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In the age of IoT, embedded designers are benefiting from the opportunities created by edge computing. By putting more processing power at the edge of the cloud, power consumption can be reduced, battery life can be extended, and designers can get more sophisticated algorithms at the sensor and the gateway. Find out how on page 24.

For more information contact TRX Electronics, authorised Mouser partner in South Africa, +27 (0)12 997 0509, info@trx.com.
SA’s focus on AI

Artificial intelligence (AI) is working its way deeper into more and more aspects of our daily lives. The newest generation of smartphones are coming out with specialised processors dedicated to performing AI tasks.

Internet companies like Google and Facebook are using complex AI algorithms to tailor the content they deliver to suit each individual’s interests and preferences.

The more advanced AI becomes, the less likely we are to even notice it’s there, and the more the lines become blurred between ‘real’ and ‘artificial’ intelligence. The goal, as it should be with any technology, is ostensibly to make our lives better, but to many of us there is something fundamentally disconcerting about the prospect of machines rivalling – or even surpassing – the power of human thought. There are also purely practical concerns about AI and the ways it can be used.

The first and most often talked about danger of AI is the risk that it will usurp people’s jobs. The more advanced the technology becomes, the better it will become at being able to automate many of the tasks performed by humans. Those who are working at the leading edge of advancing AI are quick to assure the public that it is meant as a way of augmenting, rather than replacing, the roles of people – but then they would, wouldn’t they? It wouldn’t do to have the populace becoming biased against the very thing they’re in business to develop.

Another danger comes in the form of actual physical harm. Military drones are at the extreme end of this spectrum, seeing as how inflicting damage is at the very core of their purpose. Perhaps more worryingly, though, is the prospect that even AI deployed with good intentions can either be manipulated or simply fail, with potentially lethal consequences. Autonomous vehicles – the poster child of the AI revolution – came under negative scrutiny for just such an occurrence recently, when an Uber self-driving car hit and killed a pedestrian in Arizona, USA.

Silicon Valley tech giants do not have a monopoly on AI development, however. CNN’s Marketplace Africa programme recently explored the potential impact AI could have on South African businesses and industry. In the televised segment, the work of the University of Johannesburg (UJ) was highlighted, with vice chancellor Tshilidzi Marwala boasting that the institution has the largest concentration of people with PhDs in AI, and is the leading centre for AI, on the African continent.

Cape Town, a city that is widely considered as a leader in South Africa’s adoption of ‘smart city’ technologies – a key area for AI – recently hosted an event welcoming SA into the global City.AI community. City.AI is a non-profit organisation that gathers AI practitioners on a quarterly basis across more than forty cities, to share challenges and lessons in applied AI.

Deep learning (while not quite the same thing as AI) has also been the subject of a major development at Johannesburg-based ASIC Design Services. The company has developed a framework for implementing deep learning on FPGAs, and exhibited the technology at this year’s FPGA Design Symposium in the USA as well as at Embedded World in Germany. Robert Green, who presented a paper on the framework at the FPGA Design Symposium, writes about its development in his article on page 26.

AI will inevitably come to disrupt many industries in South Africa, just as it will across the rest of the world. We might as well embrace it.

From the editor’s desk
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**South Africa**

- The CEO of Denel Land Systems (DLS), Stephan Burger, has resigned after a 36 year career at the state-owned defence conglomerate. He will be replaced in an acting capacity by Ismail Dockrat, head of the organisation’s maritime division. Burger moved through various leadership positions until he was appointed CEO in 2004, since which time he grew the DLS division’s turnover from R280 million to R3 billion.

- The Council for Scientific and Industrial Research (CSIR) has warned the public about a scam aimed at exploiting young people by promising them unfounded job placements at the organisation. Apparently two individuals calling themselves Stephen and Sherinne have been setting up fake interviews with job-seeking young ladies, only to demand sex from them in order to secure the job. In a public statement, the CSIR urged candidates to be extra cautious when approached through social media platforms, and confirmed that any meeting pertaining to its legitimate recruitment process will take place at the CSIR’s offices.

- Electrocomp has been appointed as the local distributor for Coilmaster Electronics and Schaffner. Coilmaster is a professional supplier of magnetic components including high-performance power inductors, high-current inductors, power chokes, common mode chokes, chip inductors, LAN magnetics and custom designed parts to customer specifications. Schaffner is an international leader in the fields of electromagnetic compatibility, power quality and power magnetics, with component solutions for efficient and reliable use of electric energy.

**Overseas Business**

- Full-year 2017 consolidated net sales for Renesas Electronics were 781.5 billion yen (about $7.35 billion), up 22.3% year-on-year. On a year-on-year basis, semiconductor sales increased by 23.4%, marking a successful end to a year that saw the company integrate Intersil into the fold, and recover from the impacts of the Kumamoto earthquake that occurred the year before. Automotive sales increased by 13.8% year-on-year, while industrial and broad-based sales increased by 15.7% and 12.9%, respectively.

- Bloomberg has reported that inside sources at Apple have said the company is planning to stop using Intel processors in its Mac computers from as early as 2020. Such a move has long been rumoured, and forms part of Apple’s larger strategy of in-housing processor production to its own ARM-based technology. The (unconfirmed) news immediately damaged Intel’s finances, sending its share price falling by more than 6% on 2 April, the day the news broke.

**Companies**

- Würth Elektronik eiSos has joined STMicroelectronics’ partner programme – an initiative aimed at speeding customer development efforts by identifying and highlighting companies with complementary products and services. Würth’s customers can now use the ST programme to find the products and services they need for their operations. It includes, for example, storage chokes and filters included as components in ST reference designs which have been fully tested and can be used directly in other projects.

**Industry**

- The Semiconductor Industry Association (SIA) announced worldwide sales of semiconductors reached $36.8 billion for the month of February 2018, an increase of 21.0% compared to the February 2017 total, but 2.2% lower than the January 2018 total as befits typical seasonal market trends. Year-to-year sales increased significantly across all regions: the Americas (37.7%), Europe (21.7%), China (16.4%), Asia Pacific/All Other (16.2%) and Japan (15.5%).

- Combined sales for optoelectronics, sensors and actuators, and discrete semiconductors (known collectively as O-S-D) increased 11% in 2017 – more than 1.5 times the average annual growth rate in the past 20 years – to reach an eighth consecutive record-high level of $75.3 billion, according to IC Insights. Total O-S-D sales growth is expected to ease back in 2018 but still rise by an above-average rate of 8% in 2018 to $81.1 billion. In 2017, optoelectronics sales recovered from a rare decline of 4% in 2016, rising 9% to $36.9 billion, while the sensors/actuators market segment registered its second year in a row of 16% growth with revenues climbing to $13.8 billion, and discretes strengthened significantly, increasing 12% to $24.6 billion.

**Technology**

- FPGA maker, Xilinx, has unveiled a new product category called Adaptive Compute Acceleration Platform (ACAP), which it is hailing as “revolutionary” and “far beyond the capabilities of an FPGA.” An ACAP has – at its core – a new generation of FPGA fabric with distributed memory and hardware-programmable DSP blocks, a multicore SoC, and one or more software programmable yet hardware adaptable compute engines, all connected through a network on chip (NoC). The technology has been under development for four years at an accumulated R&D investment of over $1 billion, and the first product family, code-named Everest, will tape out later this year.
Graduating with a qualification in engineering is difficult enough at the best of times, but the University of Cape Town (UCT) has shared the story of one particularly inspiring student who overcame overwhelming odds to complete his engineering studies.

As a child, Nkululeko Dlamini attended a poorly resourced school east of Johannesburg, where he was part of a feeding scheme. When he came to UCT, he struggled with English, and the death of his mother was a huge setback. Without financial resources, he was sure he would never graduate. Then one day the third-year student was found sleeping in an engineering lab – thin, hungry and penniless with his meagre belongings crammed into a small backpack.

At that point, the university's faculty of engineering and the built environment (EBE) put its Student in Distress Fund to good use in helping him put his life back together and complete his studies, with the personal help of academic mentor Ernesto Ismail. UCT points out that sometimes it's a fee deficit as small as R6000 that stands between a student being able to graduate and stalling at the finish line, and it is specifically for cases like this that the fund was established.

Dlamini, who now works for a state owned national energy utility entity, is grateful to the faculty for everything and for the big role it played in his life. “Today I am the person I am because the faculty believed in me. This is the beginning of my career and I will grab the opportunity with both hands and ensure that I will continue developing myself to become one of the greatest leaders in the country,” he said.

Last year the fund assisted 76 engineering students with their individual needs, at a cost of R383 000. Some aid was provided as a once-off, while other funding assisted students over a longer period, says faculty marketing and communications manager, Mary Hilton, who administers the programme.

Funds were used for fee deficits, laptops, stationery, books, transport, rent and vouchers for toiletries, medicine and food.

Hilton added: “This year we bought seven laptops for students who were living off campus and found it difficult to access information during the student protests. Several Zimbabwean students were unable to get money out of Zimbabwe, and we assisted with rent and food. All the students who have been assisted are eager to give back to the fund once they are on their feet and earning money.”

The faculty relies on 21 regular benefactors in alumni, friends and staff for the funding. They also received a donation from industry and R100 000 from the Vice-Chancellor’s Challenge Fund. The Student in Distress Fund was launched in 2015 with a fundraising campaign, supported by the faculty’s student council, which raised R6 600 from fellow students. Staff and alumni also assisted and the fund was able to help its first six students.

Hilton provides a backdrop: “With the poor economic climate, the changes in the criteria for NSFAS funding and family circumstances that change, there are a number of EBE students who find themselves with no money for food, accommodation, or just basic necessities.”

Two other EBE students who were assisted through the faculty's fund also graduated this year. The graduation ceremonies took place between 3 and 10 April 2018.

For more information contact Angelique Botha, University of Cape Town, +27 (0)21 650 2583, angelique.botha@uct.ac.za.

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Smart grid management system developed by Cape Town company

Based in Cape Town, CT Lab is a technology company specialising in the monitoring and management of electrical networks in the energy distribution, facility and industrial sectors. The company offers measurement devices and software, data hosting and associated support services that include product, operations and specialist subject-matter training.

The challenge
According to independent telecommunication research company BuddeComm, energy consumption is expected to grow worldwide by more than 40% over the next 25 years, with demand in some parts of the world increasing by more than 100%. This will produce an increase in competition for resources, making the development of smart grid infrastructure to improve energy efficiency and sustainability even more important.

