into a tiny 10 x 16 x 1,2 mm package that integrates modem, transceiver, RF front end, dedicated application processor, Flash memory, power management, and crystal and passive components.

Nordic partnered with Qorvo for both the RF front end and the SiP development and manufacturing. The nRF91 leverages Qorvo’s state-of-the-art, proven RF front end, advanced packaging, and MicroShield technology. The nRF91 series supports global operation with a single SiP variant thanks to the combination of Nordic’s multimode LTE-M / NB-IoT modem, SAW-less transceiver, and Qorvo’s custom RF front end solution.

The nRF91 emphasises security for low-power IoT devices by combining the inherent security of cellular connectivity with a cutting-edge security solution for the application hardware and software. The integration of an ARM Cortex-M33 processor and ARM CryptoCell-310 security IP enables an entire low-power cellular IoT application to be implemented on an nRF91 SiP.

The built-in host processor features TrustZone for ARMv8-M, helping secure application data, firmware and peripherals using an isolated, trusted execution environment across the CPU and system. This solution provides an efficient security foundation, and reduces size, bill-of-materials and power consumption versus using an external host processor. The nRF91 SiP also features built-in support for positioning via an integrated Assisted GPS (A-GPS) solution that combines cellular and GPS technology to deliver fast and accurate positioning.

The nRF91 series includes a complete suite of software and easy-to-use development tools to accelerate innovation and product development. Assistance is available from Nordic’s technical support team and development community.

Nordic is sampling devices to selected lead customers now, and plans to be ready for general sampling by mid-2018, with first production quantities available by the end of the year. The nRF91 SiP will be available in variants with and without integrated GPS.

For more information contact Carl van der Merwe, Avnet South Africa, +27 (0)11 319 8600, carl.vandermerwe@avnet.eu; Andrew Hutton, RF Design, +27 (0)21 555 8400, andrew@rfdesign.co.za.

NFC sensor for temperature logging

New from ams is the AS39513, an NFC sensor tag and data logger IC for smart labels which enables more efficient and accurate monitoring of the condition of assets such as food, pharmaceuticals and healthcare products in storage and in transit.

The new device is a complete digital sensor with an NFC front end that can easily be integrated into smart labels. A unique ID as well as logged temperature and other data stored in its internal memory can be read by any authorised NFC reader such as a smartphone or tablet.

Smart labels based on the AS39513 enable manufacturers, shippers and retailers to examine detailed logs of the conditions in which individual packages in a shipment have been kept, and to establish for instance whether perishable goods such as fresh food are in perfect condition on arrival.

The AS39513 provides a complete solution for temperature monitoring and NFC connectivity. It includes an NFC front end, a temperature sensor and an analog interface to an external sensor. Other functions integrated in the IC are a real-time clock, a 10-bit ADC, a configurable data logging engine, a 9 Kbit password-protected EEPROM and a serial peripheral interface (SPI) to connect to an external microcontroller. The device is available as a bumped die or in a 5x4 mm package which is only 0,3 mm high.

Powered by a single-cell (typically 1,5 V) or dual-cell (3 V) battery, the AS39513 can store up to 1020 time-stamped sensor measurements. Fully compliant with ISO 15693 and NFC-V (TST) standards, it can be read over a range of a few centimetres with an NFC mobile phone. An extended read range of 1 to 2 metres can be achieved when using dedicated ISO 15693 readers, offering the ability to read multiple AS39513 tags simultaneously in cabinets or refrigerators.

The AS39513, which supersedes the ams SL13A sensor tag, has a higher-performance temperature sensor which offers guaranteed accuracy of ±0,5°C in the critical range from -20°C to 10°C, and ±1°C over an extended range from -20°C to 55°C.

The chip is powered by the ams Cool-Log engine, which allows for full control and configuration of logging modes and timings. Temperature measurements can be taken at fixed intervals, or triggered when the temperature crosses a set threshold, or by a signal from an external device.

Drawing just 2 µA of standby current, the AS39513 can autonomously log temperature data for more than a year on a 30 mAh single-cell battery. This power performance enables the use of smaller and cheaper batteries, paving the way to farm-to-fork item-level tagging. The chip operates in passive mode and harvests energy from a reader’s incoming RF field, supplying external circuitry with a current of up to 3 mA at 1,8 V.

A demonstration kit, including an evaluation board and a sample app for devices running on the Android operating system, is available from the ams iCodeirect online store.

For more information contact EBV Electrolink, +27 (0)21 402 1940, capetown@ebv.com.
**Humidity, temperature and CO₂ sensor**

The new SDC30 is a humidity, temperature and carbon dioxide concentration sensor from Sensirion.

Carbon dioxide is a key indicator of indoor air quality. Thanks to new energy standards and better insulation, houses have become increasingly energy efficient, but the air quality can deteriorate rapidly. Active ventilation is needed to maintain a comfortable and healthy indoor environment, and to improve the wellbeing and productivity of the inhabitants. The SCD30 offers accurate and stable CO₂, temperature and humidity monitoring. This enables customers to develop new solutions that increase energy efficiency and simultaneously support wellbeing.

CMOSens technology for IR detection enables highly accurate carbon dioxide measurement at a competitive price. Along with the NDIR measurement technology for CO₂ detection, a best-in-class Sensirion humidity and temperature sensor is also integrated on the same sensor module. Ambient humidity and temperature can be outputted by Sensirion’s algorithm expertise through modelling and compensating of external heat sources without the requirement for any additional components.

Thanks to the dual-channel principle for the measurement of carbon dioxide concentration, the sensor compensates for long-term drifts automatically by design. The very small module height allows easy integration into different applications.

**Bluetooth Low Energy module**

Murata announced the release of a new Bluetooth Low Energy (BLE) module, the latest MBNS2832 device, consisting of Nordic Semiconductor’s nRF52832 IC, a 32 MHz crystal for timing, and an on-board antenna. Additionally, it contains pins for an off-board omnidirectional antenna and an NFC antenna. The module provides an SPI interface and UART interface to Nordic’s nRF52832 ARM Cortex M4 processor.

The WSM-BL241-ADA-008 module provides BLE connectivity between tablets, cellphones, cloud services and other proprietary functions. Nordic Semiconductor’s software developer’s kit enables developers to create and run edge device applications that can monitor and capture diagnostic information for preventive maintenance. These features can be combined in apps for both iOS and Android devices that run Bluetooth version 5.0.

With this functionality and small footprint, it is ideally suited for OEMs wanting to develop Internet of Things (IoT) devices. Target markets include industrial IoT, energy, and home and office automation applications. Specific end products include asset tracking devices, medical insulin pumps, white goods, and other consumer goods that require connectivity.

For more information contact Pieter Engelbrecht, Avnet South Africa, +27 (0)11 319 8600, pieter.engelbrecht@avnet.com.

For more information contact Electrocomp, +27 (0)11 458 9000, andrew@electrocomp.co.za.
Wireless MCUs for battery-operated IoT devices

Redpine Signals launched what it claimed as the industry’s lowest-power multi-protocol wireless MCU (WiSeMCU) solution – RS14100 – for battery-operated IoT devices. The company also launched the RS9116, which features multi-protocol wireless connectivity and is available in both hosted (n-Link) and embedded (WiSeConnect) configurations.

The devices implement multi-protocol wireless connectivity with dual-band (2.4/5 GHz) 802.11abgn Wi-Fi, Bluetooth 5 (including long range, high throughput and advertising extensions) and 802.15.4 which can be used for Thread or ZigBee connectivity. The RS14100 features an ARM Cortex-M4F which can operate at up to 180 MHz and includes up to 4 MB of Flash for applications.

Users can choose from various SoC and module packages based on their system requirements, including a tiny integrated module measuring 4.6 x 7.8 mm. The WiSeConnect embedded modules provide throughput of over 90 Mbps with integrated wireless stacks, wireless profiles and networking stack. n-Link hosted modules interface to processors running Linux, Android or Windows operating systems.

The RS14100 and the RS9116 feature a patent-pending ‘big-little’ architecture at every level including MCU, Wi-Fi, Bluetooth 5 and 802.15.4, providing optimised transitions between high-performance and low-power operating modes. This unique architecture enables Wi-Fi standby associated power of less than 50 µA, an ARM Cortex-M4F that can provide as low as 15 µA/MHz operation, and integrated Bluetooth 5 which has lower power than even standalone Bluetooth 5 devices. These capabilities are well suited for battery-operated devices such as security cameras, smart locks, video doorbells, fitness bands, industrial sensors and location tags.

The R14100 is based on a secure-zone architecture with the security processor separated from the applications processor, PUF (physically unclonable function) based root-of-trust, suite-B crypto hardware accelerators, secure boot, secure firmware upgrade, secure XIP and secure peripherals. It provides high security levels required for applications such as mobile point-of-sale terminals, smart locks, medical devices and secure voice-based ordering. The RS9116 also provides a subset of these security features relevant for providing wireless connectivity.

The RS14100 includes an ‘always-on’ sensor hub with hardware accelerators for voice-activity detection (VAD), vector filtering, interpolation and matrix multiplication, sensor data collection and capacitive touch. This enables applications such as voice triggers for primary battery-operated devices. The RS14100 also supports a rich set of digital and analog peripherals including CAN, Ethernet, eMMC/SD card, op-amp, ADC, DAC and USB OTG.

Both new shields expand the configurable, modular options for sensing, actuation and wired/wireless connectivity of the IDK, thereby giving application designers complete flexibility agnostic of the communication protocol chosen. They offer rapid and easy start-up of projects right out of the box, allowing developers to deliver data directly into the cloud, thereby enabling value-added services, including analytics.

ON Semiconductor has released two new boards, or shields, further extending its recently launched Internet of Things (IoT) Development Kit (IDK) platform’s capabilities. With the addition of two new shields that include Bluetooth low energy technology and smart passive sensors (SPS), customers are now able to create diverse and unique use cases that target smart home/building, smart city, industrial automation and mHealth applications.

The Bluetooth low energy shield features the recently launched RSL10 multi-protocol Bluetooth 5 certified radio System-on-Chip (SoC). With the industry’s lowest deep sleep current and receive power, the RSL10 enables manufacturers to create IoT devices with extended battery life. The small form factor of the RSL10 delivers the ultra-compact, cost effective end designs demanded by low-power IoT sensor networks. By integrating the Bluetooth low energy shield with the IDK, customers get a complementary choice of connectivity for extending reach, and sensing and actuator options, including lighting and motors.

The SPS shield extends the IDK to capture data from ON Semiconductor’s battery-free wireless sensors that measure temperature, moisture and pressure. The sensors are ideal for industrial and other applications with hard-to-access areas where zero maintenance is a necessity, and battery replacement is a challenge. Pairing the SPS shield with the IDK enables rapid prototyping of IoT applications that require battery-free sensing and wide-area or local connectivity and actuation options.

For more information contact ICORP Technologies, +27 (0)11 781 2029, enquiries@icorptechnologies.co.za

BLE and energy harvesting development boards

Both new shields expand the configurable, modular options for sensing, actuation and wired/wireless connectivity of the IDK, thereby giving application designers complete flexibility agnostic of the communication protocol chosen. They offer rapid and easy start-up of projects right out of the box, allowing developers to deliver data directly into the cloud, thereby enabling value-added services, including analytics.

IDK shields are supplied with full documentation including complete design schematics, PCB layouts and Gerber files to facilitate rapid transition of designs from concept, through development and into production. The industry standard interfaces ensure that current and future modules from ON Semiconductor and other vendors can be seamlessly integrated into designs while the simple ‘cut-and-paste’ approach to end product design reduces R&D time, expense and risk.

