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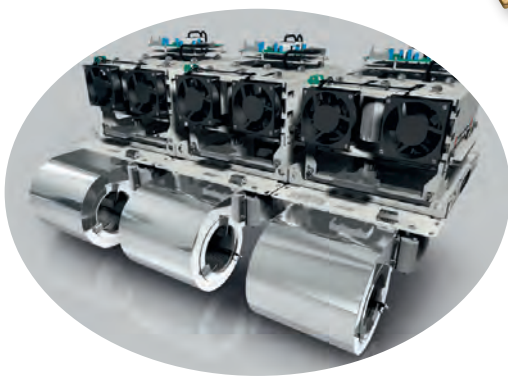


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COVER STORY



Central to National Instruments' unique platform-based approach to engineering and science applications is LabVIEW, a graphical programming syntax that simplifies the visualisation, creation and coding of engineering systems. The latest version of LabVIEW introduces new channel wires to simplify complex communication between parallel sections of code, which improves code readability and reduces development time.

"The new channel wires in LabVIEW 2016 enable us to develop applications even faster by making architectures that are more transferable across domains," said Christopher Relf, chief engineer at VI Engineering. "With channel wires, we can set up sophisticated software architectural patterns that natively have multiple sources, without having to create and maintain considerable amounts of custom software in the background."

LabVIEW 2016 enhances its interoperability by supporting improved Python integration and third-party devices. Engineers can now streamline the automation of benchtop measurements with the Instrument Driver Network, which supports 500 new devices in addition to the existing 10,000 supported instruments. Users can also take advantage of more RAM and memory with new 64-bit add-on support for the LabVIEW Control Design and Simulation Module, LabVIEW MathScript Real-Time Module, LabVIEW Unit Test Framework Toolkit, LabVIEW Desktop Execution Trace Toolkit and LabVIEW VI Analyzer Toolkit.

For more on What's New in LabVIEW 2016, visit www.ni.com/labview/whatsnew

National Instruments
www.ni.com





IT TAKES A VILLAGE

WHY YOU NEED A SOFTWARE
PLATFORM POWERED BY A
ROBUST ECOSYSTEM

Jeff Phillips, Section Manager, Software Platform, NI

“It takes a village.” While this African proverb generally refers to the need for an influential infrastructure beyond the immediate family for the healthy development of a child, you might be surprised to learn that this same concept can be extended to the engineering world.



The pace and promise of a connected world have rapidly escalated the demands on the design and test of engineering systems, and now, more than ever, it takes a village — a village of software. Today's engineering software has typically evolved along two diverging paths. Along one path, you'll find specialisation — software designed for a specific task or type of hardware. Along the other path, you'll find abstraction — a simplified interface to a once complex concept that makes it easier to accomplish the task faster, but at the price of removing low-level control. Any vendor that claims to solve these challenges with a single software is either confused or naïve. I'm not sure which one is worse, but know that whichever path you choose, you must demand interoperability or risk bearing the burden of integration yourself.

History teaches lessons, if you're willing to listen

As history has repeatedly taught us, combining disparate software from competing vendors is cumbersome, expensive and particularly difficult to ensure interoperability. Interoperability is best achieved by building multiple software out of a single platform, and then having a vibrant ecosystem build on top of that platform for specialised IP and functionality. This concept is best exemplified by the Operating System.

Decades ago, Microsoft Windows evidenced the advantages of a unified platform by defining standard communication protocols on top of a common infrastructure — the PC. The result was a common interface that was easily extensible, thus making the hardware platform of the PC highly efficient. Over time we have seen point solutions, such as cash registers, replaced by the general-purpose PC with custom software. One could argue that the Apple iOS took the platform concept to the next level. In the case of the iOS, its robust ecosystem built on top of the standard infrastructure was what catapulted it forward.

To provide ultimate interoperability and maximise the designs engineers are working on, vendors need to build software the right way. As a company, NI's philosophy is taking the benefits that the desktop Op-

erating System brought to the PC market and applying it to engineering software.

The value of an engineering OS

While both of the previous examples are consumer OSes, the analogy can be carried forward to the design and test of engineering systems. Consider the concept of an 'Engineering OS' — a software platform that's designed to standardise and simplify the interaction between a human and the engineering system they are designing, just like a traditional OS simplifies the interactions between a human and a PC.

A true Engineering OS is a collection of technology components, or fundamental building blocks, that can be used to architect various software products aimed at solving different problems. These fundamental building blocks are common across almost any engineering software — UI elements to visualise data, signal processing IP, compiler architectures to optimise code for various processor architectures, professional language constructs, driver APIs and deployment architectures.

However, the packaging of these components together is what ultimately fosters productivity and creates efficiencies when accomplishing tasks. For example, the combination of these elements into a software designed to manage a high-level test sequencing architecture will not only look different, but have different workflows, skinning, IP and an interaction design from a software designed for an interactive hardware configuration and data acquisition experience.

It's the holistic collection of these software tools that provides the value of an Engineering OS. Out of this singular platform, highly specialised products like hardware drivers, deployment management and distributed systems management are created. Out of this singular platform, high-level configuration-based products like a test sequence manager, a cloud-based analytics interface and a turnkey online condition monitoring management software are created. Out of this singular platform, highly customised development environments that contain a highly productive graphical development language or an ANSI-C based development language are available. Out of

this singular platform, each of the individual components needed to solve your application are accessible and created in a way that promotes and simplifies the integration between them. Furthermore, because the technology components of an Engineering OS are built from the same platform, there are direct and indirect benefits you will realise as the user.

Simplified learning curve

There is a straightforward, but not simple, trend in software today — the demand for more powerful and capable software with higher-level starting points and increased ease of use. One of the benefits of the platform-based approach, when done well, is that the final product presents a common and simplified learning curve. The common capabilities are addressed by the foundational building blocks, which provide two unique benefits. First, the commonality in these foundational building blocks means that users do not need to relearn these core elements when combining multiple software in a system because the interaction paradigm is shared across the platform. Secondly, the development team can wrap these foundational elements in the appropriate end-to-end design flow that's required by the task at hand — giving you a tailored experience.

Interoperability

With the growing complexity in today's solutions, the need to combine multiple software languages, environments and approaches is becoming fairly ubiquitous. However, the cost of integrating these approaches is considerable and continues to increase. The platform-based approach simplifies the interoperability on several fronts.

First, the built-in IP and APIs across products are shared. This promotes a high level of code re-use without any measure of refactoring or rewriting. This can drastically reduce the cost of integration throughout an organisation, in addition to the integration at the individual user level. This also eliminates the bifurcation between abstraction and specialisation. From a single platform, a highly specialised software can be developed to accomplish a specific task, such as data logging, offline data correlation and analysis, or even a test sequence manager. Then, that specialised software can be further extended by, or integrated into, a higher-level tool. With this unique combination of capabilities, you can ultimately select the right tool for each aspect of your project, and not be burdened by the costly task of integrating these tools together.



Ecosystem

It's become a truth for successful software — without the ecosystem, the software struggles to stay relevant. There is no successful professional software tool that exists in a silo. The ecosystem provides immeasurable value for support, example code creation, networking and referrals. Perhaps most importantly, the ecosystem can extend the platform with highly specialised IP beyond the vendor's core competency or areas of expertise. Take a look at the Apple App Store — Apple engineers are not experts in fitness monitoring or reading a weather radar, but those capabilities were designed on top of their platform.

The platform-based development approach for software not only promotes the concept of ecosystem extensions, but actually simplifies the interface that these critical members can use to accomplish the extension. The fundamental approach of the platform is that the individual core capabilities are designed as re-usable entities that surface in multiple products and can then be further customised for the specific needs of that user. The only way to effectively do this is to design the core capabilities around an extensible set of APIs that the individual product development teams use to extend and customise the functionality. It's these same APIs that enable the ecosystem to further customise the functionality for their application, their company or for their clients if they're building a business on top of the platform.

Bringing an Engineering OS to life

At our annual NIWeek conference in August 2016, we announced the company's first ever NI Software Technology Preview, in order to demonstrate our continued commitment to engineering progress that builds on the past three decades of innovation in the test and measurement market. This Software Technology Preview features several builds of software that combine related capabilities together. Among other things, these capabilities are organised around solving key challenges that you face as an end user, such as:

- custom UI development from the desktop to the web;

- systems management, visualisation and documentation;
- in-product learning through rich media integration;
- data analysis and management from the desktop to the server;
- creating a path to programming from configuration-based software.

These problem statements span many industries and can be solved in unique ways by different products. That's the beauty of using a platform-based approach. The capabilities showcased in the Software Technology Preview are designed in such a way that they can be integrated into multiple software products from NI's platform. While the Software Technology Preview is focused on future unreleased developments and capabilities, there are solutions in the market today that are realising benefits from this platform investment. VeriStand 2016, a high-level software interface designed to simplify real-time test applications, includes an interface for designing graphical user interfaces that be easily embedded or deployed. LabVIEW 2016 system design software, the 30th anniversary release of LabVIEW since the 1.0 on the Macintosh Plus, features an innovative new communication protocol that uses a single wire to transfer data between parallel segments of executing code.

Demand platforms — stay ahead of the competition

Simply put, designing an effective software platform is not simple. However, solving this difficult problem is exactly the investment software vendors need to deliver to help you solve the increasingly complex challenges faced by you and your companies. If you're still using point solutions and wasting valuable time and energy working on integration instead of the business challenges you're ultimately trying to solve, it's time to consider a platform-based approach. Whether you need to solve an engineering challenge right now or need to prepare for the technology changes ahead, you need a platform that provides the right starting point, uses the right software approach and is supported by a robust ecosystem.

National Instruments
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DUAL-STATION HORIZONTAL INJECTION MACHINE

The Kappa 2000 is a horizontal injection machine that is the dual-station version of the Kappa 1000. The product is suitable for high-volume and high-variation applications.

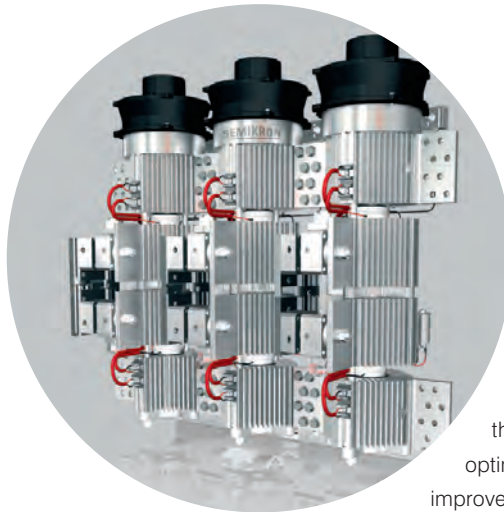
The two independent, side-by-side stations can be operated by one or two operators. The dual stations can be fed with either one or two separate tanks, offering good flexibility for a dynamic production situation.

The unit features a 5.7" touch-screen operator interface with multi-language PLC. It has five thermal control zones for precise melt control and a four-post die set for larger parts.

Safety is not compromised, with light curtains and dual palm buttons included. The product also features a mechanical ejection system and control for pneumatic ejection.

Tarapath Pty Ltd

www.tarapath.com.au



RECTIFIER STACK

SEMIKRON's Z5 rectifier stack is a high-current rectifier which, due to its modularity, can be used for different types of topologies and power ranges. Capsule technology, the Z5 heatsink profile and power connection optimisation simplify the cabinet integration and improve the serviceability.

High-performance axial fans with IP54 ratings, set for each phase leg, ensure maximum power density. Said to have 15% less size and 30% less weight than comparable products, the device offers an integratable, scalable and service-optimised rectifier stack up to 3000 A.

Semikron Pty Ltd

www.semikron.com.au



MACHINE VISION LIGHTING

Spectrum Illumination is a supplier of high-output LED lights for the machine vision industry. Machine vision lights assist cameras in a factory setting by illuminating the product as it passes by on an assembly line. The cameras take images of the product and communicate with a computer. Software then detects certain markers, indicators or defects in the image of the product to make sure the final product meets the factory's standards, requirements and quality control parameters.

The company's product lines include ring lights, spotlights, dome lights, diffused axial lights, linear lights, oxy lights, washdown lights and backlights, including monster backlights. It also offers a true modular light system (Tripod Light) that can be configured by the customer, featuring Smart Burst technology, analog control and variable intensity control built in.