CT Lab’s suite of multifunction, clock synchronised measurement platforms, combined with its web-based data hosting and visualisation platform called Osprey Pro, provide energy distribution network operators, facility managers and industrial plant operators with an unprecedented level of penetration and visibility into the complex behaviour of their electrical networks to improve grid management and overall efficiency.

“Without our products, our customers fly blind,” explained Willie van Wyk, founder and CEO of CT Lab. “They would have very limited visibility into the performance of their networks.” According to van Wyk, access to a large variety of real-time data at the measurement point is needed to actively manage the complex behaviour of energy networks. CT Lab’s tools assist clients in making strategic, data-driven decisions on various aspects of their smart grid implementations.

To deliver real-time, clock synchronised data from multiple measurement points in different locations, the company requires reliable data connectivity that works at indoor facilities and in the field. Initially offering a solution that included a separate Wi-Fi router and cellular module, CT Lab wanted to streamline its solution and provide additional battery support for communications functions. Since the company sells into numerous countries, with plans to expand to even more geographies, it needed an embedded solution that was not only reliable and scalable across cellular technologies, but also across the many network providers used worldwide.

Sierra Wireless IoT solution
Having worked with Sierra Wireless cellular modules for its previous offering, CT Lab didn’t hesitate to move forward with the Sierra Wireless AirPrime HL Series of IoT modules for its next-generation Vecto III multi-function power quality analyser. The collaboration was facilitated by Arrow Altech Distribution, an authorised Sierra Wireless distributor for South Africa.

The HL Series offers exceptional scalability between 2G, 3G, 4G LTE and low-power wide-area (LPWA) cellular networks to connect global IoT deployments with a single module. Along with the Sierra Wireless modules, CT Lab relies on the free unlimited firmware-over-the-air updates available via Sierra Wireless’ AirVantage FOTA Edition to keep its devices updated, ensuring they remain connected and secure.

“We used a Sierra Wireless embedded module on MikroTik routers for many years in the field; the performance was rock-solid,” said van Wyk. “Sierra Wireless specialises in the field of cellular communication. The solution they offer is end-to-end and provides a complete range of modules that can be deployed internationally onto most networks.”

CT Lab’s Vecto III analyser also offers multi-function measurement capabilities supporting energy measurement, power quality, SCADA, digital fault recording and micro synchrophasors in a single device; permanent ±100 ns clock synchronisation on each measurement device that can be used to automate the generation of newly derived network-wide performance data; scalable data storage; and mobile-friendly web interface with live dashboards and alarm engine supporting email, SMS and push notifications that deliver detailed diagnostic and performance data to selected individuals in real-time.

Results
Analyst firms measuring the smart grid technologies and services market put the value between $502 and $753 billion by 2022, with growth driven by spiralling energy consumption, ageing and inefficient grid infrastructure and favourable regulatory environments.

“As managing electrical networks becomes more digitised, data-driven, decentralised and strategic, CT Lab’s online big data supported monitoring and management solution is ideally positioned to assist operators to gain visibility and to actively manage their networks,” said Dr Elsa Lombard, head of education and training at CT Lab.

In addition to being the supplier of choice in the Southern African region since 1993, CT Lab recently won the national tender to supply Eskom with measurement devices for the next three years. With the addition of the Vecto III analyser to its measurement platforms, CT Lab will be able to expand its reach to other geographies without needing to customise for network compatibility, speeding time-to-market and enabling it to take advantage of the current push for smart grid growth.

For more information contact Gyula Wendler, Arrow Altech Distribution, +27 (0)11 923 9709, gwendler@arrow.altech.co.za.
Phoenix Contact upgrades Cape branch

Phoenix Contact recently held the official opening of its newly upgraded premises in Bellville, in the Western Cape.

According to national sales and marketing manager, Dereck Styane, the upgrade is in line with the philosophy and growth strategy of continually investing in buildings and people throughout the world. “We at Phoenix Contact ZA continue to do this in our own market. On the back of continued growth in the Western Cape over the last few years we felt it was well overdue to expand our operation and to revamp the facilities,” he stated.

“We are very proud of our new offices which boast a state-of-the-art boardroom and training facility, and an enlarged logistics area to accommodate our increased stock inventory. Added to this is a workshop/testing facility as we can now offer increased engineering advice and capabilities through our recently appointed applications engineer.

“It also shows our commitment to the Western Cape region in developing and growing our business in the region. We are looking forward to many good things in the Cape, one of which we pray is the much-needed rains.”

For more information contact Sheree Britz, Phoenix Contact, +27 (0)11 801 8200, sbritz@phoenixcontact.co.za.
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SPECIALISED EXHIBITIONS MONTGOMERY
A new standard has been developed to enable open, non-proprietary and vendor-independent machine-to-machine communication in SMT assembly lines. The Hermes Standard was officially launched at Productronica 2017, during which time the body responsible for its creation – the Hermes Standard Initiative – also held its first formal meeting.

Based on TCP/IP and XML, Hermes provides flexible data structures to seamlessly exchange all essential types of board-related data such as dimensions and different ID types. Keeping track of every board being assembled is therefore possible without the need for repeatedly reading barcodes or other ID tags again at each machine.

The standard can be adopted by any equipment manufacturer without any licence fee, and already counts nearly 30 vendors among its members, with around a dozen more having committed to join at the next meeting. Version 1.0 was released in April 2017, providing an impressive set of board flow management functions, and future versions will further grow other functionalities, step by step implementing more and more smart processes into electronics manufacturing.

According to the Hermes Standard Initiative, it chose to go the route of an open initiative rather than an IPC working group in order to allow all members to be fast and close to the application. The initiative members can focus on driving the content of the standard rather than struggling with a cumbersome standardisation process.

For electronics manufacturers interested in taking advantage of the benefits the Hermes Standard offers, initial solutions based on the protocol were already presented at Productronica 2017. In addition to that, some initiative members are planning to provide upgrade kits for their existing equipment in the field to support this new standard.

The Hermes Standard Initiative emphasised that the standard drives horizontal integration along the SMT line, rather than vertical integration from the SMT line to an MES. It is not in conflict with IPC’s CFX and Mentor’s OML protocols, but should rather be viewed as a complementary technology for complex production environments. In simpler environments with less demand in terms of process data, traceability, process interlocking etc., the Hermes Standard can, however, act as a standalone solution.

The Hermes standard specification and a test driver are available for free download from the Hermes Standard Initiative’s website.

For more information visit www.the-hermes-standard.info.
Connectivity and reliable power – the keys to Africa’s 4th Industrial Revolution

If you are in the electronics manufacturing and production industry, you will be familiar with two buzz words that affect and apply to you more than most: the Internet of Things (IoT) and the 4th Industrial Revolution.

Electronics designers, inventors and engineers need to think in terms of IoT integration for the enhancement of industrial and manufacturing processes or technologies.

A great way to simplify the above two buzz words is this: IoT is a small gear you can turn and turning it moves a massive wheel – an industrial revolution – the 4th Industrial Revolution. IoT is but a single gear that works with other gears for the full revolution. That said, when looking at the design of electronic solutions, it is essential to look at solutions from this level of thinking. This is the edge and your longevity.

As African business owners, inventors, scientists and entrepreneurs, where do we start and how do we get to this level of thinking? How do we use technology to leapfrog as a country and a continent? The simple truth is, we need to involve more minds, many more minds from across the country and the continent. They are the solution to uniquely African problems. Many of the answers will also have global potential. It is not only financially lucrative, but it also changes lives for the better and creates opportunities.

So where do we begin? There are two essential catalysts we must put in place to maximise our opportunities as a continent. The first key is connectivity. A connected continent can solve problems faster and innovate more rapidly. The African Union acknowledges that the continent’s weak data ecosystem needs to be addressed. African countries such as Zambia see this and are growing the market with new mobile licences following their revised telecoms law. Zambian communications minister Brian Mushimba says he is doing this to attract investors and create job opportunities.

With the connection comes the much-needed education for innovation. However, is merely being connected going to lead to knowledge? In the late nineties, Indian entrepreneurs set up the Hole in the Wall project. Young kids in this project got access to a computer in the wall and figured out how to use a PC on their own - and then taught other kids. This and other projects have allowed India to leapfrog the world and they are leading the global programming charge.

Thanks to groups such as SatADSL’s Safari
satellite project, Qualcomm, NetHope and others, remote wireless technology is becoming more accessible to communities, development groups and tourists. Imagine the potential we could harness if we as business owners, investors and philanthropists made connectivity, knowledge, and electronic components and peripherals available to remote parts of the country and continent that are connected via satellite and cable.

This leads to the second catalyst – mobile, reliable power.

Mobile, reliable power – Forbatt lead-acid batteries lead the way

Our opportunities in the 4th Industrial Revolution are dead in the water without reliable and portable power. However, thanks to incredible innovations and improved production techniques, solar energy has become an increasingly affordable solution for a continent with an abundance of the vital ingredient: sunshine.

Companies such as Forbatt SA, manufacturer of the Forbatt range of lead-acid batteries, has built some of the most reliable batteries for the energy storage and use on demand. Forbatt lead-acid batteries can be found in large solar projects, UPS systems, in homes and even in mining helmet lights. In the family of batteries, they are the most cost-effective solution, making portable remote power the most affordable option.

Sealed lead-acid batteries are the least expensive battery option per Watt-hour. The manufacturing process of sealed lead-acid batteries is a mature, reliable and well-understood technology. Sealed lead-acid batteries also 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, but they also have two critical abilities: durability and dependability.

When coupled with affordable panels, inverters and solar peripherals, the question about remote reliable power is down to implementation strategies.

Africa’s role in the 4th Industrial Revolution is your opportunity

How do we get the two essential catalysts – connectivity and power – into remote communities, tourist areas and our next generation’s hands? Well, the connectivity drive is well underway. If you missed this investment lift on the ground floor, there are still opportunities further up. Similarly, national portable power solutions are just taking off, another tremendous investment opportunity.

What’s your next big thing? Embracing Industry 4.0 technologies and integrating AI. This requires innovative, creative human input. What can you do? Work with schools, present IoT challenges, challenge the technological limitation and find the best minds. Make connectivity and reliable, portable power a priority. Don’t miss the revolution, it is in the minds of the creatives out there, and it is just beginning.

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

The DSC6000 family of MEMS oscillators combine Microchip Technology’s low power consumption and ultra-small packages with exceptional frequency stability and jitter performance over temperature.