For more information contact EBV Electrolink, +27 (0)21 402 1940, capetown@ebv.com
Linear LED driver

Infineon Technologies released the BCR430U, a constant current linear LED driver IC, providing industry-leading drop performance for regulating LED current in standalone operation.

No external power transistor is needed. Typical applications include LED strips, architectural LED lighting, LED displays as well as retail, appliance and emergency lighting.

The voltage drop at the integrated driver IC can go down to 135 mV at 50 mA. This improves overall efficiency and provides the voltage headroom required to compensate for LED forward voltage tolerances and variances in the supply voltage. Thus, more flexibility in the lighting design is possible. With the BRCU430U, additional LEDs can be added to lighting designs without changing the supply voltage.

The LED driver current ranges between 5 mA and 100 mA, and can be easily adjusted via a high ohmic resistor on a dedicated pin. The supply voltage ranges between 6 V and 42 V. For safe and reliable operation and to extend the LED lifetime, a smart over-temperature controlling circuit reduces the LED current when the junction temperature is very high.

For more information contact Dirk Venter, Arrow Altech Distribution, +27 (0)11 923 9600, dventer@arrow.altech.co.za

Cortex-M0 microcontrollers

The NuMicro M0564 series microcontroller from Nuvoton is based on the ARM Cortex-M0 core operating at up to 72 MHz. It features adjustable $V_{DDIO}$ pins for specific I/O pins with a wide range of voltage from 1.8 V to 5.5 V, supporting various operating voltages of external components, and integrates a high-speed PWM with clock frequency up to 144 MHz for precision control, and a hardware divider to speed up the calculation for the control algorithms.

The M0564 series also integrates SPROM (Security Protection ROM) which provides a secure code execution area to protect developers’ intellectual property. The devices are ideal for industrial control, motor control and metering applications.

The microcontrollers support a wide voltage range from 2.5 V to 5.5 V and temperatures ranging from -40°C to 105°C. They have up to 256 KB of Flash memory, 20 KB of SRAM as well as 4 KB of ISP (in-system programming) ROM in 48-, 64- or 100-pin packages.

Peripherals comprise timers, watchdog timers, RTC, PDMA, EBI, UART, smart card interface, SPI, I²S, I²C, GPIO, up to 12 channels of 16-bit PWM, up to 20 channels of 12-bit ADC, analog comparator, temperature sensor, LVR (low voltage reset), BOD (brown-out detector), 96-bit UID (unique identification), and 128-bit UCID (unique customer identification).

For more information contact KH Distributors, +27 (0)11 854 5011, sales@khd.co.za

Microcontrollers for power control

Texas Instruments unveiled its newest additions to the C2000 Piccolo microcontroller (MCU) portfolio. With streamlined performance, the new C2000 F28004x MCU family is optimised for power control in cost-sensitive applications such as on-board chargers for electric vehicles (EVs), inverters for motor control, and industrial power supplies.

These real-time control devices integrate a floating-point unit, math accelerators and an optional parallel processor. The integrated analog features include three independent 12-bit analog-to-digital converters (ADCs) with post-processing hardware, advanced synchronisation capabilities and programmable gain amplifiers, along with a sophisticated comparator and digital-to-analog converter (DAC) subsystem and a sigma-delta filter interface.

Developers can evaluate the new C2000 F28004x MCUs with the F280049 experimenter kit (TMDXDOCK280049M). Production quantities of the MCUs are available in a 64-pin LQFP package.

For more information contact EBV Electrolink, +27 (0)21 402 1940, capetown@ebv.com

For more information contact KH Distributors, +27 (0)11 854 5011, sales@khd.co.za

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Image sensor for human recognition

The BST-007001-010 from Omron Electronic Components is an approximately 50° long-distance type human vision components (HVC-P2) system. The image-sensing unit can recognise human facial expression, gender, age, gaze and blink into a camera module, and boasts a maximum recognition speed 10 times that of its predecessor HVC model.

Ten types of image-sensing functions are incorporated to recognise human conditions in various perspectives such as face detection, body detection, hand detection, face direction estimation, gaze estimation, blink estimation, age estimation, gender estimation, expression estimation (five facial expressions: neutral, happiness, surprise, anger and sadness) and face recognition.

The HVC-P2 consists of a camera and a separate main board connected via a flexible flat cable allowing it to be installed on the edge of a flat display unit. The output image can be chosen from three types: no image output, 160x120 pixels and 320x240 pixels. Detection resolution is 1600 x 1200 pixels, and detection range is 54° horizontal and 41° vertical.

For more information contact Electrocomp Express, 0860 10 20 20, sales@eexpress.co.za

MCUs with enhanced security for IIoT

Renesas Electronics announced the expansion of its popular RX65N/RX651 microcontroller (MCU) lineup that addresses advanced security needs for connected devices operating in industrial automation, building automation and smart metering systems.

The expanded lineup features MCUs with integrated Trusted Secure IP, and enhanced, trusted Flash functionality and human-machine interface (HMI) for industrial and network control systems.

The expansion of devices operating at the edge of the Industrial Internet of Things (IIoT) has increased system manufacturers’ need for secure network connectivity and reliability, including secure on-the-go firmware updates. The expanded RX65N/RX651 devices support these evolving security and reprogrammability needs, offering integrated Trusted Secure IP, enhanced Flash protection, and other technology advancements to create a secure and stable integrated solution, as proven by their Cryptographic Algorithm Validation Program (CAVP) certification. In turn, these security advancements enable seamless Flash firmware updates in the field through secure network communications.

The new MCUs are based on the high-performance RXv2 core and a 40 nm process, which provide strong power efficiency for CPU operation at 4.55 Core Mark/MHz. Integrating the Trusted Secure IP into the new MCUs enables system control engineers to realise high root-of-trust levels for device operation through a combination of Trusted Secure IP, integrated encryption hardware accelerators and protection of boot code.

For more information contact Callie Lombard, Hi-Q Electronics, +27 (0)11 894 8083, callie@hi-q.co.za
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Durability, dependability and other factors make for an ideal solar battery solution

Once the sun goes down or it gets cloudy, a solar system is only as good as the method used to store the harvested solar energy. Batteries are normally used as a power bank to provide the necessary storage to ensure the continuity of power supply by storing the surplus energy during the day. Battery capacity, power consumption, depth of discharge and round-trip efficiency need to be considered when choosing a battery for a solar power application.

Capacity is the total amount of electricity the battery can store. The power consumption and the depth of discharge (DOD) will affect the power storage plan and battery service life. The round-trip efficiency or energy conversion efficiency represents the ratio of energy put in versus the energy retrieved from storage. The energy plan should match the supply to the demand, and ensure the storage is sufficient to cover the periods when sunlight is not available.

Battery life is another factor to account for when choosing a battery. A battery with good cycle performance has much better economic benefit. The relative cost is lowered considerably, especially for applications in cycle use such as solar. Also, if the battery is installed in an environment without a temperature control system, a battery with a wider operating temperature range is better adapted to changes in ambient operating temperatures, resulting in prolonged battery life.

DIY or specialist installer?
For a small portable device or a home solar application, it may not be necessary to seek expert assistance. One could merely list the expected power consumption requirements and select the battery storage that is sufficient for the demand. Naturally, it is always important to follow the product installation instructions and make sure all the charging and discharging settings are correct and place the battery in a suitable working environment.

For a sizeable solar application, a specialist company is required to design a power solution to ensure that all details are taken into account. The battery solution might include not only the batteries, but also racks, temperature control system, online battery monitoring, etc. A battery management system (BMS) can also be beneficial; this typically comprises a more complete functional design to monitor the state of the battery in terms of voltage, temperature, charge, discharge, state of battery health, coolant flow and battery current. A BMS can also calculate the power requirements to adjust parameters dynamically, and implement a battery protection system to prevent the battery from entering an erroneous operation mode.

Maintenance and monitoring
A BMS is recommended for solar applications which should cover battery monitoring and protection features. However, a full-featured BMS is costly and may not be an option for consumers with a limited budget. Regardless, it is always recommended that the battery should be placed in an environment with temperature control, with the ideal operating temperature being between 20°C and 25°C.

Battery life might be reduced or the possibility of thermal runaway increased when operating at too high a temperature. In contrast, the discharge time will decrease if the battery is working at a lower temperature, and charging at a lower temperature may also shorten service life. Faulty procedures or inadequate charging methods, over-discharge, over-charge and insufficient charging time will result in failure to recover to normal capacity, reduced capacity, or shortened battery service life.

For solar applications, in particular, it is essential to know the power demand. The correct storage and charging plan is vital to avoid battery damage. It is also necessary to perform periodic maintenance for assurance of the optimum reliability of the battery if there is no battery monitoring or control system. Inspections can be conducted to identify a gradual decrease of the capacity of the system and to detect any abnormal error or individual battery conditions that may impact on system reliability.

Sealed lead-acid meets solar challenges
A sealed lead-acid battery is the least expensive battery option per watt-hour. The manufacturing process for sealed lead-acid batteries is a mature, reliable and well-understood technology. Sealed lead-acid batteries offer a wide range of capacity options for different applications and equipment. What is more, sealed lead-acid batteries have one of the lowest self-discharge rates in the family of rechargeable battery systems. This means they are not only economical, they also have two critical abilities – durability and dependability.

For more information contact Forbatt SA,
+27 (0)11 469 3598, sales@forbatt.co

Information from Forbatt SA.
PFC and offline switching ICs

RS Components has announced availability of two new ranges of power semiconductors from Power Integrations. Delivering high energy efficiency with integrated protection features, the new offering from RS includes the LinkSwitch-TN2 family of offline switcher ICs and the HiperPFS-4 family of power factor correction (PFC) ICs.

The LinkSwitch-TN2 AC-DC converter devices offer excellent load and line regulation and deliver high flexibility with support for buck, boost and flyback topologies. This makes them ideal for engineers designing non-isolated offline switching power supplies for a range of markets including appliances, metering and smart LED drivers, as well as IoT, home and building automation applications.

LinkSwitch-TN2 ICs offer a selectable device current limit for design flexibility. Family protection features include auto-restart for short circuit and open loop faults, which limits power delivery to 3% of maximum, in addition to output over-voltage protection (OVP), input over-voltage protection and over-temperature protection (OTP).

The HiperPFS-4 family of PFC controller chips is optimised for a high power factor and high efficiency across various load ranges. Eliminating the need for external current-sense resistors and their associated power loss, the family offers high levels of integration and includes a 600 V rated MOSFET to deliver a very small PFC stage form factor.

Targeting a wide selection of applications including appliances, high-power adaptors and high-power LED lighting, plus consumer and computing devices, key features of the HiperPFS-4 family include greater than 95% efficiency from 10% to 100% load; less than 60 mW no-load consumption at 230 V a.c.; a power factor of greater than 0.95, achievable at 20% load; and EN61000-3-2 Class C and D compliance. Protection features include over-voltage, under-voltage lockout, OTP, and cycle-by-cycle current and power limits for overload protection.

For more information contact RS Components, +27 (0)11 691 9300, sales.za@rs-components.com

PCB-mounted power relay

TE Connectivity has introduced the Potter & Brumfield relay T9G series, a 30 A power PCB relay for HVAC, appliances and industrial control applications.

The T9G series is the smallest relay in its class, with a 30% smaller package size and 13% less PCB floor space all while keeping the standard footprint, allowing manufacturers to add more components on PCBs without having to compromise on relay performance.

The product range is globally versatile, thanks to its UL and VDE certifications. Its PCB and quick-connect terminations also make the relay user-friendly and easy to install. TE’s T9G series meets IEC 61810-1 for reinforced insulation due to its design where the distance between coil and contacts has been increased, while the overall package is smaller. The benefit is helping to prevent circuit flashover from control to load, resulting in a safer application.