SciTech Pty Ltd

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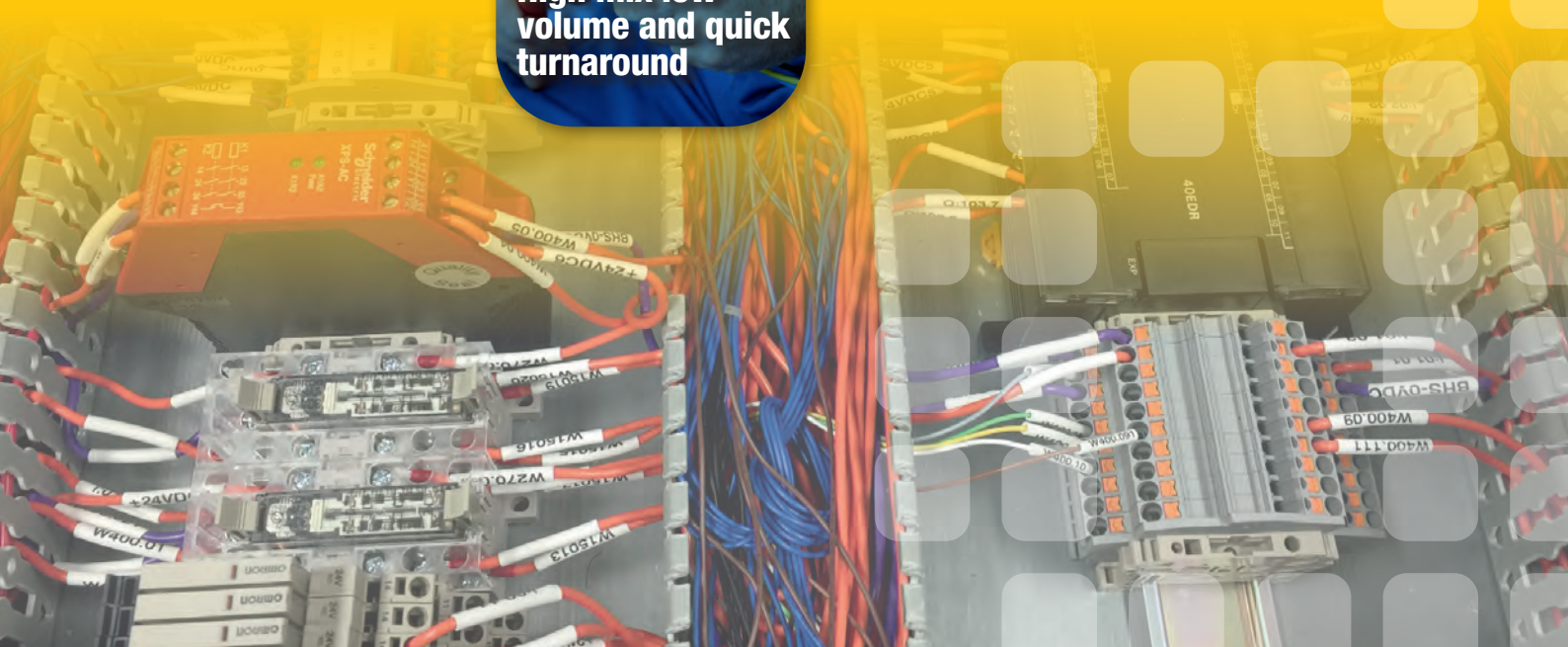
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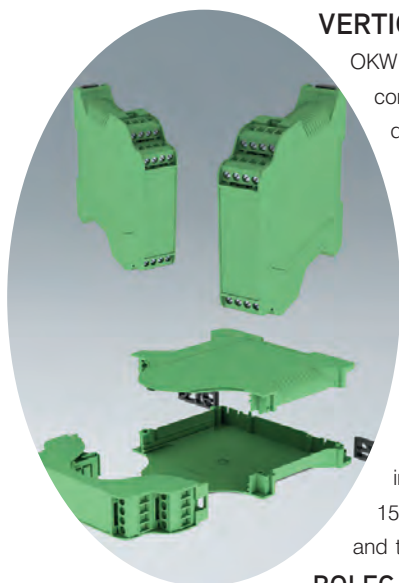
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VERTICAL DIN RAIL MOUNT HOUSING

OKW Gehäusesysteme has added a vertical DIN rail mount housing to its enclosure portfolio. Supplied complete with terminal blocks, it is suitable for DIN EN 60715 TH35 and features a clip-together design for fast assembly.

The CVB-Plus housing is a 22.5 mm-wide vertical DIN rail mount enclosure moulded in green self-extinguishing UL94-V0 flame-retardant PA66. With solid and vented versions available, the unit features front and side label recesses and is supplied with four 4-pole 5 mm pitch pluggable terminal blocks yielding 16 poles within the width of the enclosure.

The device features spring-loaded clips that can be snapped into position to make the housing chassis/surface mountable. This added flexibility makes the product useful in numerous electrical and electronic applications, including security, control products, energy management, embedded systems and HVAC.

The DIN rail mount housing incorporates two vertical PCB slots to ensure boards are held in place firmly and a development PCB is also available as an option. Specifications include 15 A, 300 V rated terminals with 20 mΩ contact resistance, 500 mΩ/500 VDC insulation resistance and the ability to withstand 2000 VAC for up to 1 min. Pin headers are tin-plated brass.

ROLEC OKW Australia New Zealand P/L

www.rolec-okw.com.au

1.5 KV AIR-COOLED INVERTER

Following the solar trend to increase DC voltage, SEMIKUBE extends its range with a 1300 A, 2-level air-cooled inverter that is able to operate up to 1500 V. Using IntelliOff driving technology, the inverter provides safe operation under all conditions.

Designed within the same footprint and qualification level as the standard SEMIKUBE family, the 1.5 kV version offers fast market entry into solar applications with the 2-level topology. IGBT modules with CAL diodes ensure high robustness of the CAL diode against cosmic rays.

Semikron Pty Ltd

www.semikron.com.au



EMBEDDED SYSTEM FOR IOT APPLICATIONS

Avalue Technology has introduced the HPC-BYT embedded system. The machine features the Intel Bay Trail platform to meet the requirements of IoT-relevant applications, include good video and graphics performance, high-speed data processing, low power and low-profile design. In addition, the product has ruggedised features to ensure a continuous and smooth operation. The system is powered by the Intel Atom E3845 4-Core 1.91 GHz processor. Due to the Type 6 COMe architecture, users are able to change the system core to meet their demands. It features fanless operation over a wide temperature range (-40 to 70°C) and wide voltage input (DC 12–48 V). It has a whole metal chassis and is also shock- and vibration-proof. The product has been developed to be an IoT gateway solution. It ensures stable 24/7 operation, low maintenance and easy integration with other equipment.

Avalue

www.avalue.com.tw

AMPLIFIER MODULE

The AMP1064 amplifier module, from Exodus Advanced Communications, covers the entire instantaneous 20–6000 MHz frequency range at 20 W CW minimum and 25 W CW typical, with flatness of less than 4 dB peak to peak.

Using state-of-the-art GaN devices and operating from a 50 VDC source at less than 3 A consumption, the module is suitable for use with all single-channel modulations standards and applications requiring high power and ultrawide band coverage. It features built-in protection circuits and ruggedness. Typical applications include high power testing, EMI/RFI, EW and communications.

ASD Technology Pty Ltd

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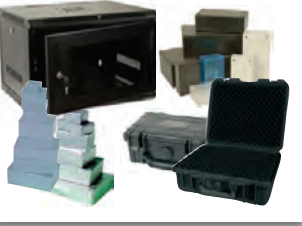
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TRUE MULTIPORT VECTOR NETWORK ANALYSER

The R&S ZNBT20 from Rohde & Schwarz is claimed to be the first true multiport vector network analyser in the microwave range with up to 16 integrated test ports. The hardware architecture from the R&S ZNBT8 has been extended to 20 GHz, allowing users to characterise multiple devices under test in parallel and thus increase throughput. The product is said to offer the high measurement performance of a two-port network analyser at each of its test ports.

With a starting frequency of 100 kHz and up to 16 integrated test ports, the analyser offers fast sweep times and good RF performance. The true multiport vector network analyser can drive all ports in parallel without the need for internal switching. Parallel measurements increase the throughput, which is particularly important for production applications.

The high number of ports is relevant for the production of both active and passive multiport components, such as frontend modules for multi-band mobile phones or high-speed data cables. Signal integrity tests can be performed for high-speed transmission standards, especially when combined with the R&S ZNBT-K20 software option for extended time domain analysis, which allows eye diagrams to be displayed on the R&S ZNBT.

Rohde & Schwarz (Australia) Pty Ltd
www.rohde-schwarz.com



DECADE RESISTOR

The Genrad 1433F decade resistance box is designed to check the accuracy of devices that measure resistance. It is available to rent from TechRentals.

The instrument can be used for precision-measurement applications where stability, accuracy and low-zero-resistance are important. It can also be used as part of DC and audio frequency impedance bridges.

The product has a low temperature coefficient, good frequency characteristics and high stability. Other features include: a resistance temperature detector (RTD) simulator; NATA-certified calibration; accuracy of $0.01\% \pm 0.002\Omega$; and seven decades by 0.01Ω to $111k\Omega$.

TechRentals

www.techrentals.com.au



BASE STATION SIMULATOR

Anritsu has introduced the MD8475B Signalling Tester, an all-in-one test solution supporting up to four component carrier aggregation (4CC CA) and 2x2 MIMO in a single test box. The product is said to lower cost of test and reduce space requirements compared to conventional solutions that require several test instruments, providing engineers with an efficient tool to conduct tests on chipsets, modules and mobile platforms integrating recent LTE-Advanced specifications.

The tester can conduct performance tests and IP layer throughput tests on UEs supporting 4CC CA in a 2x2 MIMO configuration. Improved IP throughput test efficiency is achieved through the built-in IP Packet Generator function. This simplifies the test environment by removing the need for hosting a client/server on an external PC.

The easy-to-use SmartStudio GUI facilitates efficient UE evaluation without complex test scenarios required by other instruments. Automated UE testing improves development efficiency by offering seamless transitions to regression and stress tests. It can automate the enormous number of required full network tests by calculating the combinations of CC numbers, MIMO numbers and supported wireless frequency bands required for LTE-Advanced evaluations, reducing the cost of test and speeding time to market.

By creating a stable automatic measurement environment, the signalling tester provides engineers with advantages when conducting LTE-Advanced and 2G/3G Inter-RAT test performance evaluations. It can be expanded to support up to 6 GHz frequency range to conduct tests on UEs using the 5 GHz unlicensed band.

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INFRARED CAMERA

The Fluke Ti55 Infrared Camera is designed for the quick identification of potential electrical, automotive, mechanical, HVAC/R and product development issues. It is available to rent from TechRentals.

IR-Fusion Blending interlaces detail from the 5 MP visible light camera directly over infrared images (in real time) for enhanced clarity. Picture-in-picture (PIP) mode is also an option, allowing for multiple analysis tools when locating problems.

Built for industrial use, the product has a resolution of 220 x 165, a 9 Hz refresh rate and a sighting laser. The internal 4 GB memory card can be expanded with an SD card. The unit is also equipped with replaceable smart batteries that will provide more than 4 h operating time. Data management is simplified with Fluke SmartView IR Analysis Reporting Software.

Other features include: a temperature range of -20 to 450°C; thermal sensitivity (NETD) of 80 mK; and compatibility with the Fluke Connect Mobile App.

TechRentals

www.techrentals.com.au

POWER TRANSISTOR

The NXP Semiconductors MR-F1K50H power transistor delivers 1500 W CW at 50 V, along with ruggedness and thermal performance.

The product can reduce the number of transistors in high-power RF amplifiers, decreasing amplifier size and BOM. It operates up to 500 MHz for a broad range of applications, from laser and plasma sources to particle accelerators, industrial welding machines, radio and VHF TV broadcast transmitters and amateur radio linear amplifiers.

Additional key features include high drain-source avalanche energy absorption capability; unmatched input and output for wide frequency range utilisation; versatile for singled-ended use or push-pull configuration; characterised from 30 to 50 V for ease of use; suitable for linear applications; integrated ESD protection with greater negative gate-source voltage range for improved Class C operation; recommended driver (25 W); and lower thermal resistance part available.

Wireless Components

www.wirelesscomponents.com.au



CIRCUIT DESIGN TOOL

Mouser Electronics has announced MultiSIM BLUE Premium, the latest release of the MultiSIM BLUE circuit design tool. Powered by National Instruments (NI), the product offers unlimited components within the schematic and integrated design capabilities.

The tool provides engineers with a simulation environment using Mouser's vast selection of products and a larger selection of NI components, including analog and mixed-signal ICs, passive components, discrete semiconductors, power management ICs, connectors and electromechanical components. It helps to further enhance development, giving engineers a better understanding of their designs and speeding time to market.

Featuring a Berkley SPICE simulation environment of electronic circuits, the product provides engineers with the freedom to design and simulate circuits before laying them out in physical prototypes. Users can now visualise and evaluate linear performance, making this critical step of circuit design easier, faster and more productive.