The single-output oscillators are excellent choices for use as clock references in small, battery-powered devices such as wearable and Internet of Things (IoT) devices in which small size, low power consumption and long-term reliability are paramount. They also meet the stringent mechanical durability and reliability requirements within Automotive Electronics Council standard Q100 (AEC-Q100), so they are well suited for under-hood applications as well.

The DSC6000 family consists of ultra-low power DSC60xx and a lower jitter version DSC61xx. They are available in ultra-small 1,6 x 1,2 mm and 2,0 x 1,6 mm packages. Other package sizes include 2,5 x 2,0 mm and 3,2 x 2,5 mm. They consume just 1,3 mA (typical) – less than half the current consumption of the lowest-power quartz-based oscillators. These packages are drop-in replacements for standard 4-pin CMOS quartz crystal oscillators.

For more information contact Shane Padayachee, Avnet South Africa, +27 (0)11 319 8600, shane.padayachee@avnet.com.

32 Mbit pseudo SRAM

Espressif Systems released the ESP-PSRAM32, which is a 1,8 V, 32 Mbit SPI/QPI (serial/quad parallel interface) pseudo SRAM (static random access memory) device.

The chip is configurable as 1-bit input and output separately, or 4-bit I/O common interface, and all of the necessary refresh operations are taken care by the device itself.

The SPI/QPI includes an on-chip voltage sensor used to start the self-initialisation process. When VDD reaches a stable level above the minimum voltage, the device will need 150 µs to complete its self-initialisation process.

After the 150 µs period, the device requires at least one clock to properly reset, after which it will be ready for normal operation.

The RoHS compliant chip is supplied in an SOP8-150 mil package specified for operation across a -25°C to +85°C temperature range.

For more information contact ICorP Technologies, +27 (0)11 781 2029, enquiries@icorptech.com.
Thread development kit powered by Nordic

Nordic Semiconductor announced that Particle, the most widely used Internet of Things (IoT) platform, has selected Nordic’s nRF52840 advanced Bluetooth Low Energy (Bluetooth LE)/ ANT/802.15.4/ 2.4 GHz proprietary system-on-chip (SoC) for its ‘Particle Mesh’ suite, an end-to-end mesh networking development platform.

The Particle Mesh platform enables developers to quickly construct mesh networks comprising IEEE 802.15.4 nodes running OpenThread, an open-source version of Thread. Thread is a low-power wireless connectivity specification which includes robust security, reliability, scalability and support for developer-friendly IP-based (IPv6 with 6LoWPAN) mesh networking.

Particle Mesh includes three IoT gateway variants, the ‘Argon’ (supporting Wi-Fi/ Mesh/ Bluetooth LE), the ‘Boron’ (LTE M1 and NB1/Mesh/ Bluetooth LE), and the ‘Xenon’ (Mesh/Bluetooth LE), which enable low-power wireless sensor mesh networks to connect to the Internet.

The gateways use the nRF52840’s Thread capability to communicate with other Thread devices on the mesh network while the Bluetooth LE connectivity allows developers to use Bluetooth 4.0 (and later) smart phones and tablets for mesh setup, deployment and diagnostics in the field.

The Particle Mesh development kits are pre-configured to fully integrate with Particle’s ‘Device Cloud’, a set of development tools and cloud infrastructure, to build, connect and manage mesh networks.

“Designers who need to boost DSP processing for an existing system, or wish to develop their own new IP application, can take good advantage of the Model 71800,” said Bob Sgandurra, director of product management at Pentek. “Not only does it offer up to 5520 DSP slices for plenty of processing horsepower, it also provides well-defined connections to PCIe, DDR4 memory, LVDS I/O and gigabit serial links to support high-performance interfaces.”

As the central feature of the Jade architecture, the FPGA has access to all data and control paths, allowing direct access to all board resources. A large 5 GB bank of DDR4 SDRAM is available to the FPGA for custom applications. The x8 PCIe Gen 3 link can sustain 6.4 Gbps data transfers to system memory. Eight additional gigabit serial lanes and 38 LVDS general purpose I/O pairs are available for specialised interfaces.

Pentek’s Navigator Design Suite consists of two components: Navigator FDK (FPGA Design Kit) for integrating custom IP into Pentek designs and Navigator BSP (Board Support Package) for creating host software applications.

The Navigator FDK includes the board’s entire FPGA design as a block diagram that can be edited in Xilinx’s Vivado tool suite. In addition to the block diagrams, all source code and complete IP core documentation is included. Developers can integrate their own IP along with the Pentek factory-installed functions or use the Navigator kit to completely replace the Pentek IP with their own. The Navigator FDK Library is AXI-4 compliant, providing a well defined interface for developing custom IP or integrating IP from other sources.

The Navigator BSP contains high-level libraries and drivers for Windows and Linux operating systems. Users can work efficiently using high-level API functions, or gain full access to the underlying libraries including source code.

The Model 71800 XMC module is designed to operate with a wide range of carrier boards in PCIe, 3U and 6U VPX, AMC, 3U and 6U CompactPCI and 3U Compact Serial form factors, with versions for both commercial and rugged environments.

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

XMC module for signal processing

Pentek introduced the newest member of the Jade family of high-performance data converter XMC modules based on the Xilinx Kintex Ultrascale FPGA.

The Model 71800 is a co-processor module with an XMC PCI Express Gen 3 interface and general purpose I/O using parallel LVDS and gigabit serial ports.

The Jade architecture embodies a streamlined approach to FPGA based boards, simplifying the design to reduce power and cost, while still providing some of the highest-performance FPGA resources available today. Designed to work with Pentek’s Navigator Design Suite of tools, the combination of Jade and Navigator offers users an efficient path to developing and deploying FPGA applications. The x8 PCIe Gen 3 link can sustain 6.4 Gbps data transfers to system memory. Eight additional gigabit serial lanes and 38 LVDS general purpose I/O pairs are available for specialised interfaces.

Pentek’s Navigator Design Suite consists of two components: Navigator FDK (FPGA Design Kit) for integrating custom IP into Pentek designs and Navigator BSP (Board Support Package) for creating host software applications.

The Navigator FDK includes the board’s entire FPGA design as a block diagram that can be edited in Xilinx’s Vivado tool suite. In addition to the block diagrams, all source code and complete IP core documentation is included. Developers can integrate their own IP along with the Pentek factory-installed functions or use the Navigator kit to completely replace the Pentek IP with their own. The Navigator FDK Library is AXI-4 compliant, providing a well defined interface for developing custom IP or integrating IP from other sources.

The Navigator BSP contains high-level libraries and drivers for Windows and Linux operating systems. Users can work efficiently using high-level API functions, or gain full access to the underlying libraries including source code.

The Model 71800 XMC module is designed to operate with a wide range of carrier boards in PCIe, 3U and 6U VPX, AMC, 3U and 6U CompactPCI and 3U Compact Serial form factors, with versions for both commercial and rugged environments.

For more information contact Andrew Hutton, RF Design, +27 (0)21 555 8400, andrew@rfdesign.co.za.
Category 5E outdoor cable

Perfect Vision Manufacturing, based in Arkansas, USA, has announced the release of its new category 5E outdoor SFUTP cable.

The cable has four twisted pairs of 24 America Wire Gauge (AWG), solid copper conductors, an HD-PE insulation and an anti-crosstalk divider. For shielding and protection the cable has a ripcord, overall AP tape shield, ESD drain wire and a braided shield. This makes this cable ideal for use in noisy environment, where a normal CAT5E cable will not be suitable.

Furthermore, the PVCAT5SFUTPOBLK CAT 5E cable has a UV resistant, black polyethylene jacket. The cable is completely stable in the harsh environmental conditions of Africa and is well suited for network applications in the outdoors.

The cable has tested performance characteristics that meet or exceed TIA/EIA-568-C.2. It has been certified to 100 MHz characteristics that meet or exceed TIA/EIA-568-C.2. It has been certified to 100 MHz outdoors.

This cable is well suited for network applications in the harsh environmental conditions of Africa and is well suited for network applications in the outdoors.

The cable has tested performance characteristics that meet or exceed TIA/EIA-568-C.2. It has been certified to 100 MHz and swept tested to 350 MHz, and is ETL listed ISO/IEC 11801.

For more information contact Perfect Cables Africa, +27 (0)66 235 2700, sales@perfectcables.co.za.

Connectors for Cat.8.1 Ethernet

Pressure on backbone networks and data centres is increasing due to growing transmission rates occurring mainly as a result of the increasing use of intelligent mobile devices.

“The bottom line is that data rates of ten gigabits per second offered by the 10GBASE-T variant of Ethernet are in many cases simply no longer sufficient,” says Cor Bredenhann, Webb Industries’ key account manager: data cables infrastructure.

In response to this the IEEE (Institute of Electrical and Electronics Engineers) has developed new variants of Ethernet such as 25GBASE-T with 25 Gbps and 40GBASE-T with 40 Gbps using copper twisted-pair-cabling. Due to the more stringent requirements on insertion loss budget, the link length becomes limited to a maximum of only 30 metres and, therefore, both new Ethernet variants are primarily designed for data centres, server rooms and connections between switches.

The correlating standards for cabling infrastructure and its components have also been developed and, according to Bredenhann, the newly formed Category 8.1, which succeeds Category 6A, sets high requirements on the performance characteristics of the passive cabling components. The connector specification according to IEC 60603-7-81 now includes specifications up to 2000 MHz for, amongst others, insertion and return loss, near-end and far-end crosstalk attenuation (NEXT, FEXT).

“It is important to note, however, Cat.8.1 still has a backwards compatibility to existing categories such as Cat.6A, Cat.6 or Cat.5,” Bredenhann says. He adds that Category 8.1 components form a Permanent Link of maximum 24 m which, together with two patch cords of up to 3 m, sets up a Channel Class I. “The direct connection of devices (direct attach, or end-to-end link) is also supported. In this case the devices, for example a switch and a server, are connected directly with the cable with field assembly plugs at both ends,” says Bredenhann.

For more information contact Webb Industries, +27 (0)11 719 0000, prichards@webb.co.za.

For more information contact Perfect Cables Africa, +27 (0)66 235 2700, sales@perfectcables.co.za.
INTERCONNECTION, SWITCHES, RELAYS, CABLES & KEYPADS

Low-profile interconnect sockets

Many of today’s products, such as implantable and wearable devices for the medical industry, demand miniaturisation along with high functionality and reliability.

Those requirements drive designers to find durable solutions to package more electronics into smaller spaces.