Specifications include a 4 kV rating between coil and contact, providing better galvanic isolation, and 8 kV surge resistance withstand voltage rating providing a higher degree of protection for the application. The T9G uses a 900 mW coil that provides a 10% power reduction versus conventional 1 W / 30 A power PCB relays.

For more information contact TRX Electronics, +27 (0)12 997 0509, info@trxe.com
Batteries achieve the desired operating voltage by connecting several cells in series; each cell adds its voltage potential to arrive at the total terminal voltage. Parallel connection attains higher capacity by adding up the total ampere-hour (Ah).

Some packs may consist of a combination of series and parallel connections. Laptop batteries commonly have four 3.6 V Li-ion cells in series to achieve a nominal voltage 14.4 V, and two in parallel to boost the capacity from 2400 mAh to 4800 mAh. Such a configuration is called 4S2P meaning four cells in series and two in parallel. Insulating foil between the cells prevents the conductive metallic skin from causing an electrical short.

Most battery chemistries lend themselves to series and parallel connection. It is important to use the same battery type with equal voltage and capacity (Ah) and never to mix different makes and sizes. A weaker cell would cause an imbalance. This is especially critical in a series configuration because a battery is only as strong as the weakest link in the chain. An analogy is a chain in which the links represent the cells of a battery connected in series (Figure 1).

A weak cell may not fail immediately but will get exhausted more quickly than the strong ones when on a load. On charge, the low cell fills up before the strong ones because there is less to fill and it remains in over-charge longer than the others. On discharge, the weak cell empties first and gets hammered by the stronger brothers. Cells in multi-packs must be matched, especially when used under heavy loads.

Single-cell applications
The single-cell configuration is the simplest battery pack; the cell does not need matching and the protection circuit on a small Li-ion cell can be kept simple. Typical examples are mobile phones and tablets with one 3.6 V Li-ion cell. Other uses of a single cell are wall clocks, which typically use a 1.5 V alkaline cell, wristwatches and memory backup, most of which are very low-power applications.

Series connection
Portable equipment needing higher voltages use battery packs with two or more cells connected in series. Figure 2 shows a battery pack with four 3.6 V Li-ion cells in series, also known as 4S, to produce 14.4 V nominal. In comparison, a six-cell lead acid string with 2 V/cell will generate 12 V, and four alkaline with 1.5 V/cell will give 6 V.

If you need an odd voltage of, say, 9.50 volts, connect five lead acid, eight NiMH or NiCd, or three Li-ion in series. The end battery voltage does not need to be exact as long as it is higher than what the device specifies. A 12 V supply might work in lieu of 9,50 V. Most battery-operated devices can...
tolerate some over-voltage; the end-of-discharge voltage must be respected, however.

**Parallel connection**

If higher currents are needed and larger cells are not available or do not fit the design constraint, one or more cells can be connected in parallel. Most battery chemistries allow parallel configurations with little side effect. Figure 3 illustrates four cells connected in parallel in a P4 arrangement. The nominal voltage of the illustrated pack remains at 3.60 V, but the capacity (Ah) and runtime are increased fourfold.

A cell that develops high resistance or opens is less critical in a parallel circuit than in a series configuration, but a failing cell will reduce the total load capability. It’s like an engine only firing on three cylinders instead of on all four. An electrical short, on the other hand, is more serious as the faulty cell drains energy from the other cells, causing a fire hazard. Most so-called electrical shorts are mild and manifest themselves as elevated self-discharge.

A total short can occur through reverse polarisation or dendrite growth. Large packs often include a fuse that disconnects the failing cell from the parallel circuit if it were to short. Figure 4 illustrates a parallel configuration with one faulty cell.

A weak cell will not affect the voltage but provide a low runtime due to reduced capacity. A shorted cell could cause excessive heat and become a fire hazard. On larger packs a fuse prevents high current by isolating the cell.

**Series/parallel connection**

The series/parallel configuration shown in Figure 5 enables design flexibility and achieves the desired voltage and current ratings with a standard cell size. The total power is the product of voltage times current; four 3.6 V (nominal) cells multiplied by 3400 mAh produce 12,24 Wh. Four 18650 energy cells of 3400 mAh each can be connected in series and parallel as shown to get 7,2 V nominal and 12,24 Wh. The slim cell allows flexible pack design but a protection circuit is needed.

Li-ion lends itself well to series/parallel configurations but the cells need monitoring to stay within voltage and current limits. Integrated circuits (ICs) for various cell combinations are available to supervise up to 13 Li-ion cells. Larger packs need custom circuits, and this applies to e-bike batteries, hybrid cars and the Tesla Model 85 that devours over 7000 18650 cells to make up the 90 kWh pack.

**Terminology to describe series and parallel connection**

The battery industry specifies the number of cells in series first, followed by the cells placed in parallel. An example is 2S2P. With Li-ion, the parallel strings are always made first; the completed parallel units are then placed in series. Li-ion is a voltage-based system that lends itself well for parallel formation. Combining several cells into a parallel and then adding the units serially reduces complexity in terms of voltage control for pack protection.

Building series strings first and then placing them in parallel may be more common with NiCd packs to satisfy the chemical shuttle mechanism that balances charge at the top of charge. 2S2P is common; white papers have been issued that refer to 2P2S when a serial string is paralleled.

**Safety devices in series and parallel connection**

Positive temperature coefficient (PTC) switches and charge interrupt devices (CID) protect the battery from over-current and excessive pressure. While recommended for safety in a smaller 2- or 3-cell pack with serial and parallel configuration, these protection devices are often being omitted in larger multi-cell batteries, such as those for power tools.

The PTC and CID work as expected to switch off the cell on excessive current and internal cell pressure; however the shutdown occurs in cascade format. While some cells may go off early, the load current causes excess current on the remaining cells. Such an overload condition could lead to a thermal runaway before the remaining safety devices activate.

For more information contact Michael Rogers, Uniross Batteries, +27 (0)11 466 1156, michael.rogers@uniross.co.za

![Figure 5: Series/parallel connection of four cells (2S2P).](https://www.dataweek.co.za)
Power designers are being challenged by spec changes

Vicor survey shows that mitigating the impact of inevitable changes to requirements is essential to ensure projects are on time and within budget.

Today, engineers are asked to find creative solutions to deliver more power from less space and with higher efficiencies. This makes power system design an increasingly important part of developing technologically advanced electronic equipment. Research by Vicor found that these engineers are facing a myriad of challenges meeting cost and schedule targets.

The research found that power system developers around the globe perceive the biggest challenge to be changes in specifications for the power system during development. Although it may be surprising that this was the biggest problem, rather than technical challenges associated with meeting the system’s requirements, in fact changing specifications make it even harder to deliver a project on time and on budget.

The accompanying graph summarises the responses given when power designers were asked to identify their biggest challenges.

The challenge of changing specifications
Changes to specifications during development was the biggest issue that power system designers surveyed must overcome, with almost all (87%) struggling to deal with this challenge. Changes in specifications mean project delays and increased cost, due to the additional work required to modify the design to meet the new requirements.

It’s clear that these changes do have a major impact on projects, as most of those surveyed (65%) said that changes to product specification are a major contributor to delays in power system development. Although two thirds of power engineers already see the negative impact of changes on their projects, the problem is likely to get worse, as the majority (67%) believed that changes were becoming more common.

The impact of these changes can be dramatic. Almost all (80%) engineers surveyed are struggling to meet project time scales, with a similar number (79%) seeing the time given to each project reducing, and three quarters (72%) having to increase the rate of innovation due to shorter product life cycles. The changes to specifications can only increase the time pressure.

Changes in specifications mean project delays (87%) struggling to deal with this challenge. If changes to specifications are inevitable, then there is little point in trying to avoid them. If changes to specifications are inevitable, then there is little point in trying to avoid them. Dealing with the inevitable changes

As the survey findings highlight, changes to specifications are pretty much inevitable for most engineers (87% of our respondents said this was a problem). In Vicor’s experience, changes are most frequently driven by technical issues, particularly when the exact power budget is not known at the start of the project, loads are changed or restrictions are placed on thermal management due to space restrictions. External market or competitive forces can also cause a change to specification because: customer demands change; there are changes (or will be changes) to the legislative landscape; or a competitor launches a new product. All of these factors may cause an organisation to re-evaluate what the market now needs.

The impact of these changes will vary, depending on the length of product life cycle, market leadership and other internal market forces and levels of risk. But what’s important to note in the context of this survey is that engineers have little or no control over what is happening, they can only look to find ways to ameliorate their impact. Whatever the causes, Vicor meets with an increasing number of power developers who are having to deal with the specification changing after they have begun designing.

Causes of specification changes

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Dealing with the inevitable changes

If changes to specifications are inevitable, then there is little point in trying to avoid them. Power system designers should instead look at strategies that mitigate the impact of changes.
An inflexible approach to power design will make it harder to deal with changes in specifications. This is particularly the case when a custom power system is developed using discrete components or purchased from a vendor. In this case, any changes to the inputs or outputs require complex and time-consuming redesign work. At worst, discrete designs might need a different technology to meet the new requirements.

New, flexible approaches using modular power components (termed the Power Component Design Methodology by Vicor) may provide a way forward to enable power developers to accommodate changing specs without incurring significant delays. This approach uses small, easily interchangeable products that allow changes to be accommodated quickly and easily. Using power components also increases the certainty of performance: it’s much easier to accurately forecast the size and performance of power systems developed using this approach.

Engineers typically use online tools when implementing the Power Component Design Methodology. Vicor’s PowerBench offers a suite of free tools that not only allow systems to be designed and optimised quickly and easily, but also allow for revisions to meet new specifications quickly and easily. Using power components also increases the certainty of performance: it’s much easier to accurately forecast the size and performance of power systems developed using this approach.

For more information contact Supreme Electro Magnetics, +27 (0)10 591 3500, info@semcc.co.za

Conclusion
Changes to specifications after development has started are the biggest challenge for power system designers, and the problem is getting worse. Conventional approaches to power system design, using discrete components, were developed when specifications were less fluid, and their lack of flexibility makes adapting to the inevitable changes difficult, time consuming and expensive.

Using modular power components offers several benefits, particularly the flexibility to make modifications to power systems quickly and easily, making it far more effective in today’s unpredictable design environment. Switching to this new approach may not stop power engineers’ bosses changing their minds, but will reduce the stress and cost of the new requirements.

For more information contact Brabek, +27 (0)21 706 3162, info@brabek.co.za

2 Watt DC-DC converters

The new 2W RTC2 series modules from Recom come in a six-pin SMD open-frame package with a footprint of less than 2.13 cm².

The 2:1 inputs’ voltage ranges of 4.5 to 9 V d.c. or 18 to 36 V d.c. can handle up to 15 V d.c. and 50 V d.c. respectively for up to 100 ms. The converters are insulated up to 3 kV d.c./1s, and reach efficiencies over 80%.

The modules are regulated at ±2% accuracy, with a tight line regulation of ±0.5% and load regulation of ±0.5%. They are short circuit protected, and operate under natural convection at temperature ranges of –40°C to +85°C (24 V version) without derating.

The new modules comply with the RoHS guideline and are certified according to IEC/EN 62368-1 and EN 55022/24. The MTBF is more than 2000 x 10³ hours at 25°C according to MIL-HDBK 217F. The converters come with a three-year guarantee.

For more information contact Brabek, +27 (0)21 706 3162, info@brabek.co.za

www.dataweek.co.za
Selecting the best inductor for a DC-DC converter

By Len Crane, director of technical marketing, Coilcraft.