To help better organise and modularise schematics, hierarchical design capabilities have been added so engineers can incorporate classification blocks in place of a circuit and then repeat it in other parts of the design to save time. The product also includes forward and backward annotation capabilities, allowing engineers to transfer changes from a schematic to a PCB layout environment or from layout to schematic.

Other features include unlimited schematic sheets and levels to help provide greater context and flexibility to an engineer's overall design, and unrestricted access to components and custom components to offer limitless possibilities when building a design in real time.

Mouser Electronics

www.mouser.com





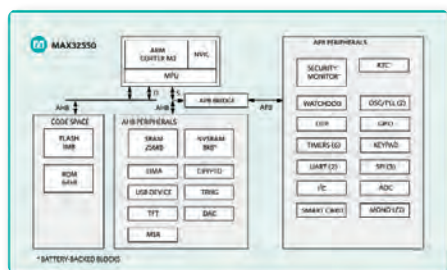
MINI POWER SUPPLIES FOR SMART HOME/OFFICE APPLICATIONS

RECOM's 2 and 3 W AC/DC power supplies are specially designed to power smart building infrastructure 24/7 by offering compact sizes for easy installation, low standby power consumption (35 mW) and full household (IEC/EN60335), CE (LVD+EMC+RoHS2) and industrial safety certifications (IEC/EN/UL60950).

The RAC03-SER/277 is a regulated power supply designed to fit inside standard wall boxes. Its round shape and low profile of only 11 mm makes it simple and quick to implement smart home/office solutions without extensive renovation works by using the space behind switch plates. For PCB mounting or even more space-constrained wired applications, the RAC02-SE/277 and RAC03-SE/277 modules with a footprint of only 34 x 22 mm are also available. These power modules deliver isolated, regulated, short-circuit and overload-protected local DC power to run smart building automation applications. The power supplies have an extra-wide input voltage range of 85 to 305 VAC, so they can cope with worldwide supply voltages as well as abnormal AC power surges and brown-outs without losing output regulation. Outputs of 3.3, 5, 12 or 24 VDC are available.

The standby power consumption is less than a twelfth of the requirements of the ErP directive. The modules have 3 kVAC input/output isolation and operate in ambient temperatures from -40 up to +85°C.

RECOM Power GmbH
www.recom-power.com



SECURE MICROCONTROLLER

The MAX32550 DeepCover is a secure microcontroller from Maxim Integrated Products. The embedded security product provides a high level of integration and security that make it easy for users to shorten time to PCI-PTS certification and get to market quicker. Users can save time and resources using the MAX32550-LBS+ because its cryptographic library already includes the required countermeasures.

The secure ARM Cortex-M3 microcontroller integrates all the essential functions for secure mobile payment and pin pads, including cryptographic engine, true random number generator, battery-backed RTC, environmental and tamper detection circuitry, magnetic stripe reader, smart card controller with embedded transceiver to directly support 1.8, 3.3 and 5 V cards, and integrated secure keypad controller.

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INFINITY IN A GRAIN OF SAND

NEURAL DUST SENSORS MONITOR THE BODY FROM INSIDE

Imagine tiny wireless sensors the size of a grain of sand that can be implanted in the human body to monitor nerves, muscles and organs in real time. Sounds like something from the movie *Honey, I shrunk the kids*, right?

Well, they're already here: engineers from the University of California, Berkeley recently created these batteryless sensors, opening the door to 'electroceuticals' — an emerging field in which these devices are used to treat disorders like epilepsy, stimulate the immune system or reduce inflammation by stimulating nerves and muscles.

The research team implanted this 'neural dust' into the muscles and peripheral nerves of rats to test out its capabilities. It is unique in that ultrasound is used to both power the devices and read out the measurements. Ultrasound technology is already well developed for hospital use, and ultrasound vibrations can penetrate nearly anywhere in the body, unlike radio waves, the researchers said.

"I think the long-term prospects for neural dust are not only within nerves and the brain, but much broader," said Michel Maharbiz, an associate professor of electrical engineering and computer sciences and one of the study's two main authors.

"Having access to in-body telemetry has never been possible because there has been no way to put something supertiny superdeep. But now I can take a speck of nothing and park it next to a nerve or organ, your GI tract or a muscle, and read out the data," Maharbiz, neuroscientist Jose Carmena, a professor of electrical engineering and computer sciences and a member of the Helen Wills Neuroscience Institute, and their colleagues reported their findings in the journal *Neuron*.

The sensors, which the researchers have already shrunk to 1 cubic millimetre (about the size of a large grain of sand), contain a piezoelectric crystal that converts ultrasound vibrations from outside the body into electricity to power a tiny, onboard transistor that is in contact with a nerve or muscle fibre. A voltage spike in the fibre alters the circuit and the vibration of the crystal, which changes the echo detected by the ultrasound receiver, typically the same device that generates the vibrations. The slight change, called backscatter, allows them to determine the voltage.

Motes sprinkled throughout the body

In their experiment, the UC Berkeley team powered up the passive sensors every 100 microseconds with six 540-nanosecond ultrasound pulses, which gave them a continual, real-time readout. They coated the first-generation motes — 3 mm long, 1 mm high and 0.8 mm thick — with surgical-grade epoxy, but they are currently building motes from biocompatible thin films which would potentially last in the body without degradation for a decade or more.

While the experiments so far have involved the peripheral nervous system and muscles, the neural dust motes could work equally well in the central nervous system and brain to control prosthetics, the researchers said. Today's implantable electrodes degrade within one to two years, and all connect to wires that pass through holes in the



© Stock/Adobe.com/au/vege

skull. Wireless sensors — dozens to a hundred — could be sealed in, avoiding infection and unwanted movement of the electrodes.

"The original goal of the neural dust project was to imagine the next generation of brain-machine interfaces, and to make it a viable clinical technology," said neuroscience graduate student Ryan Neely. "If a paraplegic wants to control a computer or a robotic arm, you would just implant this electrode in the brain and it would last essentially a lifetime."

In a paper published online in 2013, the researchers estimated that they could shrink the sensors down to a cube 50 microns on a side — about half the width of a human hair. At that size, the motes could nestle up to just a few nerve axons and continually record their electrical activity.

"The beauty is that now, the sensors are small enough to have a good application in the peripheral nervous system, for bladder control or appetite suppression, for example," Carmena said. "The technology is not really there yet to get to the 50-micron target size, which we would need for the brain and central nervous system. Once it's clinically proven, however, neural dust will just replace wire electrodes. This time, once you close up the brain, you're done."

The team is working now to miniaturise the device further, find more biocompatible materials and improve the surface transceiver that sends and receives the ultrasounds, ideally using beam-steering

technology to focus the sound waves on individual motes. They are now building little backpacks for rats to hold the ultrasound transceiver that will record data from implanted motes.

They're also working to expand the motes' ability to detect non-electrical signals, such as oxygen or hormone levels.

"The vision is to implant these neural dust motes anywhere in the body, and have a patch over the implanted site send ultrasonic waves to wake up and receive necessary information from the motes for the desired therapy you want," said Dongjin Seo, a graduate student in electrical engineering and computer sciences. "Eventually you would use multiple implants and one patch that would ping each implant individually, or all simultaneously."

Ultrasound vs radio

Maharbiz and Carmena conceived of the idea of neural dust about five years ago, but attempts to power an implantable device and read out the data using radio waves were disappointing. Radio attenuates very quickly with distance in tissue, so communicating with devices deep in the body would be difficult without using potentially damaging high-intensity radiation.

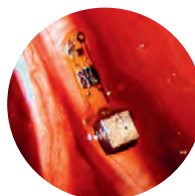
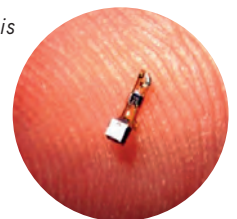
Maharbiz hit on the idea of ultrasound, and in 2013 published a paper with Carmena, Seo and their colleagues describing how such a system might work. "Our first study demonstrated that the fundamental physics of ultrasound allowed for very, very small implants that could record and communicate neural data," said Maharbiz. He and his students have now created that system.

"Ultrasound is much more efficient when you are targeting devices that are on the millimetre scale or smaller and that are embedded deep in the body," Seo said. "You can get a lot of power into it and a lot more efficient transfer of energy and communication when using ultrasound as opposed to electromagnetic waves, which has been the go-to method for wirelessly transmitting power to miniature implants."

"Now that you have a reliable, minimally invasive neural pickup in your body, the technology could become the driver for a whole gamut of applications; things that today don't even exist," Carmena said.

An implantable, wireless sensor like this could allow real-time monitoring of nerve or muscle activity anywhere in the body, using external ultrasound to power and read-out voltages.

Image credit: Ryan Neely, UC Berkeley.



In this photo, the sensor mote is attached to a peripheral nerve fibre of a rat.
Image credit: Ryan Neely, UC Berkeley.

IPAD APP FOR SWITCHGEAR



Schneider Electric has introduced the Premset Live! iPad app, an intuitive tool providing comprehensive product information and support. The app features three modules: Discover, with detailed view of Premset switchgear; Configurator, for quick visualisation of customised options; and Operate and Maintain, for maintenance support and training.

The Discover module provides a precise 3D model of the Premset switchgear. Users can virtually dismantle parts of the panel to examine each component in detail. All visualisations are 3D, with options to move, rotate and zoom. A description and technical specification appear next to each component, along with links to additional materials, such as videos. The 3D modelling enables users to investigate the product features relevant to their needs.

With the Quick Design module, users can easily build a customised Premset solution. Virtual tools allow users to define the number of core units and input additional equipment with a tap. The app provides detailed dimensions of the final project and generates an initial budget estimate. Due to the virtual reality technology, the customised configuration can be visualised in a real space, so the panel size can be verified in its destination before delivery of the final product. The Operate and Maintain module provides support in maintenance procedures. An interactive digital assistant, based on augmented reality technology, automatically recognises parts of the panel and guides the user step by step through each maintenance operation. Precise visual instructions make it easy to choose the right tools for each task. The module also serves for training purposes, as the virtual assistance enables technical staff to practise maintenance on a real panel.

Schneider Electric

www.schneider-electric.com.au

SWITCHING REGULATOR MODULES

RECOM has expanded its R-78E switching regulator series with modules featuring 9, 12 and 15 V

output voltages. The series is designed to offer all of the advantages of a standard switching regulator, including high efficiency, wide input range and accurate output voltage regulation.

Like the existing 3.3 and 5 V versions, the modules are equipped with short circuit protection. Measuring only 11.6 x 8.5 x 10.4 mm, their compact TO-220-compatible SIP3 package saves valuable board space. With efficiency up to 95%, the higher-power versions do not require a heat sink.

With a wide operating temperature range of -40 to +85°C, the series is flexible enough to handle battery-operated systems, controls and sensors, positioning systems, robotics, medical-grade applications, cooling systems and fans, telecommunications and highly sensitive measurement equipment. The modules are IEC/EN60950-1 certified.

RECOM Power GmbH

www.recom-power.com



SOLDERING IRONS

With today's delicate and complex electronic assemblies, temperature accuracy is a consistent challenge. Component density, lead size and thermally sensitive components all combine to increase process control demands — criteria which many systems fail to meet.

Thermaltronics' soldering irons, based on Curie Heat Technology (CHT), respond to the thermal demands of each solder joint by adjusting the power instantaneously, thereby meeting the exact requirements of the substrate component and solder material. In addition, the soldering hand-piece instantly heats and cools upon removing and replacing from its holder.

The product range includes both 13.56 MHz power supplies and those which operate at 450 kHz. The units have high thermal performance and recovery.

All Thermaltronics products are produced in accordance with ISO 9000 and ISO 14000 standards and meet either TUV, GS, CE or NRTL safety requirements. Strict quality control procedures are in place.

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More new products **in stock** than any other distributor.

The image shows a hand holding a smartphone that displays the Mouser Electronics website. The website interface includes a search bar, a 'Contact Us' link, and a 'See the NEWEST PRODUCTS' banner. Below the banner, there are five product listings, each with a small image of the component, the product name, Mouser Part #, Mfr's Part #, Lifecycle, and Availability. The products listed are:

- MOSFET 120V NChnl Dual Cool PowerTrench MOS...
Mouser Part #: 512-FDMT800120DC
Mfr's Part #: FDMT800120DC
Lifecycle: New Product
Availability: 1: \$5.37 | In Stock | 2,923 Can Ship Im...
- Battery Management 1-4 Series Li-Ion Battery Pack
Mouser Part #: 595-BQ40Z50RSMT-R1
Mfr's Part #: BQ40Z50RSMT-R1
Lifecycle: New Product
Availability: 1: \$6.65 | In Stock | 2,163 Can Ship Im...
- Acceleration Sensor Development Tools READ MUR...
Mouser Part #: 81-SCA10H-D01-112
Mfr's Part #: SCA10H-D01-112
Lifecycle: New Technology
Availability: 1: \$94.11 | In Stock | 104 Can Ship Imm...
- Bluetooth / 802.15.1 Development Tools EFR32BQ...
Mouser Part #: 631-SLWSTK6020A
Mfr's Part #: SLWSTK6020A
Lifecycle: New Product
Availability: 1: \$99.99 | In Stock | 78 Can Ship Imme...
- Development Boards & Kits - ARM Evaluation board...
Mouser Part #: 511-STM32...
Mfr's Part #: STM32L476...