Addressing these needs, the new 315-43-1XX-41-004000 (single row) and 415-43-2XX-41-004000 (double row) sockets from Mill-Max have 2.54 mm pin spacing with a low profile of 2.11 mm. They are designed for through-hole mounting in boards up to 1.57 mm thick, providing a secure connection to the PCB.

These sockets are ideal for board stacking and wire-to-board applications where minimising package height is paramount. When mated with Mill-Max low-profile headers 335-10-1XX-00-160000 (single row) and 435-10-2XX-00-160000 (double row) the total between-boards height is only 3.94 mm. For wire-to-board connections the Mill-Max 380-10-1XX-00-020000 (single row) and 480-10-2XX-00-020000 (double row) solder cup headers combine with the low-profile sockets to achieve a total height of 6.81 mm.

Sealed automotive connectors

Molex’s FAKRA connectors are utilised by the automotive industry, where their application is key to on-board telematics and RF communication in today’s automobiles. The connector provides a mechanical key feature along with a visual colour code to differentiate between applications.

Molex offers FAKRA connectors with a high-temperature plastic shroud that is fully compatible with lead-free reflow processes. FAKRA RF connectors offer a sealed, inline solution for automotive cameras, radio antennas, keyless entry or any application requiring an IP69K rating, along with a mechanical key feature and colour coding to ensure a proper connection.

A variety of formats are available, for cabled and PCB mounted applications.

For more information contact TRX Electronics, +27 (0)12 997 0509, info@trxe.com.

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Rugged mezzanine connectors

Mission-critical board-to-board (mezzanine) stacking connector applications demand fail-safe signal integrity as well as rugged and reliable harsh-environment performance. The HD Stacker from Glenair is a parallel stacking board-to-board connector featuring several significant design improvements.

The fine-pitch, ultra high-density 0.0625” chevron contact system provides 55% more contacts per connector size, or a 31% size reduction for the same number of contacts as compared to alternative solutions. Polarised connector bodies and available polarised guide pins prevent accidental mismating.

The through-hole solder-free press-fit compliant pin contacts are removable, repairable and available in custom lengths. HD Stacker connectors may also be ordered with pre-wired cable or flex jumper terminations. Available spacers protect contacts, provide additional dielectric insulation and ensure rugged resistance to vibration and shock.

High-speed signal integrity test reports are available upon request.

For more information contact Hiconnex, +27 (0)12 661 6779, info@hiconnex.co.za.
High-current terminals fit for Formula E

Wladimir Werz, product manager at Würth Elektronik eiSos.

For high currents, contacting is a subject in itself – heat generation, resistance, component size and mechanical reliability are all aspects to be considered.

With these challenges in mind, Würth Elektronik eiSos has added further innovative products to its REDCUBE component series, named after its cubic form. These cube-shaped high-current terminals not only look robust, they are robust. Made in Germany, they are milled from solid brass, which in effect offers a promise of quality compared to punched sheet metal constructions.

This appears to be a lot of effort for a PCB connection. Yet, for high-current applications a combination of several requirements demands careful selection of electromagnetic components. E-mobility and renewable energy are only two of many areas of application which increasingly demand high-quality, high-current terminals.

Small, strong and reliable

The trend for electronic assemblies is increasingly driven by miniaturisation. For this reason, the demand for small-sized components, with preferably fully automated processing ability, is growing. With increasing demand for electricity, topics such as contact resistance and self-heating of the component are gaining significance.

Würth Elektronik eiSos achieves this balancing act between miniaturisation and low contact resistance with its REDCUBE SMD terminals. Whether loosely by hand or fully automated and time efficient from the belt, these wire-to-board or board-to-board connections can even be used vertically, with the SMD terminals able to carry currents of up to 70 A.

The best of both worlds

Würth Elektronik eiSos developed the REDCUBE THR series for applications with high vibrations (THR = through-hole reflow, also referred to as pin in paste (PiP)). It combines the benefits of THR technology – primarily its high mechanical stability – with the fully automated assembly option and the efficient reflow soldering process. The processing of these THR terminals integrates seamlessly into the SMT process, as they can be processed the same as SMD components.

The solid and virtually indestructible REDCUBE THR terminals are available with four, eight or nine pins and can be used for currents of up to 85 A. Thanks to their robust design, significantly higher tightening torques can be achieved during assembly than with conventional punched components.

High current of up to 500 A

Small, compact, high-current terminals that carry currents of up to 500 A? Here, contact resistance poses a challenge – to reduce it, foregoing the soldering seems a good option. Therefore, Würth Elektronik eiSos developed REDCUBE terminals with press-fit technology. For this, robust pins milled from solid brass and the choice of brass (CuZn39Pb3) itself are important.

A high-performance, electrical press-fit connection is made by plugging the pins of a REDCUBE PRESS-FIT terminal into the plated through-holes of a circuit board. This creates a gas-tight electrical connection. The surface of the pins was especially optimised for the cold welding that occurs during the press-fit process. The distinctive feature of a press-fit connection compared to soldering technology is the creation of an electrical and at the same time stable mechanical connection between the component and the circuit board. The single solid press-fit pin typically has an extraction force of more than 100 N.

Tests have shown that the long-term reliability of REDCUBE PRESS-FIT sets itself apart with the lowest failure-in-time value (FIT) of the connection system – which is up to 30 times better than that of a SMD solder joint. The REDCUBE PRESS-FIT terminals are virtually predestined for electrical and mechanical connection solutions.

More than sponsoring

Würth Elektronik eiSos supported the Formula E ABT Schaeffler Audi Sport team from the very beginning. To be able to show a real e-racing car on a trade-fair stand might be a great side effect, but the commitment of the manufacturer is primarily as a technology partnership.

Formula E has become a sporting test area for electro mobility. The racing cars were originally standardised but, with each season, modifications are increasingly permissible. Thus, the technology partnership is becoming more and more tangible.

Currently, REDCUBE PRESS-FIT terminals are built into the latest Formula E racing car for high-current transmission. For the new season 2017/2018, the developments are running at full speed to be able to make the most of the benefits of REDCUBE terminals in racing as well.

Continued on page 18
Perfect match.

REDFIT IDC is a solderless reversible direct plug-in connector with SKEDD technology and insulation displacement connection. The SKEDD contacts are plugged directly into the plated through-holes of a PCB.

A complete part and a potential error source is eliminated. This results directly in higher process reliability, savings in space, material and process costs.

- SKEDD Direct Plug-in Technology
- IDC Connection
- Solderless Solution
- Simple to Plug & Unplug
- Min. 10 Mating Cycles
- Reverse Polarity Protection

www.we-online.com/REDFIT
The best connection

The properties of a REDCUBE PRESS-FIT connection are fascinating. For a circuit board with 2.4 mm thickness, the press-fit zone has less electrical resistance than the copper pin itself once a solid press-fit pin has been connected to the sleeve on each of the four corners with a connecting angle of more than three degrees. This connection is definitely neither an electrical nor a thermal bottleneck. Normally, the connecting angle is even much higher, which provides a high safety buffer.

No change is required for the circuit board production, as the through-holes for the press-fitting technique are basically produced in the same manner as those for holding THT components. For press-fitting, the circuit board thickness should ideally be between 1.6 and 3.2 mm. Tested surface treatments are chemical tin-plating and hot air tin-plating (HAL as well as lead-free HAL). Particularly for a circuit board thickness over 2.4 mm, Würth Elektronik eiSos recommends chemical tin-plating, as this process generally ensures that the tin spreads evenly in the sleeve. This makes it easier to meet tolerances.

High current carrying capacity

The REDCUBE PRESS-FIT terminals can carry currents of more than 500 A to the circuit board. In comparison to a soldered joint (R = 300 µΩ up to 400 µΩ), the press-fit zone has an extremely low contact resistance, down to 100 to 200 µΩ. Therefore, the limiting factor tends to lie generally with the layout of the connected tracks or the connection of external supply lines to a press-fitted component.

Thus, the current-carrying capacity of a REDCUBE PRESS-FIT terminal always has to be viewed within the context of the overall system. When selecting the individual high-current terminals, many factors such as conducting track thickness, placement on the circuit board, ambient temperature and thermal distribution should be taken into account.

Applications

 Compared to soldering, press-fitting offers a great number of benefits. Very thick circuit boards with high copper coating can be processed more easily. Furthermore, two-sided mounting is easily possible, which generally allows for very compact dimensioning of assemblies. Thus, current paths can be shortened, which is very beneficial especially when dealing with very high currents.

In most cases, REDCUBE PRESS-FIT is used to create a wire-to-board connection. However, this is by no means its only application. Copper bars, for example, can be mounted using the terminals to increase the current carrying capacity, either by press-fitting the copper bars together with the terminals – this is possible as long as the overall thickness of the circuit board together with the copper bar does not exceed 3.2 mm – or by screwing the copper bar onto the press-fit terminals.

The ‘high-current cubes’ are also ideally suited for mounting fuses. They can also be used for solely mechanical functions, such as connecting circuit board and housing or connecting two circuit boards together. With the two-piece board-to-board connection option, high mechanical stability as well as current carrying capacity of up to 320 A can be achieved.

Screwless press-fitting

Additionally, this latest addition to the product family presents an interesting option for wire-to-board high-current connections, e.g. for applications that are connected and disconnected several times or for installation in small spaces or difficult to access places.

REDCUBE PLUG high-current terminals are literally ‘red cubes’. Here, the cable equipped with a plug is locked into a glass fibre reinforced plastic housing using spring force. A screwless connection is created and disconnected by pressing on top of the housing. A screwless solution can be useful wherever dropping a screw during installation might have particularly serious consequences. REDCUBE PLUGS can carry up to 120 A. The cables are available with cross sections of up to 16 mm².

Conclusion

High-current applications are more common than one would think, including e-cars, charging stations, inverters, welding equipment and controllers in drive systems. With the range of REDCUBE components, Würth Elektronik eiSos offers the right product for every application. Products can be chosen by resistance, heat development and PCB assembly options and especially robust mounts for particularly vibration-resistant connections are also available. The solid brass cubes are a good choice, if one does not want to worry about a reliable low-loss connector for the design of a high-current assembly.

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

StarTech was originally established in 1994 as an industrial connector distributor for Amphenol products.

The company grew steadily over the years and was eventually bought out by Hiconnex SA. In 2017 it registered as StarTech Industrial, a certified Level 1 BBBEE contributor.

“We are an Amphenol only distributor due to the quality and support of the product range,” states general manager, Chris Brand. “Our aim is to develop the market to such an extent that Amphenol will be the leading connector supplier in South Africa.