While DC-DC conversion circuitry has matured to the point that there are ‘cookbook’ design aids as well as software to help, selecting the right power inductor is a critical aspect of converter design. This requires a good understanding of inductor performance and of how desired in-circuit performance relates to the information available in supplier data sheets.

Inductors that can be used in DC-DC converters come in a wide variety of shapes and sizes (Figure 1). In order to compare types and choose the optimal part for the application, a designer must rely on correctly understanding published specifications.

Inductor performance can be described by relatively few numbers. A typical data sheet excerpt for a surface-mount power inductor intended for DC-DC converters is shown in Table 1.

**Inductance**
Per Table 1, the inductance (L) is the main parameter that provides the desired circuit function and is the first parameter to be calculated in most design procedures. It is calculated to provide a certain minimum amount of energy storage (or volt-microsecond capacity) and to reduce output current ripple. Using less than the calculated inductance causes increased AC ripple on the DC output. Using much greater or much lower inductance may force the converter to change between continuous and discontinuous modes of operation.

Because it is not practical for a data sheet to show performance for all possible sets of operating conditions, it is important to have some understanding of how the ratings would change with different operating conditions.

**Tolerance**
Fortunately, most DC-DC converter applications do not require extremely tight tolerance inductors to achieve these goals. It is, as with most components, cost-effective to choose standard tolerance parts, and most converter requirements allow this. The inductor in Table 1 is shown specified at ±20%, which is suitable for most converter applications.

**Test conditions**
These are critical, and designers need to pay special attention to voltage, wave shape and test frequency. For example, most catalogue inductance ratings are based on ‘small’ sinusoidal voltages, and the use of sinusoidal voltage is a standard instrumentation test condition.

With regard to frequency, most power inductors do not vary dramatically between 20 kHz and 500 kHz, so a rating based on 100 kHz is quite often used and suitable. However, inductance eventually decreases as frequency increases. As switching frequencies increase to 500 kHz, 1 MHz and above, it becomes more important to consider ratings based on the actual application frequency.

**DC resistance (DCR)**
This is based strictly on the wire diameter and length and is specified as a ‘max’ in the catalog but can also be specified as nominal with a tolerance. DCR varies with temperature, so it is important that the DCR rating also notes the ambient test temperature.

The temperature coefficient of resistance for copper is approximately +0.4% per degree Celsius. So the part shown rated at 0,009 Ω max would have to have a corresponding rating of 0,011 Ω max at 85°C — only a 2 mΩ difference in this case, but a total change of about 25%. The expected DCR versus temperature is shown in Figure 2.

**AC resistance**
This is not commonly shown on inductor data sheets and is not typically a concern unless either the operating frequency or the AC component of the current is large with respect to the DC component.

When trying to minimise the size of the component, the designer should try to select the part with the largest possible resistance. Typically, to reduce the DCR means having to use larger wire and probably a larger overall size. So optimising the DCR selection means a trade-off of power efficiency, allowable voltage drop across the component, and component size.

**Self-resonant frequency (SRF)**
Every inductor winding has some associated distributed capacitance, which, along with the inductance, forms a parallel resonant tank circuit with a natural self-resonant frequency. For most converters, it is best to operate the inductors at frequencies well below the SRF. This is usually shown in the inductor data as a ‘typical’ value.

**Current rating**
This is perhaps the rating that causes the most difficulty when specifying a power inductor. Current through a DC-DC converter inductor is always changing throughout the switching cycle and may change from cycle to cycle depending on converter operation, including temporary transients or spikes due to abrupt load or line changes. This gives a constantly changing current value with a sometimes very high peak-to-average ratio.

It is the peak-to-average ratio that makes specification difficult. Look for an inductor that has two current ratings: one to deal with possible core saturation from the peak current and one to address the heating that can occur due to the average current.

**Saturation current (Isat)**
One effect of current through an inductor is core saturation. Frequently, DC-DC converters have current wave shapes with a DC component. The DC current through an inductor biases the core and can cause it to become saturated with magnetic flux. The designer needs to understand that when this occurs, the inductance drops and the component no longer functions as an inductor.

A typical inductance versus current curve for a gapped ferrite core is shown in Figure 3. It can be seen that this curve has a ‘knee’ as the inductor moves into the saturation region. Definition of where saturation begins is, therefore, somewhat arbitrary and must be defined. In the example of Table 1, saturation is defined at the point at which the inductance drops by 10%. Definitions in the range

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**Table 1. Typical data sheet excerpt for a surface-mount power inductor.**

<table>
<thead>
<tr>
<th>Part number</th>
<th>L ±20% (μH)</th>
<th>DCR max (mΩ)</th>
<th>SRF typ (MHz)</th>
<th>ISAT (A)</th>
<th>Irms(A)</th>
</tr>
</thead>
<tbody>
<tr>
<td>XAL 4020-102</td>
<td>1.0</td>
<td>146</td>
<td>79</td>
<td>8.7</td>
<td>9.6</td>
</tr>
</tbody>
</table>

---

**Figure 2. Expected DCR versus temperature curve based on 0,009 Ω max at 25°C.**

---

**Figure 1. Inductors come in many shapes and sizes. Thin versions enable low-profile converter designs.**
of 10% to 20% are common, but it should be noted that some inductor catalogues might use figures of 50% inductance drop. This increases the current rating but may be misleading as far as the usable range of current is concerned.

While there is more to be said on this topic, suffice it to say that it is typically desirable to operate with current peaks near the saturation rating because this allows the smallest possible inductor to be chosen.

**RMS current (Irms)**

The second major effect of current is component self-heating. The Irms is used to give a measure of how much average current can continuously flow through the part while producing less than some specified temperature rise. In this case, the data sheets usually provide a rating based on application of DC or low-frequency AC current, so this does not include heating that may occur due to skin effect or other high-frequency effects. The current rating may be shown for a single temperature rise point as in the example, or some suppliers provide helpful graphs of temperature rise versus current or factors that can be used to calculate temperature rise for any current.

Temperature rise due to self-heating may cause the inductor to be at a temperature higher than the rated range. This is normally acceptable provided that the insulation ratings are not exceeded. As with other parameters, it is important to know the inductor temperature rise so that this can be traded off with other parameters when making design choices. If lower temperature rise is desired, a larger size component is most likely the answer.

**Conclusion**

It can be seen that inductors for DC-DC converters can be described by a small number of parameters. However, each rating may be thought of as a ‘snapshot’ based on one set of operating conditions that may need to be augmented to completely describe expected performance in application conditions.

For more information contact Andrew Hutton, RF Design, +27 (0)21 555 8400, andrew@rfdesign.co.za.

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**Offline flyback switchers**

Power Integrations released its InnoSwitch3 family of offline CV/CC (constant voltage/constant current) flyback switcher ICs. The new devices achieve up to 94% efficiency across line and load conditions, slashing power supply losses by a further 25% and enabling the development of compact power supplies up to 65 W without heatsinks. InnoSwitch3 devices are ideal for power supplies with challenging energy consumption, footprint or thermal constraints, particularly those targeting mandatory Total Energy Consumption (TEC) specifications.

The InnoSwitch3 IC family is optimised into three application-specific series:
- CP: Constant Power. Ideal for USB Power Delivery (PD), rapid charging and other applications where a dynamic output voltage is required.
- EP: Embedded Power. Features the family’s highest-rated MOSFET (725 V) and provides full line and load protection with excellent multi-output cross-regulation for demanding industrial applications and appliances.

These newest flyback switcher ICs employ Power Integrations’ FluxLink isolated digital communications technology, plus synchronous rectification, quasi-resonant switching and a precise secondary-side feedback sensing and control circuit. This results in highly efficient, accurate, reliable power supply circuits without the need for optocouplers.

InnoSwitch3 devices are CCC, UL and VDE safety certified to bridge the isolation barrier, and the InSOP-24 package provides a low-profile, thermally efficient solution with extended 11,5 mm creepage and clearance between primary and secondary sides for high reliability, surge and ESD robustness. The new devices also incorporate a host of protection features, including lossless line over-voltage and under-voltage, output over-voltage, over-power, over-current and over-temperature protection, as well as output rectifier short-circuit protection.

Device sub-families are provided with either latching or auto-recovery capability, according to the typical demands of each target application space. All InnoSwitch3 ICs feature onboard high-voltage MOSFETs (rated at 650 V for the CP and CE series and 725 V for the EP series).

For more information contact MB Silicon Systems, +27 (0)11 728 4757, info@mbsiliconsystems.co.za.
SVID and PVID enabled voltage regulator

A new member has been added to Infineon Technologies’ IPOL (Integrated Point-of-Load) family which combines ease of use with high power density. It is the industry’s first fully integrated regulator offering PMBus, SVID and PVID functionality for powering Intel CPU POL rails, chipsets and ASICs/FPGAs. Infineon claims this is the smallest solution size of its class, with 50% space saving compared to alternative external power solutions.

The IR38163/S and IR38363/S are tailored for powering Intel Vccio and Vcpp rails, and Intel-based server applications which require SVID support. The devices do not require pre-programming as they are pre-configured for Intel requirements and addresses.

The IR38263/S offers 3-bit parallel VID (PVID) for powering Intel chipset PVNN rails and FPGA. It is ideal for telecom applications which require constant frequency operation, and netcom and storage applications that require extensive PMBus, accurate Vout, and ultra-low ripple.

This family of IPOL devices takes advantage of the benchmark efficiency of the OptiMOS 5. Additionally, the small 7 x 7 mm PQFN package with Cu clip allows the devices to operate at up to 30 A, at high frequency with minimal airflow. Pin compatible options are available with and without PMBus support.

The family features Infineon’s state-of-the-art PWM engine which provides ultra-low ripple and jitter. They minimise noise and increase control bandwidth while requiring fewer capacitors than other design options. True differential voltage sensing, wide margining range and a 0.5 % Vref accuracy work together to deliver a Vout accuracy greater than 1%.

For more information contact Dirk Venter, Arrow Altech Distribution, +27 (0)11 923 9600, dventer@arrow.altech.co.za.

Li-ion battery management ICs

Renesas Electronics rolled out two new battery management IC solutions for lithium-ion (Li-ion) rechargeable batteries used in industrial equipment, such as electric power tools and E-bikes (bicycles incorporating electric motors). The solutions based on the RAJ24090, supporting three to eight cells, and RAJ240100, supporting three to ten cells, simplify the design of industrial battery management systems, providing a high degree of safety.

The new solutions support up to ten cells for a maximum 50 V capability and are Renesas’ first battery management solutions for Li-ion batteries supporting industrial applications. The RAJ240900 and RAJ240100 have built-in safety features to protect Li-ion batteries from catastrophic failure. In addition, Renesas offers design support tools, which enable the rapid development of battery management systems.

Featuring an integrated RL78 MCU (microcontroller), the ICs integrate the remaining capacity measurement and safety monitoring functions, such as over-voltage and over-current, into a single package. This provides a high-precision analog-to-digital converter (required for battery control voltage measurement) and MCU that have been matched and adjusted beforehand, thereby contributing to substantially reducing the need for calibration. In addition, the peripheral functions required by industrial applications, including power supply, field effect transistor (FET) driver and real-time clock, are included on-chip.

The RAJ24090 and RAJ240100 support an ultra-low-power mode, which reduces current consumption to only 25 μA. This allows battery monitoring functions to operate constantly, even when the system is powered off. A record-keeping function can store information such as battery history to monitor deterioration and store system faults in the MCU memory. The MCU can issue an alarm and disable the battery to prevent Li-ion battery failure.