The background is filled with various electronic components, including chips, boards, and modules, some of which are labeled with brand names like ST, Texas Instruments, Silicon Labs, and NXP.



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WHEN SAND IN YOUR COMPUTER IS A GOOD THING

Sand in your computer sounds like something you'd like to avoid, right? Well, a research team at Georgia Institute of Technology is deliberately introducing sand into computers to help cool them.

It's not just any old sand, though. They use silicon dioxide nanoparticles coated with a high dielectric constant polymer that provides improved cooling for increasingly power-hungry electronic devices. The silicon dioxide itself doesn't do the cooling. Rather, the unique surface properties of the coated nanoscale material conduct the heat at potentially higher efficiency than existing heat sink materials. This could lead to a new class of high thermal conductivity materials that are useful for heat dissipation from power electronics, LEDs and other applications with high heat fluxes, the researchers say.



"We have shown for the first time that you can take a packed nanoparticle bed that would typically act as an insulator and, by causing light to couple strongly into the material by engineering a high dielectric constant medium like water or ethylene glycol at the surfaces, you can turn the nanoparticle bed into a conductor," said Baratunde Cola, an associate professor in the Woodruff School of Mechanical Engineering at the Georgia Institute of Technology.

"Using the collective surface electromagnetic effect of the nanoparticles, the thermal conductivity can increase 20-fold, allowing it to dissipate heat."

Further testing is needed to ensure the technique's long-term efficiency and to confirm that it doesn't impact on the reliability of the electronic devices it cools.

A MAGNETIC MEMORY DEVICE ON A PIECE OF PLASTIC

Researchers have successfully embedded a powerful magnetic memory chip on a flexible plastic material that is said to demonstrate excellent performance in terms of data storage and processing capabilities, bringing the concept of flexible, wearable electronics closer to reality.

Flexible magnetic memory devices are a fundamental component required for data storage and processing in wearable electronics and biomedical devices, which require functions such as wireless communication, information storage and code processing. Unfortunately, there are still significant challenges in fabricating high-performance memory chips on soft, flexible substrates without sacrificing performance.

To address these challenges, a research team led by the National University of Singapore's (NUS) Associate Professor Yang Hyunsoo developed a novel technique to implant a high-performance magnetic memory chip on a flexible plastic surface. The work was conducted in collaboration with Yonsei University, Ghent University and A*STAR's Institute of Materials Research and Engineering, with the results published in the journal *Advanced Materials*.

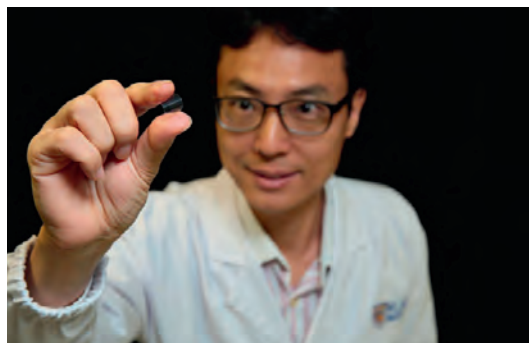
The novel device operates on magnetoresistive random access memory (MRAM), which uses a magnesium oxide (MgO)-based magnetic tunnel junction (MTJ) to store data. MRAM outperforms conventional random access memory (RAM) computer chips in many aspects, including the ability to retain data after a power supply is cut off, high processing speed and low power consumption.

The research team first grew the MgO-based MTJ on a silicon surface and then etched away the underlying silicon. Using a transfer printing approach, the team implanted the magnetic memory chip on a flexible plastic surface made of polyethylene terephthalate while controlling the amount of strain caused by placing the memory chip on the plastic surface.

"Our experiments showed that our device's tunnelling magnetoresistance could reach up to 300% — it's like a car having extraordinary levels of horsepower," said Associate Professor Yang. "We have also managed to achieve improved abruptness of switching. With all these enhanced features, the flexible magnetic chip is able to transfer data faster."

The malleable memory chip is expected to be a critical component for the design and development of flexible and lightweight devices, which have great potential in applications such as automotive, healthcare electronics, industrial motor control and robotics, industrial power and energy management, as well as military and avionics systems. According to Associate Professor Yang, "Flexible electronics will become the norm in the near future, and all new electronic components should be compatible with flexible electronics."

The researchers are currently conducting experiments to improve the magnetoresistance of the device by fine-tuning the level of strain in its magnetic structure. They are also interested in applying their technique to various other electronic components and working with industry partners to explore further applications of the technology. "We are the first team to fabricate magnetic memory on a flexible surface, and this significant milestone gives us the impetus to further enhance the performance of flexible memory devices and contribute towards the flexible electronics revolution," said Associate Professor Yang.



Associate Professor Yang Hyunsoo led a research team to successfully embed a powerful magnetic memory chip on a plastic material, demonstrating the flexibility of the memory chip. Image credit: National University of Singapore.



RESEARCH TURNS THEORIES ABOUT SUPERCONDUCTIVITY TEMPERATURE ON THEIR HEAD

The IBS Centre for Correlated Electron Systems (CCES) has revised existing theories to explain the working mechanism of iron-based superconductors.

Superconductors are a relatively new concept; they were brought to prominence in the late 1980s when two Nobel Prize winners discovered a new superconducting material. Today, research has moved on greatly; oxides are replaced with iron-based superconductors which are cheaper to mass produce and also permit a current to flow unabated.



To understand the working mechanism of iron-based superconductors, scientists have to significantly raise the transition temperatures to source the reason for the increase. Many researchers initially work on the assumption that the nesting effect is a dominant factor, especially in the case of pnictide superconductors [PSD]. Later, scientists discovered another type of superconductor, chalcogenide superconductors [CSD]. Since it turned out

that CSD is not subject to the nesting effect, the discovery of CSD generated controversy on the mechanism of their superconductivity. The nesting effect states when the surface temperature is increased, electrons become unstable thereby altering their properties both electrically and magnetically, allowing conductors to turn into superconductors.

Working under the assumption that a strong nesting effect in PSD corresponds to high temperature, the CCES team used potassium (K) and sodium (Na), two alkaline metals with peripheral electrons, thereby facilitating an easy transfer of electrons to other metals. They heated K and Na in a vacuumed environment to excite their atoms whereby the atoms attached to the surface of PSD, which have a lower temperature than the K and Na. As a result, electron doping took place on the surface of PSD. The IBS team measured the momentum and kinetic energy of electrons and revealed, for the first time, that there is, in fact, no correlation between superconducting transition temperature and the nesting effect in PSD as is the case in CSD.

“Up to now the prevailing theory of PSD and CSD have been thought of as two different systems. Our research is a starting point to confirm that those two superconductors have the same working mechanism. We have laid a cornerstone for the discovery of iron-based superconductors, whose production cost is low and has no restraints in its current,” said CCES Associate Director Kim Chang Young.

DISTRIBUTION AGREEMENT ANNOUNCED

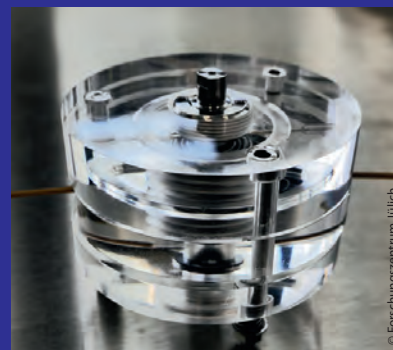
Richardson RFPD and Power Integrations have announced a global agreement under which Richardson RFPD will distribute Power Integrations’ SCALE IGBT drivers for the high-power market, as well as its SCALE-iDriver integrated circuits.

“Power Integrations’ industry-leading IGBT gate driver products are a perfect complement to our emphasis on driving demand creation for our active product vendors,” said Rafael R Salmi, PhD, Richardson RFPD’s president. “Their innovative technology and expansive offering enables us to better serve our customers in the high-power applications we target.”

“We are excited to be working with Richardson RFPD,” said Ben Sutherland, vice president of worldwide sales at Power Integrations. “Their experience and design capabilities will open up new markets and help us to deliver the highest levels of customer support.”

Power Integrations’ SCALE gate drivers reduce component count, enhance efficiency and improve reliability. They are suitable for a range of clean-power applications from 30 kW to 1 GW, including high-efficiency industrial motors, renewable energy, electric transportation and DC transmission. The SCALE-iDriver ICs are galvanically isolated single-channel gate driver ICs that range in output current from 2.5 to 8 A, reportedly the industry’s highest output current without an external booster.

SILICON-AIR BATTERY ACHIEVES 1100 HOURS’ RUNNING TIME



For the first time ever, scientists have achieved more than 1100 hours’ running time — that’s almost 46 days — with a silicon-air battery. This type of battery is being heralded as a cost-effective alternative to current energy storage technology. Unfortunately, until now they have only ever achieved short running times. Researchers at Jülich’s Institute of Energy and Climate Research (IEK) theorised that this was due to the consumption of the electrolyte. To test this, they created a pump system in which the electrolyte fluid (potassium hydroxide dissolved in water) was refilled from time to time.

“If the silicon anode remains in contact with the electrolyte, the battery will continue running,” said Hermann Tempel from the IEK’s Fundamental Electrochemistry. By topping up the electrolyte, the battery was able to achieve a running time in excess of 1000 hours, until the silicon in the battery was completely used up.

“The battery can subsequently be recharged by exchanging the anode, in other words mechanically,” said Tempel.

Silicon-air batteries have a far higher energy density and are also smaller and lighter than current lithium-ion batteries. They are also environmentally friendly and insensitive to external influences. Their most important advantage, however, is the material from which they are constructed. Silicon is the second-most abundant element in the Earth’s crust after oxygen; it is cheap and its reserves are practically inexhaustible.

AUSTRALIAN RESEARCHERS CREATE SELF-PROPELLING LIQUID METALS

RMIT researchers have created self-propelling liquid metals — the very stuff the T-1000 Terminator was made of. While a shape-shifting android assassin is still situated firmly in the realm of imagination, the development is a critical step in moving from solid-state electronics towards flexible and dynamically reconfigurable soft circuit systems.

Researchers dream of creating truly elastic electronic components — soft circuit systems that can act more like live cells, moving around autonomously and communicating with each other to form new circuits rather than being stuck in one configuration.

Liquid metals, in particular non-toxic alloys of gallium, have so far offered the most promising path for realising that dream.

As well as being incredibly malleable, any droplet of liquid metal contains a highly conductive metallic core and an atomically thin

semiconducting oxide skin — all the essentials needed for making electronic circuits.

To work out how to enable liquid metal to move autonomously, Professor Kourosh Kalantar-Zadeh and his group from the School of Engineering at RMIT first immersed liquid metal droplets in water.

“Putting droplets in another liquid with an ionic content can be used for breaking symmetry across them and allow them to move about freely in three dimensions, but so far we have not understood the fundamentals of how liquid metal interacts with surrounding fluid,” Kalantar-Zadeh said.

“We adjusted the concentrations of acid, base and salt components in the water and investigated the effect.

“Simply tweaking the water’s chemistry made the liquid metal droplets move and change shape, without any need for external mechanical, electronic or optical stimulants.

“Using this discovery, we were able to create moving objects, switches and pumps that could operate autonomously — self-propelling liquid metals driven by the composition of the surrounding fluid.”

The research lays the foundation for being able to use ‘electronic’ liquid metals to make 3D electronic displays and components on demand, and create makeshift and floating electronics.

“Eventually, using the fundamentals of this discovery, it may be possible to build a 3D liquid metal humanoid on demand — like the T-1000 Terminator but with better programming,” Kalantar-Zadeh said.

The research, which has potential applications in a range of industries including smart engineering solutions and biomedicine, is published in *Nature Communications*.

In the paper, first author Dr Ali Zavabeti detailed the precise conditions in which liquid metals can be moved or stretched, how fluid on their surfaces moves around and, as a result, how they can make different flows. The work also explains how the electric charges that accumulate on the surface of liquid metal droplets, together with their oxide skin, can be manipulated and used.

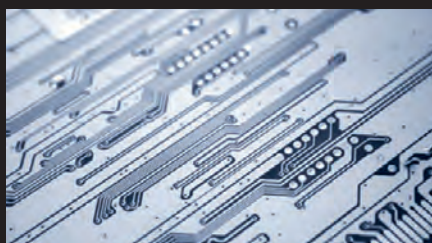


Continuous motion of a self-propelling liquid metal droplet under a pH gradient, shown at different time intervals. The droplet is placed in a fluidic channel, midway between two reservoirs filled with different electrolytes of acidic and basic nature. Image credit: RMIT.