“We get involved in projects from the concept phase and assist clients with the best possible product that suits their specific requirements, both technically and financially. We aim to develop partnerships with our clients and not just be a supplier, and in so doing help them to grow their business, which ultimately results in a positive outcome for us as well.”

StarTech Industrial stocks a wide range of industrial connectors, both metal and plastic, in volume for immediate design-in and quantity supply. The industries it supplies to include rail, automation, power generation and renewables, oil and gas, mining and military/aerospace.

Chris Brand, general manager.

Gerry Lingenfelder, sales and operations manager.

The company is a solution-based provider that can assist clients from design to manufacturing, with a stockholding of general and project-based parts. Its offering includes everything from copper, RF and fibre, to RF connectors, contacts and tools.

“We purchased StarTech with the aim of growing the business and taking it to the next level,” Brand continues. “We will employ more strategic engineering staff members in the short to medium term with the aim of securing new designs and business development. Our target is to become the leading provider of connector solutions in southern Africa by 2025.”

For more information contact StarTech Industrial, +27 (0)11 823 1520, sales@startech.co.za

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Miniature, rugged connector

Nicomatic recently introduced its new micro connector, the EMM. With its 1,27 mm pitch, it achieves extra weight and space reduction to meet miniaturisation needs in the most extreme environments.

Designed to meet the performance requirements of MIL 83513 and with key features such as reversed contacts, integrated 90° back protection and interchangeable hardware, the EMM range combines rugged design with enhanced electrical and environmental performance.

Suited to both board-to-board (thanks to its secure wiping length) and board-to-wire (from 20 gauge 24 to 30) configurations, the connector provides enhanced modularity with any pin selection available from 4 to 60 signal contacts. Typical applications include defence, security, energy, civil avionics and many others.

For more information contact Hiconnex, +27 (0)12 661 6779, info@hiconnex.co.za.

SMA end-launch connector

Anoison announced the release of its new SMA printed circuit board end-launch female connector.

The ANO 2112-4371 receptacle is made to fit printed circuit boards with a thickness of 1,57 mm and the connector is fitted with a tab contact.

This high-quality connector has a brass body with a gold-plated finish, with a contact pin made from beryllium copper alloy for good performance and reliability. It has a wide frequency range of DC to 18 GHz and a temperature range of -65°C to 165°C, making it ideal for all applications from industrial to Hi-Rel military applications.

This latest product complements Anoison’s range of high-quality RF and microwave cables, connectors and adaptors available at very competitive pricing. It offers a wide range of RF and microwave products to suit any application and environment from industrial to military uses.

Anoison is continuously expanding its product offerings, and with an engineering expertise and CAD capabilities they can quickly modify some existing products to meet any customers’ unique requirements.

For more information contact Conical Technologies, +27 (0)66 231 1900, info@conical.co.za.
Board and panel mounted switches

RS Components has announced a major expansion of switching products from leading manufacturer C&K, including devices for mounting on both panels and printed circuit boards.

Offering excellent value and reliability, the extension of the portfolio includes a full selection of popular PCB- and panel-mounted pushbuttons, DIP switches, key switches and tactile switches. Supplied with a range of latches and in a wide choice of styles, shapes and colours, the devices especially target use by machine and panel builders who are designing human machine interfaces for control systems across the full spectrum of industrial applications, including the transport and medical sectors. Highlights of the expanded portfolio include the recently launched PNP series of industrial pushbutton switches, as well as the addition of customisable graphics on the backlit cap of the AP series pushbuttons.

Targeting designers of transportation, industrial control, test equipment and automation applications, the PNP series of sealed pushbuttons are IP68 sealed to endure harsh environments and power wash-down. The units are available in multiple housing styles and feature an extended operating life of one million cycles.

Available in a new thermoplastic housing design, the PNP series also combines the rugged switch performance and 5 A power capabilities of the manufacturer’s NP series switches with the affordability of its AP series. Additional features include: longer solder leads and holes, accommodating up to two 22-gauge wires, enabling easier installation; resistive load handling up to 5 A; and SPST and SPDT electrical functionality.

Also available is the APB series of backlit industrial pushbutton switches, which integrate LEDs in blue or white to provide a highly visible indication that the switch has been activated or turned on. Nine different cap symbols are offered as standard parts, and C&K now also offers a fully customisable painted and laser-etched cap capability. The switches are SPST momentary-action devices and are available in a threaded version that features an IP67 panel seal and an IP65 snap-in version without a panel seal.

The APB series is ideal for joystick modules and control panels used in off-road transportation and construction equipment controls, as well as various other harsh industrial applications. Rated for use in temperatures from –40°C to +85°C, the switches also feature an extended operating life of up to one million cycles. Contacts are available in a range of ratings (200 mA/24 V d.c.; 100 mA/50 V d.c.; 400 mA/22 V a.c.; 125 mA/125 V a.c.) with a resistance of 50 mΩ.

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

Multi-axis joystick in modular design

New from APEM is the XD series joystick, a multi-axis hand grip joystick specifically engineered for demanding vehicle applications. Featuring non-contacting Hall effect technology to provide up to 10 million operations, the XD series is a compact yet highly reliable joystick ideally suited for off-highway vehicles and machinery.

The joystick measures just 60 mm below panel, yet withstands horizontal loads up to 1780 N. The strength of the XD series has been achieved by utilising all-metal construction as well as optimising the wall thickness and diameter of the joystick’s lever. The result is a compact joystick with the mechanical integrity of heavy-duty models much larger in size.

The XD series’ handle utilises a uni-body construction with modular inserts to provide design flexibility. This allows customers to purchase base joysticks which may then be configured as required. Insert options include an index trigger switch, operator presence paddle and a customisable faceplate. The one-piece handle also limits ingress points and enables IP67 above-panel environmental sealing.

The XD series provides SAE CAN bus J1939-71 outputs. All axis and button data are delivered on a CAN 2.0B compliant physical interface. Two additional signals allow configuration of the controller source address. The XD series can accommodate a 6 to 35 V d.c. power supply and will operate between -40°C and +85°C.

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

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Webb is ready for the Cat.8.1 Revolution. Are you?

With increasing pressure on backbone networks, data rates of ten gigabits per second offered by the 10GBASE-T variant of Ethernet are simply no longer sufficient.

The solution? The revolutionary Cat.8.1 for the new variant of Ethernet - 25GBASE-T with 25 Gbit/s and 40GBASE-T with 40 Gbit/s, which uses copper twisted pair cabling.

Join the Cat.8.1 revolution! Call Webb for Telegärtner’s latest products and solutions.
Hardly anyone remembers how we used to satisfy our hunger for knowledge or solve problems before the year 2000, in other words, completely offline. Only since the start of the new millennium have the first mobile network devices been able to receive and send data across the network to an acceptable extent.

At first, this only worked with a small amount of data, like with MMS (multimedia messaging service) contents. Today, the mobile devices are equivalent to a PC with cable connection, and use the complete spectrum of channels and contents available on the Internet. Surfing, chatting, shopping, streaming, social media – there are hardly any limits to our multimedia desires.

And because we quickly get used to any sort of comfort, our disappointment is out of proportion when we have to do without, even if only temporarily. This is understandable: after all, we are willing to spend quite a bit of money on our mobile freedom.

Dead spots and distorted voices were a frequent occurrence 10 or 15 years ago, but now they are seldom. This is also down to the optimised positioning of the transmitter masts (Figure 1).

**The network is only as reliable as its components**

Hardware component specifications are decisive when it comes to enjoying a stable network. The components cannot be too expensive when you are looking for a tidy ROI (return on investment). Equally, they cannot be too cheaply priced because then the subject of network failures comes...
up more frequently. Unexpected maintenance and service work needs to be performed quickly, otherwise a further cost-increasing factor would narrow the ROI. Additionally, the network provider is always confronted with the question of the time period for which he should specify the components.

From 2000, when the GSM standard was introduced with 2G, up to the commissioning of 4G networks in 2011, a continuous development of the mobile network could be observed. We assume that the successor to 4G, 5G, will be available from 2020. Even within a generation there are evolutions – for example, from GPRS to EDGE or from UMTS to HSDPA.

Transmission speeds have always been multiplying. With the introduction of the 4G network, also known as LTE (Long Term Evolution), a transmission rate of around 300 Mbps was reached. The first evolution stage of 4G–LTE-A (Advanced) or even LTE+ – appeared in 2014, and was able to boast transmission rates of more than three times the original LTE network.

This makes it a real challenge to predict the runtime of components by means of the network generations and evolutions. We can definitely assume that components will be used for up to 20 years. Anyone wanting to be totally certain often chooses metal connectors, for metal provides a superficial sense of value. We often overlook the fact that connectors made of plastic are well suited to outdoor use. They can even provide significant added value (Figure 2).

Nothing may fall off
The components up on the mast have to withstand sun, wind and damp – sometimes even sand- and snow-storms. These extreme conditions can release forces of such intensity that the mast and the attached components start to vibrate. Storms can also cause sudden impacts that break fastenings and destroy system parts.

In order to prevent this, applications are reconstructed in the laboratory, and different vibrations are applied. DIN EN 60068 (environmental influences) describes among other things continuous sine, as well as alternating shock vibrations. Forces are released that are many times greater than gravity (Figure 3). This test should uncover potential weak points, because breaks or cracks in housing parts, latching defects, or even electrical phenomena like contact interruptions or resistance increases can lead to premature failure.

Force equals mass times acceleration. For a connector, this means: the greater its own mass and the load of the connected cable, the more stable the design of the interface has to be. Thinking like this, the product designer could quickly tend towards over-engineering: if, however, the application is sufficiently defined by the customer, the supplier and the customer can select the right product together for the application – a product that is favourable both in technical and commercial terms.

Pluggability – safety – speed
The installer has his hands full especially when it comes to installing devices. If he is working on a mast at dizzy heights, the personal protective equipment is of particular importance. Added to this are the tools, and last but not least, the devices themselves. The more extensive the connection to the mast has to be, the more the required tools will weigh. Pluggable interfaces – especially made of plastic – help the installer to reduce the weight load.

If a device has pluggable interfaces by default, e.g. for power and data, the device need not be opened again on the mast for laying the cables, which reduces the danger of damage to the power electronics. Once the device is attached, preconfigured cable assemblies in the cable routes of the mast can be laid and conveniently connected to the device (Figure 4).