In addition, the battery management ICs support a system configuration in which N-channel MOSFETs are positioned at the positive poles of the battery cells. This means that if the battery management IC fails, the system can be shut down safely. If, on the other hand, the MCU enters a runaway state, the battery protection function of the analog front-end block can continue to operate independently, providing a failsafe for enhanced system safety.

Renesas plans to release development startup support tools, such as reference software, reference circuit diagrams and setup manuals. The support tools will enable changes to parameter settings and simplify Li-ion battery pack design, and enable faster solutions for battery management.

For more information contact Callie Lombard, Hi-Q Electronics, +27 (0)11 894 8083, callie@hi-q.co.za.

Power measuring IC for Windows 10 devices

Microchip announced the availability of a precision power- and energy-monitoring chip. The PAC1934 works in conjunction with a Microchip software driver that is fully compatible with the Energy Estimation Engine (E3) built into the Windows 10 operating system to provide 99% accuracy on all battery-powered Windows 10 devices. According to Microchip, this solution can improve the measurement of battery usage from simple CPU tasks all the way up to software running on devices that connect through a USB Type-C connector. The chip is a four-channel device with 16-bit power measurement and a 17 minute plus accumulation register, making it ideal for determining power consumption and energy usage without the need for voltage or current range adjustments.

The device has capabilities that could also make it an integral part in future software upgrades. Through bidirectional measurement, with the ability to measure both battery charging and battery discharge, the PAC1934 is well suited for upcoming USB Type-C charging topologies as they are developed and become more widely used. In addition, the device functions as a standard high-side current sensor for use in server, networking, automotive and industrial applications. Microchip is also actively working to support the PAC1934 in Linux for various applications.

For more information contact Tempe Technologies, +27 (0)11 455 5587, willem.hijbeek@tempetech.co.za.
While the pressure to get products to market is high, technologies such as USB Type-C only increase the complexity of testing. Understanding the connector helps identify the areas where additional tests, instruments and test fixtures are needed. Getting it wrong can easily extend your test time by more than two months at a potential cost of one million Euros. If your device fails at a USB-IF compliance workshop, the cost and time delay will be even higher.

**Overview of the USB Type-C connector**

Figure 1 shows the highly-functional 24-pin connection of USB Type-C. The power pins, VBUS and GND support up to 5 A/20 V/100 W. The four transmit/receive (TX/RX) pairs allow for one, two or all four channels to be used for data transmissions at any time and offer up to 20 Gbps speed per lane.

The CC1 and CC2 lines manage the definition of the connector interface by providing three functions: orientation configuration management, supply power to cable, and communication channel for power delivery. The SBU1 and SBU2 pins are sideband communication channels and provide additional connections and use for protocols other than USB.

A simultaneous link of USB 2 (D+, D-) can be used for standard USB 2 operations or as a supplemental link providing information for power delivery. The D+ connections are tied together, as are the D- connections to maintain the orientation independence of the connector.

Power Delivery (PD) dynamically manages the power allocations, adjusting voltage and current, and establishes provider/consumer roles for all the devices connected. Devices can request the power they need, and get more power when required for a specific application. PD’s bidirectional power makes it possible for a device that is being powered to also provide power to other devices. PD also enables USB Type-C to support other standards such as DisplayPort (DP) or Thunderbolt (TBT) through Alt mode.

**Test challenges and solutions**

Design and test engineers face several challenges as they update their device interface from the 4-pin USB standard A/B to the 24-pin USB Type-C connector. USB Type-C includes design changes that address issues with A/B type connectors/cables and offers more features and capabilities for USB Type-C enabled products. Understanding test challenges and solutions can help ensure successful USB Type-C integration and test for devices.

**Power delivery**

PD’s dynamic ability and range of possible power configurations, combined with the added challenge of evolving specifications for USB 2.0, USB 3.1 Gen 1 and Gen 2, and PD compliance, make USB Type-C device test validation much more challenging than traditional USB testing. Power, PHY layer and protocol layer remain the key test categories for compliance test. Important test parameters design engineers must consider include many different voltage levels, device charging, cable functionality, and determination of provider versus consumer device status.

“Type-C is exponential in its effect on your board testing and validation. Considering Type-C validation as an ‘incremental’ change to your testing environment is wrong and dangerous.”

Figure 2 (page 26), shows the host and device as dual role ports (DRP) which is aligned with the USB Type-C environment where the roles can be swapped. The state of a DRP – whether it is acting as a host or a device at a given time – is managed by the CC line as a part of the PD infrastructure. Debug of the PD protocol is one of the biggest challenges engineers face since it requires access to the CC lines and the VBUS signal for proper characterisation. USB PD has specified voltage/current levels that devices can select for operation, making the ability to test PD levels as devices initialise very important.

An example configuration for physical layer device test includes an oscilloscope, probes, current probe, USB PD protocol software, coupons/fixtures and a PD controller. With 300 kHz data transfer rates, a Keysight Infiniium oscilloscope of 500 MHz or more that includes a long record length to capture the entire packet is recommended. Although predominantly DC signals, most have AC characteristics and require a scope...
with adequate bandwidth. It is recommended to use a probe offset to see signal transients when analysing the 5 V d.c. supply signal as the use of a DC block filters out DC and low-frequency content.

**Transmit/receive (TX/RX)**

USB Type-C specifications introduce many new TX and RX test challenges. The ability to quickly and accurately measure key aspects of the transmitted eye, LFPS and LBPM timing, transmitted SSC profile, SCD signals, and to perform de-emphasis and pre-shoot will be critical for successful TX test. Flexible signal generation and bit error detection are key for RX test validation.

TX and RX compliance testing requires running compliance test patterns. These various signal patterns are generated during compliance tests, while measurements are made in a tool known as SigTest. Each compliance test presents individual challenges. USB-IF compliance testing will require many loading and charging conditions, which increases the number of tests engineers must configure and execute for each device.

For TX compliance testing of USB 3.1, DP 1.3, TBT 3 and MHL, the N7015A and N7016A Type-C test fixtures, for use with Keysight Infiniium oscilloscopes, are recommended. This solution offers the best signal integrity with 20 GHz bandwidth (at -3 dB) and is de-embeddable up to 30 GHz. It includes a Type-C plug interface fixture which handles connector ‘flip’ and provides test point and probing access for transmitter and power delivery measurements.

The M8020A J-BERT high-performance 16 Gbps bit error ratio tester has everything needed built into the equipment: de-emphasis, pattern capabilities, continuous-time linear equalisation (CTLE), decision feedback equalisation (DFE), the capability to create the various pattern structures, and re-sequencing. The Keysight USB 3.1 receiver test solution provides accurate and repeatable test results enabled by the M8020A J-BERT’s built-in and calibrated jitter sources (random jitter, period jitter, SSC), precise emulation of pre- and post-cursor de-emphasis, and inter-symbol interference (ISI) traces.

**Cable and connector**

USB Type-C channel specifications, including symmetrical connectors, high-speed data, high power, multiple data transmission types, and backward compatibility, result in many configurations that need to be tested to verify USB channel conformance. Performance of the channel in various configurations is also affected by loss, reflection and cross-talk. More rigorous methods than what have been used in the past are needed to remove test fixture effects, to manage additional effects on channel response (Figure 3), and to manage EMI and RFI levels in the USB Type-C channel during USB compliance testing.

Traditional cable/connector compliance tests have used a vector network analyser (VNA) for the frequency domain analysis, and a time domain reflectometry (TDR) oscilloscope for time domain analysis. A new recommended solution is the Keysight ENA series network analyser with enhanced time domain analysis (option TDR) for a one-box solution that measures all the compliance parameters. A microwave electronic calibration (ECal) module, N4433A, which is controlled from the ENA USB interface, is used for ENA calibration and to remove the effects of the test setup.

Keysight Technologies is the only vendor whose Type-C testing solution incorporates USB-IF certified equipment and testing for USB Rx/Tx testing, TBT certified equipment and testing for TBT Rx/Tx testing, and VESA certified equipment and testing for DP Rx/Tx testing.

For more information contact Tshiamo Mogakwe, Concilium Technologies,
+27 (0)12 678 9200, info@concilium.co.za.

![Figure 2. USB Type-C full feature implementation.](image)

![Figure 3. Channel response requires a shift in test methodology from the traditional parametric to the stressed eye testing.](image)
Anritsu has announced a software release for the MT8870A universal wireless test set to support RF tests of LTE Category M devices. The release includes Category M FDD uplink Tx measurement software (MX887065A), Category M FDD downlink waveform files (MV887065A) and a fully automatic measurement program, providing fast and automatic testing of Tx power, frequency, modulation accuracy, modulation sensitivity, etc. in accordance with the 3GPP LTE Category M RF test specifications.

LTE Category M, a cellular IoT standard included in LTE-Advanced Pro, is a wireless technology based on licence band LPWA (low-power wide-area) in parallel with NB-IoT (narrowband Internet of Things). As well as anticipated smart city and freight tracking applications, it is expected to be adopted by emergency warning systems due to its support for voice communications. But a key issue for a smooth rollout of the service is assuring high mass-production efficiency to help cut terminal costs. The measurement of LTE Category M devices can be automated using a program to control chipsets built into target devices, but, until now, these programs required bespoke development for every customer.

Turnkey measurement solution for LTE Cat. M

Working closely with chipset vendors to establish measurement technologies for LTE Category M devices, Anritsu has been able to develop a turnkey solution to support automated evaluation at elevated measurement speeds for up to four LTE Category M devices and chipsets without requiring a customer-developed control program.

The MT8870A is a measurement instrument for mass production of various types of wireless communications equipment and modules. Four high-performance tester units are installed in the main unit and each unit supports parallel independent measurement for evaluation of up to four wireless devices and modules. The MT8870A already fully supports 2G/3G/LTE/LTE-Advanced/NB-IoT, WLAN/Bluetooth, GPS and FM evaluations.

For more information contact Coral-i Solutions, +27 (0)11 315 5500, sales@coral-i.co.za.

Optical spectrum analyser for in-service network testing

The FTBx-5255 optical spectrum analyser (OSA) module was released by EXFO for field applications to meet the live network testing needs of telecom service providers, Internet content providers and network equipment manufacturers all under pressure to deliver flawless services to a high-speed, data-hungry market.

The device obviates the need to interrupt communications by shutting down networks or channels to measure the optical signal-to-noise ratio (OSNR) of 100G/200G/400G (Pol-Mux) signals, a key performance indicator of customers’ quality of service. With the new OSA, service providers and data centres can stay live for in-service network testing of OSNR from 10G to 400G; O-band pluggable and L-band transceivers; and CWDM spectral analysis, among other applications. The capability to address all these OSA testing applications will also appeal to NEMs, in particular the system verification and system testing groups.

The FTBx-5255 is available in EXFO’s FTB-2, FTB-2 Pro and FTB-4 Pro portable test platforms as well as in the LTB-8 platform for rackmount and lab applications.

For more information contact Chris Nel, Lambda Test Equipment, +27 (0)12 349 1341, chris@lambdatest.co.za

Do You Know How Efficient Your Energy Storage and Conversion Systems Are?

We offer a range of off the shelf test systems and instruments that provide accurate insights into the performance and efficiency of many components of an energy storage or energy conversion system, backed up by a local Keysight accredited repair and calibration facility.
All-in-one optical test platform

Viavi Solutions has released its new T-BERD/MTS-4000 V2 platform – a small, compact handheld test platform designed for all phases of the fibre-optic network lifecycle.

The newly streamlined form factor supports the full range of Viavi fibre analysis tools, including OSA, OTDR, bidirectional insertion loss/ORL, light source, power meter and connector inspection. It offers engineers, technicians, installers and contractors high performance as well as scalability and upgradability.