STMICROELECTRONICS IS MEMS MANUFACTURER OF THE YEAR

Semiconductor company STMicroelectronics was named the MEMS Manufacturer of the Year at the MEMS World Summit, held in Shanghai from 25–26 July.

The company was picked by a jury of MEMS World Summit advisory board members representing leading research institutes, equipment manufacturers and MEMS manufacturers. In naming ST, the jury highlighted the significant role of the company’s high-efficiency 6-axis MEMS sensor modules in driving the transformation of smartphones into intelligent personal assistants as one of the key winning factors.



“ST has always been a leader in MEMS and we want to recognise their continued presence at the top,” said Salah Nasri, advisory board chair of the MEMS World Summit. “The evaluating criteria for selecting this year’s winner were also based on factors such as revenue, product development, company culture and company awareness.”

“The performance of 6-axis MEMS sensor modules, which have become a key building block of today’s consumer and IoT devices, has enabled new features in smartphones and more broadly new user experiences,” said Andrea Onetti, group VP and general manager, MEMS Sensors Division, STMicroelectronics. “ST is honoured to receive this award as we strive to bring continuous innovation to the development and deployment of MEMS technologies for a variety of fields, including industrial and automotive.” ST recently reported that its second-quarter net revenues totalled \$1.70 billion, its gross margin was 33.9% and net earnings were \$0.03 per share.

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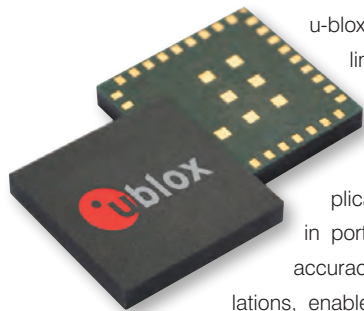
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Visit www.arcia.org.au to book your tickets

MINIATURE GNSS RECEIVER



u-blox has announced the EVA-M8Q GNSS receiver, completing its line-up of receivers in the miniature and EVA 7 x 7 mm form-factor package. The product is TCXO based and is optimised to provide high acquisition and tracking sensitivity, making it suitable for use with small antennas either in covert applications, such as asset tracking and stolen vehicle recovery, or in portable devices. The product's high sensitivity, along with the accuracy provided by concurrent reception of three GNSS constellations, enables an end-system with antennas that can be easily hidden within a vehicle or other high-value assets that need to be tracked. The ease of manufacturing offered by the QFN-like package suits requirements for medium- to high-volume production, while the highly integrated module of the series allows OEMs to achieve a faster time to market. EVA-M8 series are said to be the smallest GNSS modules featuring GPS, BeiDou, Galileo and GLONASS reception. Three out of the four GNSS constellations can be received concurrently, which leads to high positioning accuracy. The series also features anti-spoofing and anti-jamming technology to provide good security and integrity protection.

u-blox Singapore Pte Ltd
www.u-blox.com

BATCH SYSTEM

Modern batch systems must account for the growing need for flexible, scalable solutions, true distribution of control and responsive functionality. Rockwell Automation's SequenceManager enables powerful and flexible sequencing capabilities of the batch process at the controller, offering increased functionality for skids, off-network systems and single-unit controls.

Leveraging a Logix-based controller platform, the product allows operators to configure, view and obtain critical information about batch sequences stored in the controller, increasing visibility and accessibility to all stages of the production process.

The product is suitable for industries where batch process control is regulated or business critical, such as food, beverage, pharmaceutical and chemical. Specific applications include single- or multiple-independent unit operations, such as OEM skids, clean-in-place systems, dryers, evaporators, ovens and reactors.

Rockwell Automation Australia
www.rockwellautomation.com.au



WIDE CREEPAGE POWER TRANSISTORS

STMicroelectronics has introduced a portfolio of TO-220 FullPAK (TO-220FP) wide creepage power transistors, including what is claimed to be the world's first 1500 V super-junction MOSFET. The package is suitable for the power transistors of open-frame power supplies commonly used in equipment such as television sets and PCs, which are vulnerable to surface contamination by dust and particles that can cause high-voltage arcing between transistor terminals.

The package's extended lead spacing of 4.25 mm eliminates the special potting, lead forming, sleeving or sealing needed to prevent the arcing when using conventional packages with 2.54 mm lead spacing. Power-supply manufacturers can now meet applicable safety standards and minimise field failures without applying these additional processes, thereby simplifying manufacturing and enhancing productivity.

The wide creepage version provides good arcing resistance while retaining the electrical properties of the standard TO-220FP. Moreover, similar outer dimensions help streamline design-in and ensure compatibility with established assembly processes.

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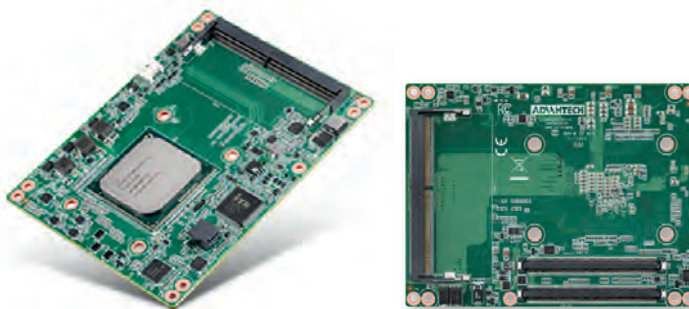


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COM EXPRESS BASIC MODULE

Advantech's SOM-5991 COM Express Basic Module, designed around the Intel Xeon processor D-1500 family, is powered by a server-grade processor that boasts up to 16-core scalability.

The module provides high bandwidth interfaces for data transmission-reception within a basic form factor of 125 x 95 mm with a Type 6 compliant pin-out. The high computing capability and low thermal design power deliver good power efficiency and make it suitable for microservers, networking and cloud storage.

The device incorporates two 10GBase-KR interfaces, which helps fulfil the ever-increasing service application demands in the area of COM Express. Users can take advantage of the native 10GBase-KR interfaces to design in 10GbE carrier boards. Moreover, PCIe x16 and 8 PCIe x1 support non-transparent bridging (NTB), which allows redundancy via PCIe.

The product has four screw holes near the CPU. The thermal module is attached to the CPU using the design of balanced torque. The COM Express adds a backplane to increase rigidity like single board, so the thermal module makes tight contact with the CPU and no board bending occurs. This results in efficient heat dissipation with high computing performance.

The development board was created especially for server-grade applications. To implement the remote management user scenario, a BMC controller is integrated on the carrier board. It also supports graphics with a VGA interface, KVM redirection, storage redirection and IPMI2.0/1.1 through a dedicated NIC (network interface controller) or shared NIC, SOL (serial-over-LAN), remote system BIOS update, etc.

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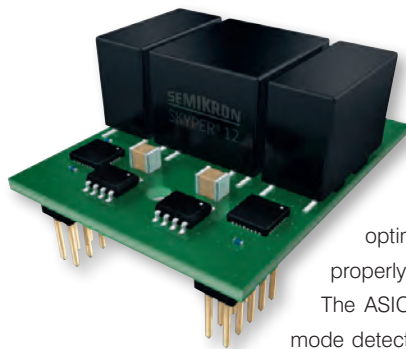
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IGBT DRIVER

SEMIKRON's SKYPER 12 safely drives IGBT modules up to 400 A. With a footprint of 35 x 45 mm, the driver is suitable for compact inverter designs with small IGBT modules, like Mini Dual or SEMiX 5. Due to a complete ground layer, adjustable filter management and optimised transformers with low coupling capacitance, the driver core can work properly in compact designs with a high level of electromagnetic compatibility. The ASIC chipset offers safe short circuit handling with soft switch off and fast mode detection. Due to the integration level, an MTBF rate of up to 8 million hours at full load can be realised.

The IGBT driver core offers the optimised platform for IGBT modules in the range from 80–300 A. Reference circuits for SEMiX 5, MiniSKiiP Dual and SEMiX 3 Press-Fit support users for efficient driver integration.

Semikron Pty Ltd

www.semikron.com.au



PORTABLE OPTICAL 3D SURFACE MEASUREMENT SYSTEM

The portable optical 3D surface measurement system μ surf mobile, by NanoFocus, is suitable for portable roughness measurements, analyses of 3D structures, measurement of microgeometry, topography, layer thickness and volume.

The system was developed for measuring large objects such as rolls and vehicle bodywork. The portable confocal microscope weighs only 5.5 kg. The surface measurement system is ready for on-site use within a few minutes. Large-scale measurements are possible along the radius of curvature of a roll due to the integrated autofocus.

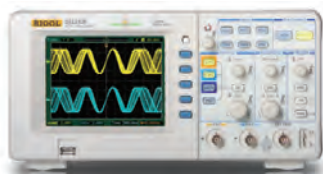
The product is based on the robust μ surf confocal technology, which allows the use of the portable system even in rough production environments. A typical measurement takes just 5–10 s. The system is suitable for deployment along the whole industrial process chain.

The product is available in different configurations, giving users the opportunity to choose the set-up which best suits their requirements. The portable measurement system can be transported safely from one location to the next in a roller case. It is also available with an objective nosepiece.

A broad range of additional equipment makes it possible to use the product in different industrial sectors. Special software solutions, such as for the paper and print or steel industry, complete the package.

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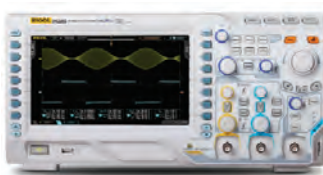
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IoT AND WEARABLES DEVELOPMENT PLATFORM

The WaRP7 development platform has been claimed to be a game changer for the Internet of Things (IoT) and wearables market. Built to address key challenges for design engineers such as size, battery life and connectivity, its open-source design and complete software package allow developers to innovate without licensing restrictions. It will meet the needs of applications including smart homes, sports and heart rate monitors, and wearables.

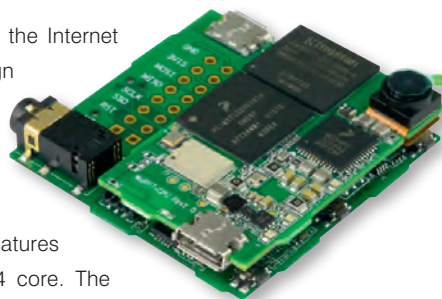
The product is based on the NXP i.MX 7Solo applications processor, which features the implementation of the ARM Cortex-A7 core, as well as the ARM Cortex-M4 core. The heterogeneous multicore architecture enables low-power modes critical for most IoT and wearable designs, but also provides the power to drive a higher-level operating system and a rich user interface.

The platform offers a variety of connectivity options, enabling a wide range of usage models including near-field communications. The Murata-type 1DX multiradio module offers 802.11b/g/n + Bluetooth 4.1, classic and low energy. It is flexible enough to offer all the advantages of traditional development tools, with a main CPI board measuring just 2 x 4 cm.

The product comes with onboard sensors, connectivity including NFC, Bluetooth, Bluetooth Smart and Wi-Fi, and onboard external LPDDR3 memory. It offers rich multimedia capability with access to MIPI-DSI display port, onboard camera and audio features. It is highly integrated with onboard sensors, a rechargeable battery and power circuitry.

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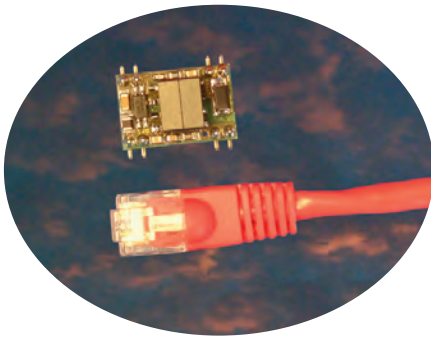
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ULTRAMINIATURE MODULE FOR THE POWERED DEVICE (PD)

Silvertel's Ag9900 series PD module comes in a small package size and is designed to extract power from a Cat5 cable. It fully conforms to the 802.3af Power over Ethernet (PoE) standard and includes 1.5 kV isolation, a PoE signature and an integral DC-to-DC converter. The module provides a Class 0 signature.

The product offers a simple, ultrasmall PoE solution using minimal external components. External bridge rectifiers enable the device to be powered from mid- or end-span PSE, accepting power from either the spare or data pairs of the cable. An integrated optimised DC/DC converter operates over a wide input voltage range with high efficiency (up to 87%).

Built-in protection against overloads and short circuits is provided. The regulated DC output nominal voltage is easily adjusted using a simple pull up/down resistor.

The Ag9900M provides signature and control circuitry to give full PoE compatibility. A signature is required by the power sourcing equipment (PSE) before it will provide power to the port.