Summary
Mobile networks are becoming increasingly powerful. Users always want good network coverage, and operators also expect all the required devices to function trouble-free over their entire service life. The connectors have to keep up too – with the product range PRC, Phoenix Contact provides robust and long-lasting plastic connectors for extreme conditions.

Whether at the coast, in the mountains, or in the desert, the connectors of the PRC range are designed for high performance with minimal space needs. Robust plastics and established connection technology play their part in safe and long-lasting operation of the telecommunications system.

Comprehensive approvals and a continuously growing product range facilitate use in many other industrial areas, even outdoor communication applications. The system operator has the choice between preconfigured device connectors that are made according to his specifications, and individual components that he can configure to his own requirements.

For more information contact Richard Schoonebeek, Phoenix Contact, +27 (0)11 801 8200, rschoonebeek@phoenixcontact.co.za.
The rise of edge computing

By Mark Patrick, Mouser Electronics.

Through the advent of the Internet of Things (IoT), there has been significant interest generated in edge computing. Like Cisco’s ‘fog’ computing, this means putting more processing power at the edge of the cloud, which helps to reduce the overall power consumption from the sensor node to the data centre.

This represents a significant opportunity for embedded designers, who are demanding more sophisticated algorithms at the sensor and the gateway.

While there has been considerable activity over the last few years in apps and software to support data centre hardware, the move to edge computing will need a much broader base of software, running on higher performance embedded systems.

Hardware is becoming available in both the embedded and industrial markets that will address this. It generally utilises dual- or quad-core processors, such as the KeyStone system-on-chip offering from Texas Instruments at the nodes and Intel’s Core i7 in gateways from suppliers like ADLINK that are capable of handling both the sensor data and the analytics. This will be essential with tens of billions of IoT devices expected to connect to the network.

Current IoT architectures tend to only deploy analytics in a data centre context once all the information has been collected, but as IoT deployments increase, data will simply not be provided quickly enough. To be truly useful, analytics will really need to be placed at the true edge, directly into the devices.

“The situation we have at the moment is that data is being sent to a massive data lake where it is not being used,” said Chad Boulanger, global VP of business development for IoT analytics at software development company Greenwave Systems. “As the IoT continues to grow, this is not going to add value. The only way to do that is to do as much as possible at the true edge of networks – within the actual devices – so that the machine knows that something is wrong right there and can take appropriate action. If the data has to travel from another part of the network, that could have a detrimental impact.”

According to a report by market researcher Gartner, there will be 20,4 billion connected IoT devices in use globally by 2020. The sheer quantity of data that will be transmitted from these devices is driving adoption of edge computing, where connected devices and sensors transmit data to a local gateway device instead of sending it back to the cloud or a designated data centre.

Edge computing is well suited for IoT applications because it allows for quicker data analytics and reduced network traffic. Real-time data analysis for decision making purposes is thus possible — aiding in factory optimisation, predictive maintenance, remote asset management, building automation, fleet management and logistics.

But edge computing is not just about analytics. Adding more energy-efficient methods for handling algorithms quickly and locally can save power reserves in remote battery-based nodes, reducing the amount of data traffic and thereby extending operational lifespan.

Using digital signal processing (DSP) provides the ability to use more sophisticated algorithms for analytics and data processing, while increased memory capacity allows data to be buffered for longer low-power states. Flexible I/Os enable a more distributed heterogeneous processing architecture. This combination provides the flexibility needed for OEMs to quickly deliver new innovations.

The challenge is providing the right level of performance in embedded devices. Alongside analytics, one of the first steps is to increase the prevalence of computer vision. This requires more dedicated DSP blocks in the embedded processors, as well as much greater focus on the skills of the embedded designer.

This focus on edge processing is also driving programmable logic technology further into embedded sensor systems, with products such as the iCE40 UltraPlus FPGAs from Lattice Semiconductor leading the way. This has eight times more memory and twice the DSP resource, plus improved I/Os over previous generations. As a result it can provide the higher levels of performance needed by edge computing devices that are constantly on, always ready to instantly process commands locally without going to the cloud. There is support for functions such as gesture detection, facial recognition, audio enhancement, audio beam forming, phrase detection, double tap, shake-to-wake and pedestrian dead reckoning (PDR).

As well as 1,1 Mbits of SRAM and 8 DSP blocks, the FPGAs in this family incorporate up to 5K lookup tables (LUTs) and non-volatile configuration memory (NVM) for instant-on applications. With under 100 µW used in standby and compact QFN packages, they are highly suited to deployment in space-constrained environments with power limitations. Key applications include always-on sensor buffers and distributed processing for mobile devices at sub-1 mW power consumption, always-on sensor functionality while the AP is in sleep mode, etc.

But edge computing is not just about more powerful hardware. FogHornSystems for example has developed a platform that it says can provide real-time analytics on ultra-small-footprint edge devices. This allows developers to get data from IoT applications, reducing bandwidth usage and cost. It minimises latency and increases reliability, as...
Figure 3. Handling more of the IoT processing at the edge of the network.

well as providing real-time responsiveness. The company’s Lightning Micro embeddable software has a small memory footprint (less than 256 MBytes) for data processing and real-time analytics at the edge using a C++ SDK. The data is fed in via IoT protocols, such as OPC-UA, MQTT and Modbus, and the real-time streaming analytics engine can be configured through an easy-to-use expression language and hundreds of built-in functions.

Greenwave Systems is also looking at how analytics can be implemented at the edge of the network. It has teamed up with Wind River to port its AXON Predict analytics engine to VxWorks – allowing customised analytics that boost computational power and real-time intelligence in industrial IoT designs.

“We sought to give VxWorks developers a tool to analyse and autonomously respond to high-volume streaming sensor data at the source,” said Michel Genard, general manager of operating system platforms at Wind River. “AXON Predict will provide developers with embedded analytics that learn patterns, provide insights and take actions inside connected device operations and behaviours.”

This edge analytics engine allows developers to build a set-and-forget application with intelligence and process critical data at the edge of a network in real-time. This enables machines and smart sensors to collect information at every step of the network, automatically detect anomalies and take immediate action right at the source of input. Enhanced security features bolster the analytics engine and will provide enterprises with yet another layer of data and device protection.

Bringing all of the elements together, the Linux Foundation has launched the open source EdgeX Foundry project in order to build an open framework for edge computing. This will involve developing a range of microservices that can sit on various operating systems and hardware (from x86 to ARM), AMD, Analog Devices, Dell and sensor company RFmicron, as well as energy harvesting specialists EnOcean Alliance, have all signed up.

The Linux Foundation points to industry fragmentation and the lack of a common IoT solution framework continuing to hinder widespread adoption and stalling market growth. The complexity of the current landscape and the broad variety of components creates paralysis. EdgeX is intended to solve this by making it easy to quickly create IoT edge solutions that have the flexibility to adapt to changing business needs.

“Businesses currently have to invest a lot of time and energy into developing their own edge computing solutions, before they can even deploy IoT solutions to address business challenges,” said Dr Phillip DesAutels, senior director of IoT at the Linux Foundation. “EdgeX will foster an ecosystem of interoperable components from a variety of vendors, so that resources can be spent on driving business value instead of combining and integrating IoT components.”

Adopting an open source edge software platform is going to be the way forward. This will allow hardware makers to scale faster with an interoperable partner ecosystem, benefiting from more robust security and system management, while sensor/device makers can write an application-level device driver with a selected protocol through the use of an SDK. Likewise system integrators can get to market faster by combining plug-and-play ingredients with their own proprietary technology.

**Conclusion**

Edge computing in relation to IoT is opening up new opportunities for embedded designers. FPGAs are being used to aggregate data, but once in place can also be used to process that data and deliver real-time analytics. Coupled with DSP and multicore processors, intelligent nodes and gateways can provide more useful information back to the cloud while reducing power consumption and extending battery life.

For more information contact TRX Electronics, authorised Mouser partner in South Africa,
+27 (0)12 997 0509, info@trxe.com.
Embedded deep learning framework for FPGAs

By Robert Green, ASIC Design Services.

Editor's note: This article is based on a paper presented by the author at this year's FPGA Design Symposium in California. As his in-depth analysis goes beyond what these pages allow, readers interested in the subject are encouraged to go to www.dataweek.co.za/9167a for the complete version of the article.

Multi-layer convolutional neural networks have led to state-of-the-art improvements in the accuracy of non-trivial recognition tasks such as large-category image classification and automatic speech recognition. These models are computationally expensive and resource-consuming. The implementation of convolutional neural networks on embedded devices can be problematic since these platforms are resource, power and space constrained.

In this article a framework, developed by ASIC Design Services, for accelerating convolutional neural networks on FPGAs is introduced. The framework is a scalable and flexible embedded deep learning solution that allows for the implementation of a wide range of convolutional neural networks on FPGAs.

Background

Traditional image processing techniques used hand-crafted features combined with a trainable classifier. The features served as a unique, compact representation of the input image. The classifier uses the features for subsequent learning and inference. This classifier may have been as simple as a naive threshold technique or something more complex such as a support vector machine or a feedforward neural network.

Using hand-crafted features proved to be difficult, especially for novices in image processing. The design is time consuming and in some cases the features are highly application specific. These techniques also required in-depth data analysis to understand the underlying distribution of the features in the data. For noisy input data, hand-crafted features can produce inconsistent representations resulting in erroneous classification results.

Using trainable features has solved many of these problems, since the features themselves are learned from the same data used to train the classifier. In the late 1980s LeCun had success with the idea of using a trainable feature extractor combined with a trainable classifier for classifying digits. The approach became widely known as convolutional neural networks (CNNs).

The approach offers an attractive solution for several machine learning problems such as scene labelling and other computer vision tasks. Many vision tasks also lend themselves to embedded applications such as robots, unmanned aerial vehicles and surveillance cameras. Limited on-board processing and power resources as well as total solution size constrain the intelligence that can be implemented on these edge-node devices. The computational demands and bandwidth requirements of CNNs make it difficult to utilise the power of these algorithms on embedded platforms.

General purpose GPU (graphics processing unit) computing has been used with great success to accelerate the performance of CNNs. A major drawback of these devices is that they have high power requirements. Furthermore, GPUs are quite big, rendering them unsuitable for many embedded applications.

Field programmable gate arrays (FPGAs) have long been used to accelerate high-speed algorithms in hardware. The Core Deep Learning framework developed by ASIC Design Services and introduced in this article exploits the advantages of FPGAs for accelerating CNNs.

Convolutional neural networks in general

A typical CNN has two primary components: a feature extractor and a classifier. The feature extractor consists of cascaded convolution layers that are highly processing intensive. The classifier, on the other hand, consists of stacked, fully connected neural network layers, sometimes referred to as dense layers, that are primarily memory intensive.