The instrument features a high-visibility, multi-touchscreen with permanent touch keys; two bays for field replaceable modules; support for the existing 4100 series modules and new MA2, MA3, MP2 OTDR modules; Ethernet, Wi-Fi and Bluetooth connectivity; cloud-based or on-board SOLR and PDF report generation; and a 3 year warranty.

This new field tester supports the full network lifecycle through construction, activation, maintenance and troubleshooting with applications for FTTH/PON, CWDM and DWDM, DAS, C-RAN, 5G, enterprise and data centre (Tier 2 – OTDR and MPO switch), access and metro core (10G, 40G, 100G – OTDR and C-OSA).

For more information contact Tshiamo Mogakwe, Concilium Technologies, +27 (0)12 678 9200, info@concilium.co.za.

Pico extends sampling oscilloscope range

Pico Technology has added three 15 GHz models and a further 25 GHz model to its professional, portable and low-cost PicoScope 9300 series of sampling oscilloscopes.

The new 15 GHz models replace the preceding 9200 series 12 GHz models, with significantly upgraded specifications at even lower prices, with the result that all Pico sampling oscilloscopes now operate under the PicoSample 3 software. These instruments combine Pico's cost-effective sampling technology with the convenience of USB and LAN control ports.

The 9301-15 gives the benefits of two channels at 15 GHz bandwidth and prescaled trigger to 14 GHz. It delivers a 16-bit sampling rate of 1 Msps in support of fast-update eye diagrams, persistent traces, histogramming and statistical analysis. Equivalent sampling rate tops out at 15 TSp – translating to a time resolution of just 64 fs – along with a long maximum trace length of up to 32 kilosamples.

At 15 GHz bandwidth, this entry-level sampling oscilloscope aligns with today's popular gigabit data rates, as it will support third harmonic characterisation of serial data out to 10 Gbps and fifth harmonic out to 6 Gbps. Full touchscreen control, menus that configure to the application at hand, comprehensive PRBS pattern lock, and eye-line step and scan all serve to enable visualisation, measurement and characterisation of high-speed serial data. By moving up to the 9302-15 model, users can add clock recovery trigger out to 11,3 Gbps and RMS jitter typically down to 1,0 ps +1% of data interval.

The third of the new 15 GHz models addresses single-ended time domain transmission and time domain reflection measurements. Again, it's a significant upgrade to the predecessor 9211 in cable, component, backplane and PCB impedance and transmission characterisations and network analysis. In this model, system transition time (65 ps) halves distance resolution and adjustable pulse width extends reflected fault detection range from around 4 mm typically out to 400 m.

At 20 GHz, the 9311-20 continues to support fully differential and deskewable TDR/TDT capability and all 9300 models can be paired with the P9G900 standalone fast pulse generators to achieve similar TDR/TDT capability, for example on the four-channel and optical input models, or greater flexibility with any 9300 model. The 9300 family also pairs well with Pico's low-invasive PicoConnect 900 passive probes, capable of browse probing out to 9 GHz or 18 Gbps, typically without interrupt of downstream function.

At 25 GHz, Pico has created the model 9302-25 to add 11,3 Gbps clock recovery to the higher bandwidth models. This bandwidth will support 5th harmonic assessments at data rates up to 10 Gbps and, assuming a clock or sub-clock is available, 16 Gbps at the 3rd harmonic.

For more information contact Comtest, +27 (0)10 595 1821, sales@comtest.co.za.

GNSS simulator gets web server interface

The LabSat 3 Wideband is a GNSS (global navigation satellite systems) simulator that can record and replay multiple signals from different satellite constellations, simultaneously. Built into a small, portable and lightweight package, it now features remote control via Telnet, and a web server interface.

The web server control makes using the LabSat 3 Wideband very simple. Easily accessed via the LabSat Ethernet connection through a standard web browser, the HTML interface graphically displays bandwidth, centre frequency and signal capture.

To see how it works, an online demo is available (at http://racelogic.createsend1.com/t/r-l-jldhb1-k-t/) which allows a user to create configurations as if they were doing it on a live unit. They can set the number of channels, bandwidth and quantisation to see which signals can be recorded and from which constellations, and also ‘play’ a scenario to see how it is represented in the GNSS monitor.

Small, battery-powered and with a removable solid state disk, the GNSS simulator allows for quickly gathering detailed, real-world satellite data and replay these signals on a bench. With three channels, a bandwidth of up to 56 MHz and 6-bit sampling (3-bit I and 3-bit Q), LabSat 3 Wideband can handle almost any combination of constellation and signal that exists today, with plenty of spare capacity for future planned signals.

For more information contact Andrew Hutton, RF Design, +27 (0)21 555 8400, andrew@rfdesign.co.za.
Low-profile scope for machine diagnostics and ATE

Comtest has announced the availability of the new Tektronix 5 Series MSO Low Profile oscilloscope for machine diagnostics and automated test equipment (ATE) applications.

Building on the success of the 5 Series MSO mixed-signal oscilloscopes and innovations like FlexChannel technology and 12-bit ADCs (analog to digital converters), the new low-profile instrument offers a best-in-class combination of channel density, performance and low cost per channel at 1 GHz bandwidth, allowing researchers and scientists to gather more accurate data and gain deeper insights into their machines while reducing test equipment space requirements.

Rack-mounted oscilloscopes are commonly used to evaluate the performance of various machines in such application areas as high energy physics (pulsed power), military and government for weapons testing and materials research. Software is typically used to control the instrument remotely. As with ATE applications, engineers and researchers often struggle to put together cost-effective data acquisition solutions with enough performance and channels to better monitor their machines while reducing test equipment space requirements.

“Among the many innovations in the 5 Series MSO, FlexChannel technology that packs eight analog channels, or up to 64 digital channels, in a fraction of the space of traditional benchtop scopes truly stands out and delivers significant benefits for machine diagnostics and similar research and production test applications,” said Brian Ice, general manager, mainstream oscilloscopes, Tektronix. “Along the same lines, the 12-bit ADC is also a big win for customers because it allows them to obtain more complete, more accurate data that could someday lead to significant breakthroughs, such as self-sustaining fusion reactors.”

Whereas conventional benchtop oscilloscopes used for machine diagnostics applications might require 6U of rack space and yet provide only four input channels, the 5 Series MSO Low Profile offers a 6x improvement in channel density made possible by its combination of 8 FlexChannel inputs and its robust, space-saving 2U package.

With 1 GHz analog bandwidth, 6.25 GSps sample rate on all channels, and 125 M record length, the new instrument has the performance researchers and engineers need to capture accurate waveform data with high signal integrity.

With 12-bit ADCs, lower noise and a high 7,6-bit ENOB (effective number of bits), the 5 Series MSO Low Profile reveals deeper insight by showing more signal details compared to 8-bit oscilloscopes. The 12-bit ADCs provide 16 times the vertical resolution of traditional 8-bit ADCs, providing a larger dynamic range that allows users to measure small signal details riding on large signals.

The 5 Series MSO Low Profile is also well-suited for ATE applications where channel density and performance are critical. For these applications, engineers can start with the benchtop 5 Series MSO with its 40 cm HD touchscreen for development and then seamlessly transition to the compact, rack-friendly low-profile version.

EXFO unveiled the EX1, a pocket-sized solution enabling technicians to measure subscribers’ real-life throughput – up to full line rate Gigabit Ethernet – using the same method they do: Speedtest by Ookla. Multipurpose and portable, the instrument is ready to evolve with networks and provide active testing capabilities for complete service lifecycle testing and continuous or on-demand performance monitoring at points of contention – key to delivering consistent QoE throughout the transition to virtual networks.

To confirm that customers get what they pay for, residential and business Ethernet subscribers measure actual throughput/speed using off-the-shelf solutions that fall short in capturing correct speed rates. Performing speed tests using a dedicated carrier-grade device is necessary to provide subscribers with reliable proof that speed delivered and service level agreement (SLA) rates match.

In addition, with its future-proof, scalable platform, the EX1 is ready to support among others the evolving applications such as Wi-Fi testing capabilities.

Intermittent quality issues take more time to troubleshoot, requiring a flexible monitoring solution that can stay in place as long as required. The EX1’s portable design and extensive feature set (including over 140 tests) make it the best choice for on-demand performance testing at any interval or any moment.

Technicians can simply connect to the EX1 through their smart device for an untethered testing experience. Together with its monitoring capabilities, it provides a precise and actionable data intelligence tool that’s ideal for use in service commissioning or break/fix scenarios.

For more information contact Chris Nel, Lambda Test Equipment, +27 (0)12 349 1341, chris@lambdatest.co.za.
A new approach to turnkey industrial PC systems

Accordingly, a strongly focused market approach prevails in the offering of application-ready systems. It seems that manufacturers are forced to compromise: it is either robust design or high performance; either compact size or configurable I/O; either modular or inexpensive.

The resulting systems out in the market differ to a large extent. Most of them, and at least anything called a ‘box PC’, have their own design with a rather rigid set of functions. Despite that, vendors seem to follow their competition as well as basic market trends regarding interfaces, housing design and supported temperature ranges. Unfortunately, this leads to a lack in flexibility and modularity.

For a manufacturer focused on board-level products, the most flexible solutions use platforms like CompactPCI or ATX with configurable slots that can ideally be filled from the manufacturer’s own component portfolio. ATX or Mini ATX are built up mostly of PCI cards. More compact platforms like DIN rail PCs require special boards for most systems. In both cases, systems end up rather specialised, which makes them more expensive and less flexible for future extensions.

Unsatisfied with conventional ideas, MEN has raised the bar on turnkey solutions with the goals of ensuring short time to market, easy configuration even with special I/O requirements, a modular approach to save time and costs, and a final system that is ready for harsh environments.

One basic idea that MEN’S standard products have paved the way for is built-to-order (BTO) systems. Computer systems are subject to extreme cost pressure, particularly in industrial areas such as automation. On the other hand, they need to be configurable. They need PCI components and fieldbus options. Ideally, everything has to come off the shelf to optimise the costs, both on the manufacturer’s side and on the customer’s side.

To meet these needs, 19-inch CompactPCI with a standard height of 4U seemed the most solid standard basis, and a more compact system can use only half the horizontal pitch with 40 HP (9.5”). The harder part was to make it configurable in such a way that it can accommodate all kinds of I/O functions along with the PCI cards very common in industrial applications, without having to change the resulting backplane for different configurations.

The backplane for MEN’S resulting industrial PC solution is built around a standard 3U CompactPCI (PlusIO) CPU board. An Intel Core i7 processor brings high CPU performance to industrial applications. This performance is scalable through an existing family of compatible CPU boards and results in lower maintenance and modification costs. The family concept also makes the system long-term available: when an Intel CPU is discontinued, a new compatible CPU card with an up-to-date processor will be in place. The CPU comes standard with two Gigabit Ethernet interfaces, USB and VGA at the front, and connects to high-speed serial interfaces via its PlusIO rear connector.

With such CPU flexibility at its heart, even an industrial PC can cover a broad range of possible tasks, including RAID, NAS, kiosk or data acquisition functions. To implement the actual I/O functions, two CompactPCI and two CompactPCI Serial peripheral cards can be plugged in, plus two PCI or PCI Express cards. These proven and reliable standards ensure the demanded modularity, and allow independence from a single supplier, if necessary. The two PCI/PCIe slots can be equipped with half-length cards for further customised extension.
The industrial PC can be powered by two 6-HP AC or DC power supply units (PSUs) to provide redundancy. An uninterruptible power supply (UPS) guarantees continuous operation, or lets the operating system shut down gracefully. A carefully-designed shield controller adds supervision and a status panel. Its mechanical setup allows the system to be wall- or rack-mounted. Cooling can be either by natural convection or by a fan installed in an additional fan tray at the bottom.