The Ag9900MT variant provides overtemperature protection. This option reduces the output power if the maximum operating temperature is exceeded. Normal operation resumes when the temperature drops back below the threshold.

The range is a suitable PoE solution for any application, particularly for small devices and space-limited designs such as IP phones, WAPs, sensors and access control panels.

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MINI DC ELECTRIC LINEAR ACTUATOR

maxon motor has released a completely customised miniature electric linear actuator for positioning tasks. By combining a 16 mm, 60 W, 24 V brushless DC motor with an integrated radial and axial thrust block bearing system, the shaft is manufactured directly as a ball screw assembly.

Despite the tiny dimensions available, with motor diameters as low as 6 mm, the units can deliver high linear forces. The 16 mm ball screw version has a force delivery capability of 403 N. With the brushless motor's ability to accelerate to 12,000 rpm in under 2 ms, the actuator is also dynamic.

The motor is fitted with an integrated digital encoder for detent-free smooth positioning. The length of the ball screw and the nut details are configurable to suit the machine design requirements.

maxon motor Australia Pty Ltd

www.maxonmotor.com.au



4G LTE ROUTER

Robustel announces its latest 4G LTE router R2000 Dual with two cellular modules and two SIM cards for multiple carriers and continuous cellular connections, with fast network switching between modules (within 3 s) in case of network failure.

The Robustel GoRugged R2000 Dual is a rugged cellular router offering state-of-the-art mobile connectivity for machine-to-machine (M2M) applications. The router will primarily operate in 4G LTE with 3G/2G fallback and has RCM certification for Australia.

The router is suitable for use in mission-critical applications requiring high reliability in its cellular network connection such as ATM, vending machines, retail POS, kiosks, branch office and convenience stores. The product will also support 4G LTE Band 28 (700 MHz) for the Telstra and Optus networks, aside from its other supported frequency bands (B1, B3, B5-9, B18, B19, B21, B38-41).

The router also has four PoE ports which minimise installation costs in applications such as IP video surveillance and digital signage. 802.11b/g/n Wi-Fi is available with data rates of up to 300 Mbps as well as a customisable captive portal. An ethernet WAN port is also provided for uplink.

Digital input for ignition control is available so the router can be easily powered on or off in vehicular applications and a screwable terminal block allows for a secure power supply. It has an extended operating temperature range of -40 to 70°C and power supply input voltage of 9 to 48 VDC.

Glyn Ltd

www.glyn.com.au

INRUSH CURRENT LIMITERS AND NTC SENSING THERMISTORS

Sample kits of Ametherm's inrush current limiters and NTC sensing thermistors are now available. The kits make it quick and easy for designers to find the right part to provide circuit protection, temperature compensation and measurement in their applications.

The Standard Sample Kit consists of nine 120 and 240 VAC inrush current limiters from the SL series. The devices feature resistance values at 25°C of 10Ω, diameters from 3–32 mm and steady-state current from 1–15 A. For single- and three-phase input voltages up to 680 VAC, the Mega Sample Kit features five inrush current limiters from the MegaSurge series. The devices offer diameters from 14–37 mm, up to 500 J of input energy, steady-state current to 18 A and resistance values at 25°C of 10Ω, 30Ω and 150Ω.

The Sensor Sample Kit of NTC sensing thermistors includes four probe assembly types — ring lug, threaded hex nut and tip, epoxy and steel housing. Constructed of metal oxide ceramic materials, the devices feature resistance values at 25°C from 10–100 kΩ, beta of 3950 and 4500 K, thermal time constant down to 10 s and maximum power of 125 mW. The kit also includes a device from the ACCU-Curve series of interchangeable thermistors. Offering tight tolerance of ±0.2°C and a fast thermal time constant of 7 s, the epoxy-coated device can be potted in a variety of housings.

The devices are optimised for a wide range of applications, including AC motors, power supplies, motor drives, audio amplifiers, battery chargers, air sensors, HVAC systems, high-speed computers, MRIs and X-ray machines.

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REINVENTING THE SPRING-LOADED PROBE PIN

By reinventing and fully automating the manufacturing process, spring probe pins can now deliver high performance at the price of a stamped contact for high-density, fine-pitch applications.

For decades the spring-loaded probe (also known as the pogo-style pin) has delivered excellent mechanical and electrical performance in a highly compliant contact. However, this often came at a high cost given that each pin is constructed of three to four discrete parts manufactured and assembled in a laborious, less-than-fully-automated process.

The cost could be so exorbitant, in fact, that when significant volumes of pins are required, many users opted to utilise less compliant, lower performance alternative contact technologies to reduce costs.

This approach is becoming less viable, however, with the increasing miniaturisation of integrated circuits, electronic components and devices that pack more circuitry into smaller footprints.

A single test socket for reliability and burn-in testing, for example, can require hundreds and even thousands of spring-loaded probe pins in a fine pitch configuration. The same applies to board-to-board compression connectors. When factoring in multiples of test sockets as well as production-level quantities of connectors, pin quantities can literally run into the millions.

Enter — or perhaps re-enter — the spring probe. With a new approach to pin design and a complete reinvention of the manufacturing process, miniaturised spring probes as small as 0.2 mm are now available that provide a high temperature, current and bandwidth performance pin at the price of a stamped contact.

Traditional pogo-style pins

Although designed and manufactured in subtly different ways, the pogo-style pin is typically constructed of a pin, two plungers and a spring encapsulated in a metal shell. This style of pin is highly compliant, which means it is designed to compress or 'comply' during insertion. This is critical when attempting to maintain a good connection despite potentially uneven surfaces, varying heights, errors in parallelism and flatness, or pivoting or rotating elements.

Although compliancy can be achieved by other techniques, such as bends, buckles or cantilever-style contacts, additional space between pins is required during compression. Spring-loaded pins operate in a purely vertical fashion, so the maximum space occupied at any time is defined by its diameter. This allows for placement of spring-loaded pins in fine pitch distances as low as 0.2 mm.

The trend towards more compact, high-density electronics design — defined as the number of pins in a small area or the distance between pin centres — is already impacting several markets.

One market that regularly utilises fine pitch spring probes is for electronics reliability testing, including burn-in, HTOL, HAST, THB and other testing protocols. To conduct this type of testing, sockets are manufactured to provide an intermediate (temporary) connection through an array of pins between the printed circuit



board (PCB) and the components or multichip modules being tested. The PCB is then connected to a computer or other device for data capture and analysis to determine pass or fail.

The other market is compression-style board-to-board connectors used in electronics for telecom, automation, medical, aerospace and military applications. These specialty connectors utilise spring probe technology to create a one-sided connector that is mounted against pads on the PCB. The benefits of spring-loaded connections include the elimination of receptacles to reduce costs, space savings, 'one-touch' attachment and removal, and high durability.

Whether creating a temporary connection, such as for testing, or as a permanent board-to-board interconnection, the common denominator is more pins, less real estate.

"Devices used to have 2000 pins in a two-inch-square area. Now they want the same 2000 pins in a half-inch square and the only way to do that is to reduce the pitch of the device," said Ila Pal, chief operations officer of Ironwood Electronics, a manufacturer of high-speed sockets and adaptors for characterisation, burn-in and production testing.

"We were utilising spring probe pins on a 1 mm pitch design and more recently at 0.5 mm," explained Pal. "Then, last year, there were requests to shrink the pitch to 0.4 mm. Now, we are moving even further down to 0.35 mm."

Germany-based test socket manufacturer EP Ants GmbH is experiencing the same market trend. According to Rick Taylor, president and co-founder, 70–80% of the test sockets his company manufactures today are for high-density applications.

According to Taylor, another market driver is price. Higher density means a higher volume of pins per test socket. Multiply that by the number of sockets required for parallel or serial testing at a single facility and customers expect companies such as EP Ants to deliver the best possible price without sacrificing performance.

"As everything gets smaller and the density gets tighter, pin counts are increasing," said Taylor. "At the same time, our customers expect to reduce their costs. So we challenge ourselves to find ways to manufacture our sockets at an achievable price whenever possible."

So when Taylor heard about a spring-probe called the H-Pin that could deliver high performance at a significantly lower price, he was intrigued.

The H-pin

The H-pin is a stamped spring probe that delivers the mechanical, electrical and thermal performance of a pogo-style spring probe. The highly compliant pin has a working range up to 1 mm with a flat spring rate and can be utilised up to 15 GHz with -1.0 dB loss, carry up to 4 amps of current and withstand temperatures up to 200°C.

Although there are a few design tweaks, the real departure is in the manner in which complete pin assemblies are manufactured using a high-volume BeCu stamping process and a 100% automated, high-speed assembly and inspection process that can produce up to 400 pins per minute.

Available in various lengths and pitch sizes as low as 0.2 mm, the product is the brainchild of Plastronics, a global provider of test sockets for semiconductor reliability testing. For more than 40 years, the company has used spring-loaded probe pins to create finished sockets for burn-in, humidity, failure analysis and other test requirements.

Depending on quantities, the spring-loaded probe pins can cost 30–50% less. With thousands of pins potentially in a single test socket or board-to-board connector, the savings can be significant.

According to Taylor, simply reducing the cost meant little without consistent pin quality. To ensure this was the case, EP Ants conducted extensive testing of the H-pin, which included inviting customers to also test the product and provide additional feedback.

"As a test socket manufacturer, we have to rely on the quality of the pins we get from our spring probe supplier," said Taylor.



"The H-pins have a very reliable quality level, which is extremely important to us and our customers."

Meeting high-performance demands

For spring-loaded probe pins, high-performance characteristics are defined by the ability to withstand high temperatures required for burn-in and other tests, ability to handle increasing amounts of current over increasingly smaller pins and the ability to handle high frequencies.

According to Taylor, they do not rely on a single pin manufacturer. However, his company uses the H-pins for high temperature burn-in, tri-temp and HAST testing where the spring-probe is regularly subjected to temperatures well in excess of 200°C.

"The H-pin works well when exposed to the high temperatures we use for burn-in or tri-temp testing," said Taylor. The tests are typically conducted at up to 240°C and, despite cooling the back side, the spring pins still experience a fair amount of temperature. "We have worked with these pins above 200°C and we did not have a problem where other pins have failed."

The ability of the pins to withstand higher levels of current, despite shrinking in size, is also an increasing concern — particularly with the prevalence of higher power output lithium batteries.

"These semiconductor packages and chips have power management features that need to be tested as well," said Taylor. "The H-pins can take a lot of current." For high-performance applications, there can be concerns about the construction of traditional spring-loaded probe pins and how their design can affect the quality of the connection under compression; the potential for unreliable test results requires all finished pins be tested and binned according to performance results — a very costly process step.

According to Ironwood Electronics' Ila Pal, the H-pin solves this problem by utilising a leaf spring between the two plungers along with an external compression spring that allows the pin to maintain a good connection and pass signal throughout its movement.

Furthermore, the performance of the pin as measured by its contact resistance is also a benefit in high-frequency testing. Whereas standard spring-loaded probe pins can experience wide variations in contact resistance, potentially leading to false failures, the variation in the H-pin is minimal and well within accepted levels.

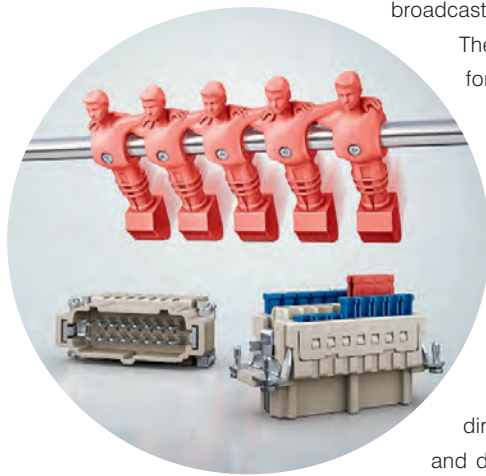
"For the H-pins, the variation is very minimal," said Pal. "So, testing is very precise, because we can add a cut-off factor for pass and fail, without having to worry about false failures."

Plastronics
www.plastronics.com



RAPID TERMINATION DEVICES

The Han ES Press series, an expansion of Harting's Han E series, offers a connector termination solution for a variety of applications in machinery and robotics, energy, transportation, automation, broadcast and entertainment.



The series includes multifunctional connectors that employ plug-in jumper technology for rapid termination without tools, thereby providing significant time saving during assembly and increased process reliability. The termination of the conductor is based on cage clamp technology, which allows the simple, quick and vibration-proof assembly of conductors with or without ferrules.

This design means it is simple, safe, easy and up to 50% quicker to assemble conductors. In addition, due to zero insertion force (ZIF) capability, conductors can be easily pushed into the contact cavities, which can be closed with light finger pressure on the device's blue press button. There is also an audible and tactile snap-in for the press buttons and plug-in jumpers.