Convolutions layers

A standard convolution layer has M number of output feature maps and N number of input feature maps. Each output feature map has R rows and C columns. The convolution layer performs a unique filtering operation for each input-output feature map combination. Kernel weights associated with each input-output feature map combination are trainable. A stride can also be specified for the convolution operation.

The primary operation for this type of layer is a multichannel convolution. Each output feature map is not just the results of a simple convolution over a single input feature map, but rather the combination of convolutions over all input feature maps. With each cascaded convolution layer, the feature extractor can learn progressively more complex and abstract feature representations of the input data.

Fully connected layers

Every input node in a fully connected layer is connected to every output node and a weight is associated with each connection. The fully connected layer applies a linear transformation on the input vector.

The value of the output node is simply the inner product of the input nodes and the weights. A bias is also added to the result. The bias and weights in a fully connected layer are all trainable. Stacking multiple fully connected layers increases the expressive power of the classifier and allows the network to learn a non-linear transfer function for the classification phase.

Other layers in a CNN

Together with the convolution and fully connected layers there are two other layers that are also widely used in CNNs. Non-linearity or...
activation layers allow the network to learn higher-order representations of the input. Pooling or subsampling layers, on the other hand, provide translation invariance and remove unnecessarily detailed processing to improve performance.

Furthermore, there are also variations in convolution layers such as depth and point-wise convolution layers. The focus of this article will not be on these layers and the reader is referred to the many online resources that are available on CNNs for more detailed discussions.

**Results**

The Core Deep Learning framework was tested using the Microsemi SmartFusion2 security evaluation kit and Microsemi PolarFire evaluation kit. The SmartFusion2 kit is fitted with an M2S090 FPGA whereas the larger PolarFire kit is fitted with the MPF300T FPGA. Microsemi FPGAs were chosen for their low-power capabilities and optimal MACC unit configuration options. LPDDR and DDR3 were used for external memory on the SmartFusion2 and PolarFire kits respectively.

The evaluation boards were connected to a laptop via an Ethernet link. The laptop was only used to upload new input data and read back the results after the FPGA was done processing. In this section the effect of the compression on the accuracy of the implementations is investigated. Furthermore, the performance results for several CNN implementations generated with the Core Deep Learning framework are given.

**Evaluating the effect of compression**

Naturally it is expected that the network will lose some accuracy when implementing quantisation due to decreased representation power, but it was found that it was not as significant as expected. In fact, tests of the standard LeNet CNN structure on the well-known MNIST dataset showed an increase in accuracy. Before quantisation the network had an accuracy of 99.12% and after quantisation the network had an accuracy of 99.15%.

Implementation of the scene labelling network (described in the next experiment) on the FPGA caused an insignificant drop in accuracy of 1% after quantisation. Tests of the popular VGG-16 network on the ImageNet 2012 dataset, where colour images are classified as one of 1000 classes, showed a small drop in accuracy. The 32-bit floating point accuracy was 88.45% and after quantisation the accuracy dropped to 87.54%. In cases like these, the accuracy drop can be rectified or partially addressed by fine-tuning the weights of the network for the quantised format.

Both the LeNet and VGG-16 network examples were of a classification nature, where the output of the network is a single class for each image or pixel. In such tasks it is only important that the value of the output unit corresponding to the correct label is higher than that of competing classes.

The other major machine learning task is regression, where exact output values are of interest. In addition to the 8-bit representation of the output, which limits the resolution, the 8-bit representation may cause saturation inside the neural network, thereby limiting the accuracy of the output. Figure 1 shows the output of a facial keypoint network as implemented on the FPGA. The network gives as output the coordinates of the five facial keypoints.

The network was trained using Kaggle facial keypoint detection dataset. The green keypoints are the points detected by the non-quantised network whereas the red keypoints show the results of an 8-bit dynamic fixed-point network implementation. The strong overlap between the red and green keypoints shows that the regression task was still successful even though an 8-bit representation was used for the FPGA implementation.

**Qualitative evaluation**

Scene labelling is a semantic segmentation task where each pixel of the input image needs to be assigned a label. Figure 2 shows the visual results of a scene labelling CNN that was implemented on the SmartFusion2 evaluation kit using the framework. The dataset used to train the scene labelling network is available online.

In Figure 2, the image on the left is the input image. The image in the middle is the classified/segmented image and the image on the right shows an overlay of the first two images. In the centre image, yellow represents the sky, purple the trees, brown the buildings, orange the roads and green indicates foreground objects.

**Evaluating performance of the framework**

In this experiment the performance results for the Tiny-YOLOv2 network is given. The network is based on the original YOLOv2 network. TinyYOLOv2 is much faster than the original YOLOv2 but is less accurate. The YOLO networks can best be described as real-time object detection networks. In the results that follow an operation is defined as a multiply-accumulate operation. The Tiny-YOLOv2 network is a 7 GOPs network. The network was trained on the PASCAL VOC dataset that consists of 20 object classes.

Table 1 shows the FPGA resource utilisation and Table 2 shows the performance for the Tiny-YOLOv2 network running on the Microsemi SmartFusion2 and PolarFire kits. The core frequency was set to 166 MHz, although this can easily be increased to 200 MHz if better performance is required.

Figure 3 shows the visual results for the Tiny-YOLOv2 network implemented on the PolarFire kit. The images are part of the testing data in the PASCAL VOC dataset.

**Conclusion**

The reconfigurability, power efficiency, low power requirements and security advantages of FPGAs make these devices a viable solution for moving intelligence to the node/edge. The implementation of CNNs on embedded platforms can be challenging. Considering the different sources of parallelism, minimising the memory footprint through data quantisation and exploring the design space allows for an efficient chip specific, network specific implementation of CNNs on a FPGA.

The Core Deep Learning framework can greatly assist in reducing the engineering time needed for bridging the semantic gap between high-level model specification and FPGA implementation of CNNs. The results show that the framework can produce FPGA implementations of computationally expensive CNNs for both small and large FPGA devices that run in real-time.

For more information contact Robert Green, ASIC Design Services, +27 (0)11 315 8316, robert.green@asic.co.za.
Tiny TVS for high-speed data interfaces

Diodes Incorporated has announced its most advanced dataline transient voltage suppressor (TVS) ever, the DESD3V3Z1BCSF-7.

Designed to provide exceptional TVS/ESD protection to the high-speed input/output ports of advanced systems-on-chip (SoCs) featuring differential signal lines running at 5 GHz and beyond, the device is ideal for high-speed interfaces like USB 3.1/3.2, Thunderbolt 3, PCI Express 3.0/4.0, HDMI 2.0a and DisplayPort 1.4.

Modern SoCs are typically manufactured on advanced CMOS process nodes, which can make them more susceptible to transient voltages and electrostatic discharges appearing at the input/output ports. Due to the higher than desired input channel capacitance, traditional TVS devices can degrade high-speed signals as they travel between connectors at the boundary of the adopting system and the input/output ports of SoCs.

The DESD3V3Z1BCSF-7 has been developed using Diodes’ advanced in-house processes to achieve ultra-low input channel capacitance (0.175 pF typical), low dynamic resistance, low trigger/holding/clamping voltages, and is assembled in a state-of-the-art package with ultra-low capacitance. Meticulous design results in exceptionally low insertion loss, meeting the signal integrity requirement of high-speed interface standards like USB 3.1/3.2 and Thunderbolt 3.

In addition to its ultra-low input capacitance, the DESD3V3Z1BCSF-7 offers exceptional ESD protection that meets IEC61000-4-2 requirements of up to ±8 kV air and contact. It features clamping voltage of 4.5 V typical for \( I_{VP} = 3 \, A \), breakdown voltage of 9 V maximum and reverse standoff voltage of 3.3 V maximum, while peak-pulse power dissipation (PPP) is 25 W over the short-circuit waveform of 8/20 µs.

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

Ethernet to serial converter

Hi-Flying’s Eport-E20-PIN is a fully self-contained module providing a serial interface to Ethernet connectivity to web-enable any device. The highly integrated and compact solution can be simply accessed and controlled over the Internet.

Featuring an ARM Cortex-M3 microcontroller core running at 96 MHz and with 2 MB Flash and 128 KB SDRAM memory, the converter runs on the FreeRTOS operating system. Its single RJ45 port with LED provides a 10/100 Base-T Ethernet interface with auto-negotiation, and support is provided for a broad range of network protocols including TCP/IP, Telnet and Modbus TCP. Encryption standards TLS, AES 128-bit and DES3 are supported. The serial side supports up to 921,600 bps data rates with two-wire TTL logic.

The module comes in a package measuring 50 x 23 x 12 mm, runs from a 3,3 V input voltage, and has an operating temperature range of -45°C to 85°C. It is also FCC, CE and RoHS certified.

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

Gate drivers deliver up to 5 A

Power Integrations introduced the newest member of its SCALE-iDriver IC family: the SID1102K, a single-channel, isolated, IGBT and MOSFET gate driver in a wide-body eSOP package. Featuring a peak drive current of up to 5 A, the new part is able to drive 300 A switches without boosters; external boosters can be used to cost-effectively scale gate current up to 60 A peak.

This device provides N-channel drive for both the low- and high-side booster MOSFET switches which reduces system cost, minimises switching losses and increases power capability. Reinforced galvanic isolation is provided by Power Integrations’ solid insulator FluxLink technology which eliminates the need for opto-couplers, improving reliability and ruggedness.

SCALE-iDriver technology simplifies design and manufacturing by reducing BOM count, as complete drivers can be built using a SID1102K IC and just eight external components. Devices deliver system-level protection features including under-voltage lock-out, rail-to-rail stabilised output voltage from a single supply rail, high common-mode transient immunity and 9,4 mm creepage and clearance.

Key applications include UPS, standard AC drives and VFDs, photovoltaic/ solar systems, commercial air conditioners, DC chargers and welding equipment.

For more information contact MB Silicon Systems, +27 (0)11 728 4757, info@mbsiliconsystems.co.za.
TDK introduced an extremely compact EPCOS film capacitor for the DC link of inverters. With dimensions of just 40 x 58 mm (d x l), it offers a rated voltage of 350 V d.c. and a capacitance of 65 µF. This means that the capacitor, which has the order number B32320I2656J011, has a very high capacitance density of 0.9 µF/cm³ and offers up to 50% more capacitance per volume than comparable capacitors. The space it requires on the PCB is correspondingly small.