While this concept is not brand new, it does take modularity to the extreme. The pool of standard hardware available to build up a specific functionality includes all kinds of I/O for PCI, CompactPCI and CompactPCI Serial such as networking or mass storage, analog and digital I/O, or wireless interfaces. Additionally, MEN has partnered with Hilscher to offer fieldbus interfaces from CANopen, DeviceNet, real-time Ethernet (EtherCAT, EtherNet/IP, Modbus, Powerlink, Profinet, Sercos, Varan) to Profibus on 3U CompactPCI. The supported components have been selected to guarantee a complete range of options from a reliable source.

In terms of power supply, MEN relies on its own experience and is launching a new family of PSUs that emphasise the modular approach. Depending on the market, PSUs can vary greatly. They have to handle a wide range of DC or AC input voltages, for instance. To facilitate certification procedures, the new products will fulfill the railway requirements of different geographical areas. Parallel and redundant modes let the user connect power supplies inside a system to increase availability or power output.

And finally, even the best hardware cannot be called ‘application-ready’ without matching software. This is why the industrial PC always comes with a pre-installed operating system and drivers. If that sounds like a solid base for many tasks, one should never forget how different embedded applications can be. There is no ‘Jack of all trades’ solution. This has never been as true as it is today, with embedded computers finding their way into ever-new fields of use. Engineers need to think outside the box before actually designing it. The footprint of a 19” system may still be too large, its cooling concept may not work in restricted surroundings, or its housing may not be robust enough. MEN engineers have considered these aspects as part of their vision.

To cater to a market that needs robust box PCs and other more dedicated systems, they came up with an impressive roadmap of devices embedded into a clear concept. A growing family of off-the-shelf box computers is one important pillar in this plan.

A number of standardised components can be assembled to build up all kinds of box PCs, allowing for different CPU performance classes from ARM to AMD and Intel, numerous I/O configuration options and scalable housing sizes. A range of standard boxes cover dedicated functional areas to meet cost requirements and fast time-to-market.

An important focus is on in-vehicle PCs complying with EN 50155 for rail and ISO 7637-2 for automotive. One compact box was designed for graphical performance and another slightly larger box comes as an all-rounder for wireless communication. With AMD, or alternatively Intel performance, it is combinable with displays or storage, while PCI Express Mini Cards, SIM card holders and antenna facilities leave the necessary room for configuration of the exact wireless functionality up to LTE (4G) or WLAN / Wi-Fi. A GNSS interface supporting GPS and GLONASS for positioning complements the possibilities.

Also based on AMD are an industrial box PC optimised for cost efficiency and one for storage applications, including hot-pluggable HDD/SSD shuttles. Next up there is a number of Intel-based box PCs for even higher performance in storage and communication functions.

One option for implementing a panel PC is to combine a suitable display and box PC. The box design was already prepared for that, too. What these CompactPCI based systems and box PCs have in common is their modular, family-based design. Many design details are completely dedicated to one package concept, but many functions can be re-used and technologies can be shared between device types.

Plug-on modules like PCIe Mini cards can add wireless or legacy I/O functions and especially fieldbus interfaces. Hilscher’s modular solution for functions from CANopen to real-time Ethernet integrates perfectly into MEN systems, with CompactPCI peripherals and mini cards being based on the same functional unit.

Re-using such units drastically reduces costs. The mentioned, system formats will soon be expanded by a family of routers and switches, available both in box and 9,5” rack-mount CompactPCI format, similar to the different industrial PCs explained above. These are not just application-ready but true turnkey systems. The networking products are designed with one common PCB base. This will yield a complete range of ready-to-use devices optimised for different markets and performance levels.

Besides upcoming application-ready RAID and NAS systems based on CompactPCI, very special systems are also under way for safe train control. These involve sophisticated design according to standards like EN 50128/50129 but use the same modular basis of 9,5” CompactPCI. They are combined with an existing 3U CompactPCI safe rail CPU card, safe rail I/O cards and safe software.

While MEN is not exclusively active in the rail market, this is where the most challenging designs have their origin. All of the system-level products already available or coming up soon benefit from more demanding requirements. Flexibility and modularity not only bring reliable, rugged design and competitive pricing to demanding markets, but also to industrial PC solutions or networking.

The final question is whether even heavily configurable devices can keep up with the off-the-shelf idea.

Even with a radically modular concept, can one just ‘click and place’ components online and put the system into a shopping basket for ordering?

Yes and no, in a way. ‘Complicated’ is an attribute that does not sound desirable for a system that promises easy configuration, but a truly optimised solution deserves some degree of complexity.

Customers face full racks of devices in all flavours in the embedded supermarket. By understanding its customers’ needs, MEN’s solution can still put a customer’s system on their desk and in their project in a very short time, but without the hassle of worrying about which components really match.

For more information contact Rugged Interconnect Technologies, +27 (0)21 975 8994, sales@ri-tech.co.za

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FEATURE

INDUSTRIAL & EMBEDDED COMPUTING & NETWORKING

The SFP transceivers are suited for fibre transmission systems up to 1,06 Gbps fibre channels. The device has a hot-pluggable footprint and comes standard with a built-in diagnostic function.

The module is fitted with a 1310 nm Fabry-Perot laser transmitter, and is well suited for fibre transmission systems up to 10 kilometres in length. The SFP transceivers are compatible with the Small Form Factor Pluggable Multi-Sourcing Agreement (MSA).

Digital diagnostics functions are available via the 2-wire serial bus specified in the SFP MSA.

Finisar SFP modules are compatible with most network equipment manufacturers' products, including Cisco, Intel, IBM, Dell, Juniper, Huawei, ZTE, Gigabit and others.

For more information contact Conical Technologies, +27 (0)12 347 3035, finisar@conical.co.za

SFP module for Gigabit Ethernet

Finisar announced the release of the FTLF1318P3BTL bidirectional SFP module for advanced telecommunication and industrial systems. This SFP module has a data rate of up to 1,25 Gbps on 1000Base-LX Ethernet and 1,06 Gbps fibre channels. The device has a hot-pluggable footprint and comes standard with a built-in diagnostic function.

The module is fitted with a 1310 nm Fabry-Perot laser transmitter, and is well suited for fibre transmission systems up to 10 kilometres in length. The SFP transceivers are
Miniature COM-based SBCs

Diamond Systems unveiled its ultra-small COM-based Zeta single-board computer family. Highlights of the Zeta family include interchangeable COM Express modules for scalability and long product life, and extensive I/O, including a complete high-quality analog and digital data acquisition subsystem.

Designed in the COM Express Mini Type 10 form factor (84 x 55 mm), the Zeta family offers performance scalability due to its use of COM Express CPU modules. Three processor options are currently available: Intel ‘Bay Trail’ E3825 dual-core 1.33 GHz CPU with soldered 2 GB RAM; Intel ‘Apollo Lake’ E3940 quad-core 1.60 GHz CPU with soldered 4 GB RAM; Intel ‘Apollo Lake’ N4200 quad-core 1.1 GHz (burstable to 2.5 GHz) CPU with soldered 8 GB RAM.

Zeta’s I/O list includes a VGA display and single-channel LVDS port, dual Gigabit Ethernet, 4x USB 2.0 Ports plus 1x USB 3.0 port, 4x RS-232/422/485 ports with software-programmable protocol and termination, 16x digital I/O lines, optional complete analog and digital data acquisition system, and integrated wide-range power supply for 24 V d.c. or 110 V d.c., according to class S2. In addition the internal electronics are protected against dust and humidity by conformal coating, are designed to operate in a temperature range from -40°C to +70°C (+85°C for 10 minutes according to class TX) and are firmly soldered against shock and vibration. By default, the panel PC, based on the T40E AMD dual core processor, communicates via 2x Ethernet, 1x USB, 1x audio, GPIO and a serial interface, which are all accessible via M12 connectors on the rear. Furthermore, a PCI Express Mini Card interface and an M.2 slot are available, for instance to control wireless communication functions like 2G, 3G, 4G, WLAN or GPS. Also, two micro-SIM slots with dual-SIM functionality are available. The DC17 can flexibly connect to an MV8 (Multifunction Vehicle Bus) train network, by using a PCI Express Mini Card with either master or slave support.

For more information contact Rugged Interconnect Technologies, +27 (0)21 975 8894, sales@ri-tech.co.za.

Railway-compliant panel PC

The robust panel PC, DC17, was specially developed by MEN for railway applications, and offers everything that is needed for immediate use in a train: EN 50155 conformity, an IP65-protected housing, a 12,1” display with touch screen, flexible I/O, wireless functionality and an extended temperature range from -40°C to +70°C.

The DC17 is used in demanding HMI applications in the railway market, e.g. for surveillance and status control of train functions, for speed optimisation, for fleet management, for driver assistance systems or CCTV. The compact housing comes with an IP65 compliant front and offers enough space for a 12,1” impact-resistant XGA TFT LCD display with LED backlight. Together with 1024 x 768 pixels resolution and the projected capacitive touch screen, the DC17 is still readable and easy to use even when exposed to sunlight, such as in a driver cabin.

Compliant to the EN 50155 standard, the robust display computer comes with an integrated wide range power supply for 24 V d.c. or 110 V d.c., according to class S2. In addition the internal electronics are protected against dust and humidity by conformal coating, are designed to operate in a temperature range from -40°C to +70°C (+85°C for 10 minutes according to class TX) and are firmly soldered against shock and vibration.

For more information contact Rugged Interconnect Technologies, +27 (0)21 975 8894, sales@ri-tech.co.za.

VPX carrier board for FMC/FMC+ modules

Pentek recently introduced the JadeFX Model 5983, a 3U VPX carrier board for FMC and FMC+ modules based on the high-performance Xilinx Kintex Ultrascale FPGA.

The board includes a VITA-57.4 FPGA site providing access to a wide range of I/O options. When combined with any of Pentek’s Flexor FMCs to create a FlexorSet, it becomes a complete multichannel data conversion and processing subsystem suitable for connection to IF, HF or RF ports of a communications or radar system.

Model 5983 is the carrier foundation for a new series of FlexorSets capable of hosting FMC and FMC+ modules. The list of enhancements includes: 1.5x higher performance utilising 15% less power with the Kintex Ultrascale FPGA; 2.8x increase in FMC bandwidth potential with the new FMC+ standard; 1.5x faster memory transfer rate with 9 GB of DDR4 SDRAM; optional GPS for precise data tagging for time and position; optional 12 GB/sec VITA-66.4 optical backplane I/O; and Navigator BSP and FDK for streamlined IP development.
Würth Elektronik eiSos adds more connectors to catalogue

Würth Elektronik eiSos has released a new expanded catalogue of electromechanical components weighing in at 1098 pages thick.

The board-to-board connectors boast additions to the WR-BTB and WR-PHD product families, both of which are specially designed for SMT assembly and to withstand the heat of the reflow soldering oven. Also released are connectors for data connections that can be used between the cable and circuit board: the REDFIT IDC SKEDD connector. The patented connection technology of this plug enables space-saving, solder-free and reversible signal connections. The plugs get by without jacks, as contacted drilled holes in the board are sufficient. The product range of USB plugs has been expanded with a series of through-hole and surface-mount variants, so now there are products for both assembly processes. Low-profile modular jack variants with and without LED have been supplemented, too. The product group of terminal blocks has grown and a series of particularly compact solutions has been added to the switches and keys. In the field of connection technology, the portfolio has been expanded with another SMD spacer with additional dimensions.