The series also provides plug-in jumpers, enabling multiple contacts to be bridged directly at the connector. This allows for rapid reconfiguration, as well as bridging star and delta circuits.

Available in 6-, 10-, 16- and 24-contact variations, they also feature an integrated opening for use with a measuring probe, current ratings of up to 16 A at 500 V with 6 kV impulse voltage and a minimum of 500 mating cycles.

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SYSTEM DESIGN SOFTWARE

NI has announced LabVIEW 2016 system design software, empowering engineers to simplify development and effectively integrate software from the ecosystem into their systems. The latest version of the software introduces channel wires to simplify complex communication between parallel sections of code. Available on both desktop and real-time versions of LabVIEW, the channel wire method helps improve code readability and reduces development time.

The success of LabVIEW is due to the openness of both the product itself and the ecosystem that supports it. LabVIEW 2016 continues this trend with enhanced interoperability with Python and third-party devices. This openness, combined with several enhancements, helps users continue to improve productivity by streamlining code development and deployment.

The product is fully compatible with the latest NI hardware technologies for RF design and test, embedded control and monitoring, and engineering education, including the second-generation vector signal transceiver, NI PXIe-6570 digital pattern instrument, NI PXIe-4135 low-current source measure unit (SMU), time-sensitive networking-enabled CompactRIO controllers and the NI Educational Laboratory Virtual Instrumentation Suite (NI ELVIS) RIO Control Module.

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ARBITRARY WAVEFORM GENERATORS

Spectrum Instrumentation has released the generatorNETBOX series of arbitrary waveform generators (AWGs). The units combine the latest digital-to-analog converter (DAC) technology and can generate signals from DC up to 400 MHz in frequency. Full remote control is achieved through an ethernet connection to any PC or LAN.

The instruments are available with two, four or eight fully synchronous channels. To allow the generation of long and complex waveforms, the AWGs combine their large onboard memories with operating modes such as Single-Shot, Loop, FIFO, Gating and Sequence Replay. They can even output signals while new waveform data is being sent to the onboard memory.

Each channel is clocked using a precision phase-locked loop (PLL) control system that can be generated internally or from an external clock or reference. The AWG's flexibility is further enhanced by front-panel multipurpose I/O connectors that allow access to asynchronous digital inputs, asynchronous digital outputs, the trigger output, the run and arm status, the PLL reference clock and a marker output.

Small and compact, the products can be used on a benchtop or rack mounted. For mobile applications, they can be powered by an optional 12 or 24 VDC. The instruments are fully self-contained and come with all the tools necessary to generate an almost unlimited variety of waveforms.

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BINARY I/O FOR RAIL APPLICATIONS

The G403 3U CompactPCI Serial board has been designed specifically for modern railway applications. The board is suited to many different control functions, such as door-locking control and interior lighting.

The product supports a total of 16 bidirectional digital I/O channels organised into four optically isolated groups for data transmission, with four channels in each group. In addition to an accommodating configuration as either an input or output, each channel features an individual edge-triggered interrupt.

A voltage range of 14.4 to 154 VDC with a current output of 1 A at 24 V complies with EN 50155, making the board ready for immediate use in train applications as well as able to handle digital I/O signals with different voltage levels and ground references. The four front connectors use spring cage terminal blocks, facilitating low wiring outlay and enabling fast installation while ensuring a secure connection.

The board is equipped with all safety measures necessary for mobile environments, like voltage and temperature supervision, as well as readback of outputs and conformal coating against dust and humidity. This makes the device a robust product for all controlling means in the rail market.

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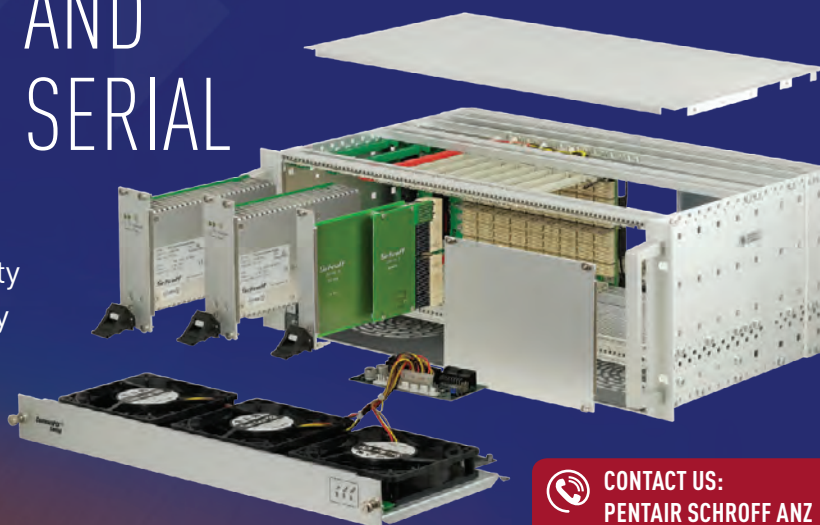
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INNOVATION, INTEGRATION AND THE IoT

Lauren Davis

GET AHEAD WITH SYNERGY

The Internet of Things is transforming the electronics industry. With internet access becoming a standard feature for more and more devices, not to mention the growing need for these devices to talk to other devices, companies are being pressured to become specialists in connectivity and everything that goes with it.

In response to this trend, semiconductor company Renesas Electronics has developed what it claims to be the world's first integrated IoT platform — Renesas Synergy. The product has been rolling out across Asia since 20 July and held its Sydney launch on 29 August.

Ronnie Ho, director of marketing at Renesas Electronics, explained that some companies might have some great ideas and potential applications relating to the IoT, but not have the expertise to leverage them. This means they will need to build their product from the ground up, first designing suitable hardware, then software, then testing it all to make sure it works. Even those companies that do have such expertise often encounter obstacles that slow down their time to market.

Thus, after investing a substantial amount of time and money in R&D, training and maintenance, there are no resources left for companies to focus on making their products truly innovative. This is where Synergy comes in. Synergy is a complete and qualified platform with fully integrated software, a scalable family of microcontrollers and unified development tools. Operating under the three core values of enabling faster time to market, reducing cost of ownership and reducing barriers to entry, the platform allows developers to start MCU software development immediately at the API level.

As explained by Peter Carbone, vice president and general manager of the Synergy IoT Platform Business Division, Synergy provides companies with a baseline they can build on — a bridge that they can cross. Instead of developing the basic infrastructure themselves, or putting together hardware and software components sourced from third parties, they can skip straight to making their product special; adding their own “secret sauce”, in the words of Carbone.

So how can one little platform account for dozens of potential applications across several industries? Carbone explained that Renesas has developed a core technology, based on its 30 years in the embedded industry, which can be adapted to many different applications.

“When we developed Synergy, we looked at five basic market segments: metering or energy management, factory automation, building

automation, home automation and medical,” he said. “And then we looked at some of the core elements that are common across that.”

The platform has the flexibility to be modularised, so components can be brought in and out. The source code of the Synergy Software Package (SSP) is completely visible during development and debugging, and can be edited, saved and printed on purchase of a licence from Renesas. Verified and qualified software add-ons are also available from the company, while hardware add-ons for specific applications can be purchased from Renesas's Independent Design Houses (IDHs) — a network of companies who have been trained in leveraging the platform quickly and efficiently.

Renesas has so far recruited 16 IDHs in South-East Asia, Oceania and India who will provide ongoing support to customers and have also developed their own prototypes using Synergy. For example, Queensland company IntelliDesign has created the Zephyr Air Quality Monitor, which provides real-time measurements and alerts on critical changes in air quality. Amatek Design, in NSW, utilised Synergy for a monochrome display as part of its rowing simulator. iWave Systems Technologies, in India, has developed a healthcare solution that measures vital data and then sends that data to the patient's doctor via the cloud. And with more IDHs set to be announced in 2017, the variety of Synergy-based products will only continue to grow.

According to Carbone, Synergy is particularly suitable for the Australian market, where there are a lot of innovative start-up companies who unfortunately face some amount of risk when they go to launch a new product. He said the Synergy business model works as a stimulus for these companies, as it requires no upfront licences, maintenance or support fees — customers only start paying for the platform when they start shipping their product.

“When they make revenue, we make revenue,” he said.

Synergy is now available in Australia and New Zealand through electronics distributor Braemac.

Renesas Electronics
www.renesas.com

NFC TIMING RELAY

The Schneider Electric Zelio NFC Timing Relay offers control and monitoring of a timing relay via NFC (near-field communication) using a smartphone or tablet. The product is suitable for maintainers, machine and panel builders, OEMs and anyone who uses a timing relay to control simple on/off switching tasks.

The timing relay comes with 28 timing functions. This allows engineers to reduce the number of individual references for their designs or installations, thereby improving efficiency. The time-saving copy and clone function of the mobile app allows fast and easy configuration of the timer relays. Further savings in time are delivered by the store-setting option that allows repeated use.

Configuration can be achieved easily via a smartphone app. The app provides precise time setting, up to 1 ms, so there is no more parallax error and no more calculation required. Control and monitoring of the timer is achieved using the diagnostics feature, which allows users to check the time lapse and input/output status. Security is provided via password protection for all settings. The automatic setting provides a maximum 0.2% error in timing, which is better than current or traditional solutions that allow an error margin of up to 10%.

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COMPACTPCI SERIAL CARRIER BOARD

MEN's G227 CompactPCI Serial carrier board, for PCI Express Mini Cards, is suitable for wireless data communication. It offers space for two PCIe Mini Card slots for LTE, UMTS, GSM or HSPA, each with two antenna connectors at the front, one PCI Mini Card slot for WLAN, telephony, GPS or audio signals and up to 10 microSIM cards.

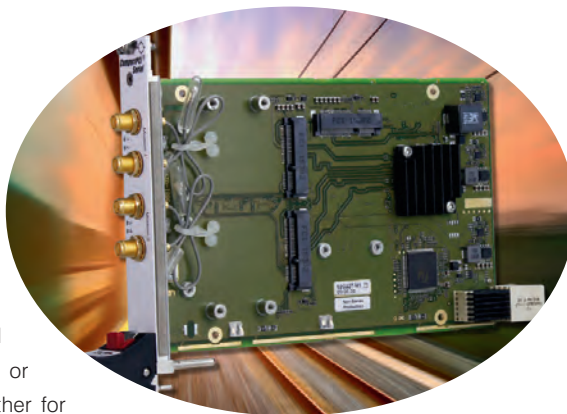
The CompactPCI Serial card is equipped with three PCIe Mini Card slots in total: two of them for communication via LTE, UMTS, GSM or HSPA — each with two front-sided antenna connectors — and another for WLAN and GPS, for transmission of audio signals or as a virtual SIM card. The integration of GNSS signals with MEN's PCI Mini Card PX1, as well as the connection of an additional antenna connector at the front, is also possible via the third slot.

Particularly for usage with frequent location or rate-related network changes, 10 microSIM cards can be accommodated on the product. The remote software provided by MEN allows the separate control and the power up and down of the microSIMs.

The versatile PCI Mini Card carrier board is suitable for wireless applications like fleet management or passenger information in the train and other mobile markets. For use in harsh environments, the board works in an operating temperature of -40 to +85°C and is coated against dust and humidity.

OEM Technology Solutions

www.oem.net.au



RUGGED EMBEDDED COMPUTER

Crystal Group has launched the RE1312 Rugged Embed-

ded Computer, a lightweight computer with the capability to bring powerful computer processing to a variety of transportation platform applications.

Airborne and mobile computer systems need to withstand unstable power sources and a variety of shock and vibration conditions. The rugged embedded computer offers a high-compute processing ability while taking up a limited amount of space. Weighing only 3.18 kg, it is suitable for data-intensive applications including signal intelligence, surveillance, reconnaissance and transit case integration.

The computer is a ruggedised system based on Intel Core-i7 Gen6 Dual or Quad Core processors. The system can be configured with up to 32 GB, non-ECC DDR4 of memory. Along with six USB 3.0 ports, the unit offers two 15 mm SSD or three 9 mm SSD storage options which are externally removable.

The system's LGA 1151 socket supports HDMI and DVI-I video output options. A tough carbon fibre composite frame serves simultaneously as the entire system's structural backbone and EMI shield. The unit measures 30.48 x 11.43 x 22.86 cm and can be tray or bulkhead mounted with supplied bracket ears.

The computer operates over a wide temperature range, from -40 to 60°C, with 18 to 36 VDC input. It is compatible with several industry-standard operating systems and complies with MIL-STD 461, CE102 and RE102 for EMC testing.