Other features include the low ESR of just 10 mΩ and the high ripple current capability of 3.7 A. Both the plastic can and the epoxy resin sealing material are designed to be flame-retardant in accordance with UL 94 V0. The capacitor is designed for a temperature range from -25°C to +65°C, and has an integral thermal fuse that trips at a current of 5 A and a temperature of 115°C.

Typical applications include HF filtering in inverters, for example in domestic appliances, as well as general DC applications.

Murata has expanded its product range of embedded-core technology DC-DC converters with the NXF1 series, a cost effective, fully regulated, high isolation converter with 3.3 V or 5 V outputs from Murata Power Solutions.

Inputs available are nominal 3.3 V and 5 V in an industry-standard surface-mount package with a very low profile. Line regulation is typically better than 0.03% and load regulation typically better than 0.5%. All parts have continuous short circuit protection with auto restart or latch-off depending on model and temperature. Input range is ±5% around the nominals of 3.3 V and 5 V.

Parts are 100% production tested to 3 kV d.c. and have agency recognition pending for ‘basic’ protection at 250 Vrms and ‘reinforced’ protection at 125 Vrms to UL60950. Medical recognition to ANSI/AAMI ES 60601-1 is also pending for 2 MOOP (means of operator protection) and 1 x MOPP (means of patient protection) at 125 Vrms and 1 MOOP based upon a working voltage of 250 V. Parts are fully compatible with lead-free soldering and are backwards-compatible with Sn/Pb systems, and can be mounted in accordance with J-STD-020 with a classification temperature of 260°C and Moisture Sensitivity Level (MSL) 2.

Typical applications for these converters are in systems where agency-recognised isolation is required with tight output regulation as is needed in power for remote pressure, hall-effect, mass airflow and other sensors. Markets addressed include alternative energy/solar power, transportation, telecom/wireless equipment and medical.

The NXF1 series is rated at -40°C to +105°C C with derating depending on model, and provides high reliability with its patented embedded-core technology which makes production fully automatic, yielding a cost-effective product with excellent performance repeatability.

Packaging is the industry-standard footprint for SMT 1 W converters in the Murata proprietary iLGA inspectable format with gold plated terminations. Height is just 5.01 mm including tolerances. Parts are fully compatible with lead-free soldering and are backwards-compatible with Sn/Pb systems, and can be mounted in accordance with J-STD-020 with a classification temperature of 260°C and Moisture Sensitivity Level (MSL) 2.

For more information contact Deon Schoombee, Electrocomp, +27 (0)11 458 9000, deon@electrocomp.co.za.

For more information contact Avnet South Africa, +27 (0)11 319 8600, sales@avnet.co.za.
Bourns has released several new SinglFuse families of multilayer SMD chip fuses for time-lag, fast-acting and slow-blow application requirements.

The SF-0603SPxxxM and SF-1206SPxxxM time-lag models come in 0603 and 1206 footprints with 32 V d.c. and 24 – 63 V d.c. ratings respectively. They are rated for current of 1,0 to 8,0 A, and are intended for applications such as PC and LCD monitors, portable memory, gaming systems, cell phones, digital cameras, battery chargers and set-top boxes.

The fast-acting SF-0603FPxxxM comes in an 0603 package rated for 500 mA to 5,0 A and 32 V d.c. It provides circuit protection for PCs and monitors, server farms, portable memory, cell phones and tablets, digital cameras, gaming systems, set-top boxes, drones and robotics, white goods, battery chargers and industrial controllers.

The slow-blow SF-0402SxxxM, SF-0603SxxxM and SF-1206SxxxM series, in sizes 1005 (EIA 0402), 1608 (EIA 0603) and 3216 (EIA 1206), have respective current ratings of 500 mA to 4,0 A, 500 mA to 6,0 A and 500 mA to 8,0 A, and voltage ratings of 24 V d.c., 24 – 63 V d.c. and 32 – 63 V d.c. Typical applications are PC and LCD monitors, portable memory, gaming systems, cell phones, digital cameras, battery chargers and set-top boxes.

All the parts are UL listed, RoHS compliant and halogen free.

For more information contact Electrocomp, +27 (0)11 458 9000, andrew@electrocomp.co.za.

Coilcraft débuted its new LPD8035V series of miniature, high-voltage 1:1 coupled inductors at the Applied Power Electronics Conference (APEC) held 4 to 8 March in Texas.

The LPD8035V provides 1500 Vrms, one-minute isolation (hipot) between windings from a package that measures just 7,92 x 6,4 x 3,5 mm, providing users with significant size and cost reductions over conventional bobbin-wound alternatives. It is ideal for flyback, SEPIc and isolated-buck converter designs.

The series is currently offered in six inductance values ranging from 4,7 to 150 µH. It provides peak current ratings up to 2,7 A, which represents a 40% increase over previous generation products. It also has a tight coupling coefficient (≥0,97).

LPD8035V coupled inductors are qualified to AEC-Q200 Grade 3 standards (-40° to +85°C ambient), making them suitable for automotive and other high-temperature applications. They feature RoHS compliant matte tin over silver-platinum-glass frit terminations and are halogen free.

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

The EML3193B is a frequency adjustable, 3 A, current-mode step-down converter with an integrated high-side switch. Made by Elite Semiconductor Memory Technology (ESMT), the device operates across a wide input voltage from 4,5 V to 36 V and provides an adjustable output voltage from 0,808 V to 30 V.

The converter features PWM mode operation with up to 2 MHz adjustable switching frequency, and provides a highly efficient solution with current-mode control for fast loop response and easy compensation. The EML3193B automatically enters PSM mode at light load.

Cycle-by-cycle current limiting and thermal shutdown are provided for fault condition protection. An internal 2 ms soft-start design reduces input start-up current and prevents the output voltage and inductor current from overshooting during power-up.

The EML3193B is available in E-SOP-8L and TDFN-10L thermally enhanced packages.

For more information contact ICORP Technologies, +27 (0)11 781 2029, enquiries@icorptechologies.co.za.
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**Microprocessor supervisory IC**

The PT7M3808 family of microprocessor supervisory circuits from Diodes Incorporated monitor system voltages from 0.4 V to 5.0 V, and feature threshold accuracy from 0.5% and an adjustable delay time from 1.25 ms to 10 ms.

Offered in fixed-threshold versions for standard voltage rails between 0.9 V and 5.0 V, and with an adjustable threshold version down to 0.4 V, the PT7M3808 uses a precision reference to provide a 0.5% negative-going input threshold accuracy when monitoring voltages up to 3.3 V and 1% accuracy at voltages from 3.3 V to 5.0 V. The delay time is adjusted from 1.25 ms to 10 ms by connecting an external capacitor to the CT pin; a longer 20 ms or 300 ms delay is possible by connecting a resistor in one of two configurations.

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

**PoE power controllers**

Silicon Labs has released two new Power over Ethernet (PoE) Powered Device (PD) families – Si3406x and Si3404 - that include all necessary high-voltage discrete components on a single chip. The ICs support IEEE 802.3 at PoE power capabilities, flexible power conversion options exceeding 90% efficiency, robust sleep/wake/LED support modes and enhanced EMI immunity. The Si3406x ICs integrate all power management and control functions required for a PoE+ PD application, converting the high voltage supplied over a 10/100/1000BASE-T Ethernet connection to a regulated, low-voltage output supply. The Si3404 IC, meanwhile, offers cost-effective, 802.3 Type 1 compliant support for lower-power 15 W applications.

*NuVision Electronics, +27 (0)11 608 0144.*

**Tiny Bluetooth 5 module**

u-blox has announced the new ANNA B1 Bluetooth 5 module for industrial applications. Its ultra-compact module design and industrial operating temperature range make it ideal for wide ranging applications in size constrained designs requiring high-speed Bluetooth connectivity. It comes certified for select markets off-the-shelf, and is essentially a miniaturised variant of the existing NINA B1 Bluetooth low energy module, packed as an SiP design into a tiny 6.5 by 6.5 mm footprint, just 1.2 mm thin. ANNA B1 includes an Arm Cortex-M4 MCU with a floating point unit, Flash and RAM. The open CPU option allows for custom applications to be embedded, or product developers can speed up time to market by leveraging pre-Flashed u-blox connectivity software.

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

**PMBus power modules**

From Renesas Electronics come two new fully encapsulated digital DC-DC PMBus power modules. The dual ISL8274M operates from a 5 V or 12 V power rail, and provides two 30 A outputs and up to 95.5% peak efficiency in a compact 18 x 23 mm footprint. The ZL9024M operates from a 3.3 V rail and outputs 33 A in a 17 x 19 mm footprint. They deliver point-of-load (POL) conversions for advanced FPGAs, DSPs, ASICs and memory used in servers, telecom, datacom, optical networking and storage equipment. Both devices are easy to use, PMBus-configurable power supplies that include a controller, MOSFETs, inductor and passives encapsulated inside a module that increases available board space and reduces bill of materials (BOM).

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

**High-speed GaN FET drivers**

Texas Instruments announced two new high-speed GaN FET drivers to create more efficient, higher-performing designs in speed-critical applications such as light detection and ranging (LiDAR) and 5G RF envelope tracking. The chips can deliver switching frequencies of 50 MHz while improving efficiency and enabling five times smaller solution sizes than silicon MOSFETs. With an industry-best drive speed as well as a minimum pulse width of 1 ns, the LMG1020 60 MHz low-side GaN driver enables high-accuracy lasers in industrial LiDAR applications. The LMG1210 is a 50 MHz half-bridge driver designed for GaN FETs up to 200 V. Its adjustable dead time control feature improves efficiency for DC-DC converters, motor drives, Class-D audio amplifiers and more.

*Avnet South Africa, +27 (0)11 319 8600.*

**Time-of-flight sensor**

The VL53L1X time-of-flight sensor from STMicroelectronics extends the detection range of its FlightSense technology to 4 metres, bringing high-accuracy, low-power distance measurement and proximity detection to an even wider variety of applications. The VL53L1X measures only 4.9 x 2.5 x 1.56 mm and is pin-compatible with its predecessor, the VL53L0X. The compact package contains the laser driver and emitter as well as the single-photon avalanche diode (SPAD) light receiver that gives FlightSense sensors their enhanced ranging speed and reliability. Furthermore, the 940 nm emitter, operating in the non-visible spectrum, eliminates distracting light emission and can be hidden behind a protective window without impairing measurement performance.

*EBV Electrolink, +27 (0)21 402 1940.*
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