The catalogue of electromechanical components can be ordered free of charge from the Würth Elektronik eiSos website. All components featured in the catalogue can be ordered from stock anytime and no minimum order quantity is needed.

For more information contact Jason Page, Würth Elektronik eiSos, +27 (0)71 259 9381, jason.page@we-online.com.

Rectifier chip diodes

Bourns announced the release of ten new rectifier diode series for general applications, addressing the needs of portable electronics, communications, computing and video equipment manufacturers that are challenging the semiconductor industry to develop increasingly power efficient solutions with smaller electronic components.

The new device families include Schottky barrier, fast response and high voltage rectifiers with reverse voltage ratings of up to 1000 V and forward current ratings of 1 A, 2 A or 3 A, depending on the device in question.

Model CD214A-Bxr series devices are available in a compact low-profile SMD package, measuring 4.5 mm x 2.2 mm x 0.96 mm and intended to be mounted directly onto an FR4 printed circuit board. The devices fit the SMA (DO-214AC) footprint.

The Model CD214B-BxR and CD214B-F sx series are available in an SMD package measuring 5.2 mm x 3.6 mm x 1.1 mm and intended to be mounted directly onto an FR4 printed circuit board. The devices fit the SMD (DO-214AA) footprint.

The Model CD214C-BxR, CD214C-Fsx and CD214C-Sx series are available in an SMD package measuring 8.0 mm x 5.0 mm x 1.1 mm and intended to be mounted directly onto an FR4 printed circuit board. The devices fit the SMC (DO-214AB) footprint.

Each of the series is RoHS-compliant and halogen-free.

For more information contact Electrocomp, +27 (0)11 458 9000, andrew@electrocomp.co.za.
Available from thermal profiling specialist, ECD, is a range of PCB carriers for securely holding small- to medium-sized circuit boards of almost any shape and up to six Temprobes for thermal profiling.

All board carriers feature four adjustable arms, two of which can be pivoted and locked to position the board in the middle of the frame. The two opposing arms are spring loaded to grip the board firmly and to permit quick board replacement. Large board carriers have two additional long arms to support the leading and trailing board edges.

All carrier arms can be repositioned along the side rails to adapt to the length of the circuit board. Standard and large size carriers are available for reflow and wave solder applications. For wave solder machines, board carriers are manufactured of clear, hard anodised aluminium for resistance to flux.

For more information contact Electronic Industry Supplies, +27 (0)11 726 6758, hreispty@africa.com

Creating proof of concept prototypes, working prototypes and demonstration models are some of the most common commercial uses of FDM 3D printing. FDM, or fused deposition modelling, is a low-cost form of 3D printing and is commonly used for creating all sorts of models and prototypes. It is the form of 3D printing used by hobbyists in homemade machines from plans available on Github and other websites. There are also many commercially available machines on the market.

Unfortunately, most of the machines available have relatively small build volumes, i.e., the size of the model that they can create. Typically, this is about 200 x 200 x 300 mm which is small for any commercial use. In many cases prototypes are larger than this and have to be printed in multiple parts and glued together, which is not entirely satisfactory.

To overcome this obstacle, the CR-10 from Creality comes in three sizes of build volume, the smallest being 300 x 300 x 400 mm, the next size being 400 x 400 x 400 mm and the largest 500 x 500 x 500 mm. It comes partially pre-assembled and takes less than 30 minutes out of the box to assemble and start printing. A YouTube video of the assembly and testing can be viewed at https://goo.gl/4oYVz8.

For more information contact Henry Hugo, Centurion Micro Electronics, +27 (0)83 581 4549, henry@cme.co.za.
Cables for RF testing

A new range of semi-rigid RF/microwave cables and assemblies is available from Huber & Suhner that offer ultra-high frequency of more than 26 GHz.

Key products in the range are the high-quality flexible Sucoflex 126E coaxial cable assemblies, which are designed to provide enhanced optimal performance at up to 26,5 GHz (depending on connector interface choice) with excellent return loss. The cables are ideal for applications that require electrical stability and low loss, such as in test and measurement and defence systems. They also feature a blue polyurethane (PUR) outer jacket, which offers excellent chemical and abrasion resistant properties and advanced protection in the most hostile environments including those with wide temperature ranges from –40°C to +85°C. The high-grade assemblies are available in various lengths and connector types, including 500 mm and 1000 mm lengths.

The range now also includes the Minibend 50 Ω SMA plug-to-plug cable assemblies. These are designed for applications requiring low-profile connections between RF modules within communication systems. Available in 7,5 cm, 15 cm and 30 cm versions, the triple shielded cables have a robust high-temperature FEP outer jacket, stainless steel outer braid and an aluminium/polyimide barrier tape.

Also available are the TLP-P 11716 high-flex test leads, which are 50 Ω TL-P passive intermodulation (PIM) test assemblies. They are constructed from chemical-, oil- and abrasion-resistant TPU armoured cable for protection in hostile environments, and also include moulded protection between connector and cable supporting IP67 ingress protection, when mated correctly. The optimised 4 GHz test leads are available in many various lengths and connector configurations.

Alternative test leads include the Sucotest ST18A armoured cable assemblies, which are 50 Ω flexible leads that offer excellent electrical performance combined with low insertion loss, stability and exceptional return loss. Ideal for heavy duty and outdoor applications up to 18 GHz, the assemblies are designed for a range of applications including the testing of wireless communication infrastructure, and are available in a variety of lengths and connector configurations.

The portfolio also includes IP68-rated black silicone universal weather protection boots for LISCA jumper cable assemblies. They are designed to protect jumpers between antennas and remote radio heads from the ingress of water, contamination and corrosion.

For more information contact Andrew Hutton, RF Design, +27 (0)21 555 8400, andrew@rfdesign.co.za.

| Cellular/GNSS passive monopole antenna |

The compact TG.08 with hinged rotatable Fakra Code D connector is a monopole antenna for automotive telematics applications that provides wide coverage among cellular and GNSS frequencies and offers impressively high efficiencies.

Designed by Taoglas to fit in crowded device environments, the antenna’s robust brass hinge enables it to be oriented in all directions, allowing users to maximise performance with minimum effort. The Fakra connector gives additional mechanical robustness over a traditional SMA connector since it locks securely with its mate and will not come loose due to vibrations or impacts.

This 72 mm long monopole antenna has good efficiency in the 700 MHz to 2700 MHz range, covering the 2G/3G/4G bands, as well as GPS/GLONASS/BEIDOU. When connected to a ground plane, it can achieve up to 75% efficiency at GPS and LTE bands.

With its cellular and GNSS function, plus compact design, the TG.08 is well suited for routers, vehicle tracking devices, telematics devices and remote monitoring systems. It is also ideal for use in cellular modules with Assisted GPS functionality that can be implemented in various devices.

As with all monopole antennas, it works best when connecting directly to the ground plane of the device main-board or to the device’s metal enclosure. For optimum radiation efficiency care should be taken to keep the radiating element of the antenna as far away from metal as possible.

For more information contact Andrew Hutton, RF Design, +27 (0)21 555 8400, andrew@rfdesign.co.za.

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Analog Devices announced a series of five high-performance inertial measurement units (IMUs) that address the navigation- and safety-related needs of industrial applications in several emerging markets, while also reducing their system complexity and cost. The ADIS16470, ADIS16475 and ADIS16477 deliver performance improvements in the smallest size with standard surface mount assembly, while the ADIS16465 and ADIS16467 offer similar performance advantages in a more ruggedised enclosure option. All of the IMUs provide six degree-of-freedom sensing via triple-axis MEMS-based accelerometers and gyroscopes, and allow systems to characterise motion accurately despite turbulence, vibration, wind, temperature and other environmental disturbances.

Arrow Altech Distribution, +27 (0)11 923 9600.

u-blox released SARA R412M, an LTE Cat M1, NB IoT and quad-band 2G (EGPRS) module with worldwide coverage. Measuring just 16 x 26 mm, the module can operate in Cat M1, NB IoT or EGPRS single mode, or as a preferred connection that does not require a module reboot to switch between modes. It allows developers to select their own desired frequencies and operator configurations, and ensures data integrity between applications via secure communication protocols, notably including two-way authentication between client and server, a strategy often utilised with cloud services. Critical firmware updates can be delivered with over-the-air updates that utilise LWM2M, a light and compact protocol that is ideal for IoT applications.

RF Design, +27 (0)21 555 8400.

The SKY68001-31 from Skyworks is a hybrid, multi-band, multi-chip RF front-end (RFFE) module supporting cellular LTE Cat M1/Cat NB1 (half-duplex system) transceiver platforms. The module integrates the entire RF front end necessary for an LTE multi-band radio operating in low-band B5/B8/B12/B13/B17/B18/B19/B20/B26 and mid-band B1/B2/B3/B4/B25/B39/B66 frequencies, including Rx low-pass filters, broadband PA with bias controller, Tx low-pass harmonic filter, antenna switch and MIPI RFFE controller. Cost-optimised for low-data-rate applications, the device comes in a 4 x 5 x 0,9 mm package. Two additional Aux ports offer greater flexibility for more bands on the Tx or Rx path.

Hi-Q Electronics, +27 (0)11 894 8083.

Texas Instruments has introduced the industry’s smallest op-amp and low-power comparators at 0,64 mm², housed in the compact X2SON package. With a high gain bandwidth of 10 MHz, fast slew rate of 6,5 V/µs and low-noise spectral density of 10 nV/√Hz, the TLV9061 op-amp is designed for use in wide-bandwidth, high-performance systems. The TLV7011 family of nanopower comparators delivers fast response time with propagation delays down to 260 ns. Both devices support rail-to-rail inputs with low-voltage operation down to 1,8 V, enabling ease-of-use in battery-powered applications.

EBV Electrolink, +27 (0)21 402 1940

Dialog Semiconductor launched the GreenPAK SLG46824 and SLG46826, the market’s first configurable mixed-signal ICs that support in-system programming using a simple I²C serial interface. This streamlines the development process as it allows the installation of an un-programmed GreenPAK on the PCB, and supports programming of the non-volatile memory (NVM) in-system, for easy system checkout. Available in a 2,0 x 3,0 mm 20-pin STQFN package, both chips are equipped with low power consumption analog and digital resources like analog comparators, an internal voltage reference, power-on reset, and more advanced digital resources, like multi-function macro-cells.

Future Electronics, +27 (0)21 421 8292.

A new microcontroller (MCU) from Microchip combines specified radiation performance with the low-cost development associated with commercial off-the-shelf (COTS) devices. The AtmegaS64M1 meets the needs of ‘NewSpace’ and other critical aerospace applications which require faster development and reduced costs. The new device joins the AtmegaS128, a radiation tolerant MCU that has already been designed into several critical space missions including a Mars exploration plus a megaconstellation of several hundred Low Earth Orbit (LEO) satellites. The COTS version of the device can be used to begin development of hardware, firmware and software, and replaced with the radiation tolerant model at the prototype or production stage.

Tempe Technologies, +27 (0)11 455 5587

The SKY68001-31 from Skyworks is a hybrid, multi-band, multi-chip RF front-end (RFFE) module supporting cellular LTE Cat M1/Cat NB1 (half-duplex system) transceiver platforms. The module integrates the entire RF front end necessary for an LTE multi-band radio operating in low-band B5/B8/B12/B13/B17/B18/B19/B20/B26 and mid-band B1/B2/B3/B4/B25/B39/B66 frequencies, including Rx low-pass filters, broadband PA with bias controller, Tx low-pass harmonic filter, antenna switch and MIPI RFFE controller. Cost-optimised for low-data-rate applications, the device comes in a 4 x 5 x 0,9 mm package. Two additional Aux ports offer greater flexibility for more bands on the Tx or Rx path.

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