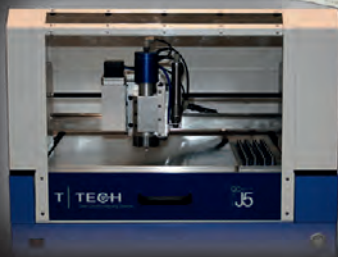
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I/O INTERCONNECT SYSTEM

The Molex Nano-Pitch I/O interconnect system benefits high-performance applications by delivering robust, small-form-factor, high-speed and multiprotocol interconnects suitable for both internal and external solutions.

The system features a continuous ground-signal-signal-ground pinout concept, which optimises it for high-speed applications and maximises the number of high-speed lanes within the lengths provided. It provides up to 12 Gbps per channel in SAS 3.0 and up to 16 GTps per channel in PCI Express.

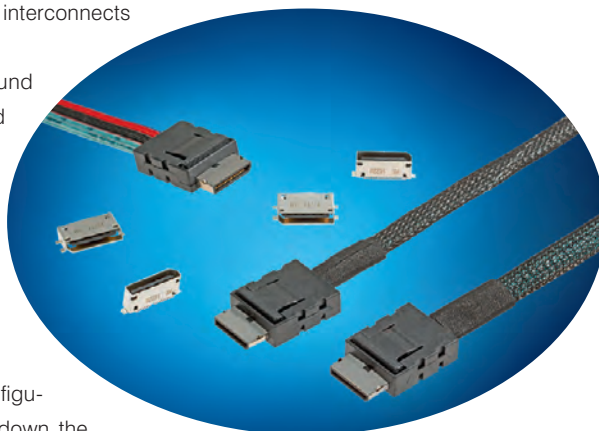
The low-profile connector solution supports SAS-3/SAS-4 and PCIe Gen 3/Gen 4 interfaces. The 42-circuit, 0.50 mm-pitch, metal shell SMT connectors are available in both right-angle and vertical versions to fit a variety of placement options.


The system offers staggered and constant dual-row contact configuration, enabling engineers to add components without shutting down the system (known as hot pluggability). The connectors also provide optimal routing for high-speed trace connections while reducing the need for PCB real estate.

The interconnect system provides inventory and manufacturing assembly efficiencies in data centre and enterprise storage systems, storage racks, storage controllers and host bus adapter (HBA) servers, as well as telecom hubs, servers, switches and routers.

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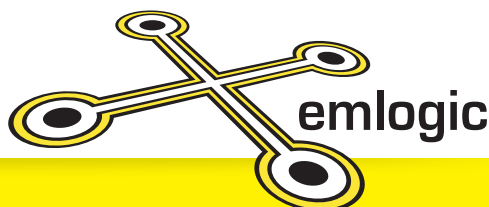




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GREAT CONNECTOR INVENTIONS: BACKPLANE STIFFENERS

David Brearley*

Backplane connectors with large moulded housings existed in the late 1980s but were expensive and very difficult to make. True position for all of the pins had to be accurate or the connector could not be placed easily on the boards and mated. Teradyne Connector Systems found a solution.

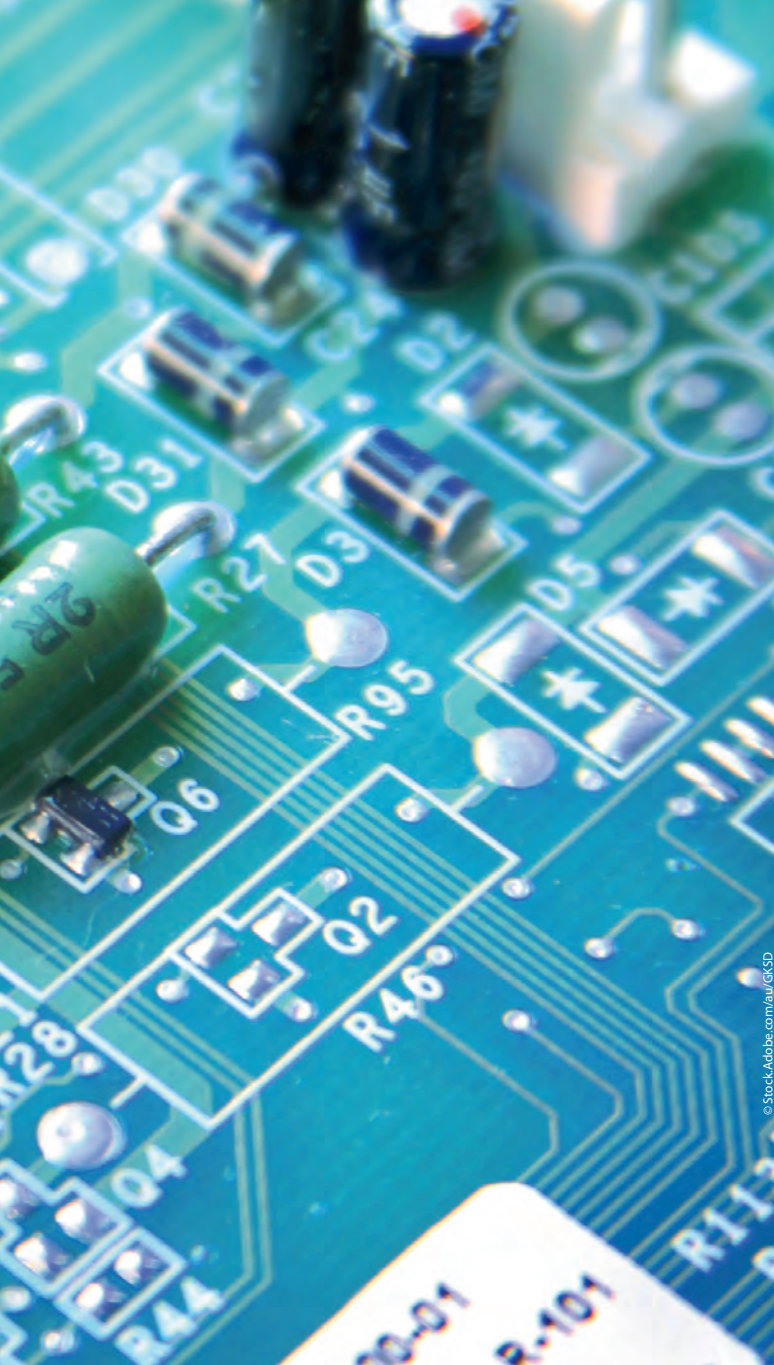
Teradyne Connector Systems (TCS) was a division of Teradyne, the renowned maker of test systems. The connector group was formed to design and tool connectors that Teradyne could not find in the market. Semiconductor testing equipment required large boards with very high pin-count connections to the backplane.

Backplane connectors that used large moulded housings existed in the late 1980s, manufactured by Berg, AMP and a few others, but they were expensive and very difficult to make. The primary challenge was to mould a single-piece housing the full length of the daughtercard edge that could be up to 18" long. The moulds to make these connectors tended to be two-cavity expandable tools that took many hours of set-up before a batch of a particular length could be successfully run. It was especially difficult to keep these very long mouldings straight and flat enough to meet specifications. True position for all of the pins had to be accurate or the connector could not be placed easily on the boards and mated.

In the mid-1980s, TCS engineers figured out this problem could be overcome by using smaller right-angle receptacle blocks mounted

on an extruded stiffener. This connector family was called High Density Plus. The idea was to use the extruded stiffener to group signal modules, guidance and power blocks on a single stiffener. The stiffener was beefy enough to make the assembly straight and each module is precisely located on the stiffener to eliminate cumulative tolerance issues that plagued the long moulded-housing connectors. The stiffeners accepted screws from the bottom of the board, firmly attaching the stiffener to the board and removing any bow or twist in the process. The 'Plus 2' version of this connector added ground contacts above and below the signals to provide grounding and shielding. These assemblies on 0.100" pitch were large and expensive, but the improved true position of the tails eased placement on large boards, and the accuracy of the mating contacts reduced mating forces and improved reliability. AMP used similar extruded stiffeners as well.

The real stiffener breakthrough came in the next generation of 2 mm connectors from Teradyne. Extruded stiffeners were expensive, bulky, heavy and occupied a lot of daughtercard space. Also, because these connectors were soldered to the daughtercard, repair



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was quite difficult and destructive. The invention of the continuously stamped L-shaped stiffener solved this issue. Features in the stamping allowed placement of individual blocks with true position fixed by the holes in the stiffener.

The first TCS connector to use this feature was the HDM (High Density Metric) six-row connector, invented by Dan Provencher, Phil Stokoe and Dave McNamara. A key advantage of the stamped stiffener was that it could be removed to allow an individual module (or wafer) to be repaired. Subsequent stiffeners for VHDM had slots that accepted dovetail 'top hats' on each wafer so that each is accurately located to the stiffener and the mating connector. These wafers can actually float slightly left and right to ease engagement to the mating pin field, further reducing mating force and improving reliability.

Note that Metral had four rows (a fifth was added later), and 2 mm HM had five rows (eight-row versions eventually appeared). When you start to designate ground pins, the density advantage of having six rows of contacts in an open pin field backplane connector emerges. A six-row arrangement allows pairs to be oriented verti-

cally within columns rather than horizontally within rows, which eliminates orphan pairs at the ends of rows and increases density. This fundamental fact led to subsequent shielded backplane connector configurations in even row counts of four, six or eight pairs.

The addition of stiffeners to daughtercard connectors facilitated accurate true position for very large connectors mating with very large backplanes. High-end customers, especially in the computing and networking industries, liked the stiffeners on connectors primarily because they eliminated the need for discrete board stiffeners. These customers put Teradyne into the mainstream connector business, which changed the direction of the backplane connector industry forever. Rick Schneider of TCS realised that a powerful second source would improve his competitive position with major companies like Cisco, IBM, EMC and Oracle. Molex, new to the backplane business at the time, signed up to second-source the Teradyne offering.

Many other connector manufacturers took the opposite approach — tooling small modules, not more than 50 mm long, then allowing the OEM or CM manufacturing site to configure the boards by placing as many connector blocks as it wished wherever the pins were needed. This approach allowed distributors to stock all of the basic building blocks for a connector family for immediate delivery, which eliminated the lead time needed to build connectors to order.

We find strong proponents for both approaches. Chinese companies, in particular, prefer small connector blocks with maximum flexibility to configure at the manufacturing location. Amphenol-TCS has successfully differentiated its product value proposition by offering custom connector configurations using stiffeners for the VHDM, HSD, GbX and XCede product families. Molex, TE Connectivity, FCI, ERNI, HARTING and others have also been quite successful selling smaller blocks for their backplane connector families.

**David Brearley has been in the connector industry for more than 30 years. He began his connector career with Berg Electronics, a division of DuPont in Harrisburg and the Netherlands, then in 1990 he joined Molex to build its backplane connector business. Dave has also managed products at Amphenol-TCS, FCI, and was midwest salesperson for Neoconix. Prior to joining Bishop in 2015, he was contributing editor for Connectortips.com. Dave is active in IEEE, and was draft editor for the IEEE 1301.3 standard for metric backplane connectors. He can be reached at dbrearley@bishopinc.com.*

For more information, please contact Robin Pearce, Bishop & Associates, via email at rpearce@bishopinc.com.

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INTERMEDIATE RINGS FOR ENCLOSURES

For the MINITEC EM mobile enclosure, OKW Gehäusesysteme offers intermediate rings with an integrated recess for a USB interface. With the help of this interface, portable solutions become possible, eg, compact measuring units with data recording as data logger sticks.

The intermediate rings are made to fit the MINITEC EM with the dimensions 68 x 42 x 18 mm. There is a choice of two versions for different USB types. The existing intermediate ring is intended for a Type A USB plug in accordance with DIN IEC 61076-3-107. A further version for the use of Micro USB 5P, B Type SMT is now also available.

Both TPE intermediate rings are in the colour volcano and have an eyelet for attachment purposes. Matching enclosures are available in ABS (UL 94 HB) off-white and lava as well as in PMMA Plexiglas black. They can each be chosen with or without a recessed surface for membrane keyboards or decor foils.

Installation is easy: the intermediate ring is inserted between the top part and the bottom part, and secured with a screw at the rear. The TPE version has a pleasant touch sensation and also offers impact protection. To ensure that the enclosure is always within easy reach, it can be attached to a keyring or worn around the neck on a lanyard.

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4K HDMI MATRIX SWITCH

The SM-8X8-C64KR-POE-HDBT matrix switch routes uncompressed Ultra-HD 4Kx2K digital HDMI signals and IR from HDMI video sources to displays and speakers via a CATx cable using HDBase-T Technology.

The matrix switch is capable of connecting to as many as eight HDMI video sources directly and eight video displays via ST-C6HDP-POE-HDBT-R-LC receivers with a maximum extension of 100 m from the switch using CAT5e/6/7 cable. PoE provides power to all connected receivers. Each input can be independently connected to any or all outputs.

The product supports Ultra-HD 4Kx2K resolutions to 4096 x 2160, HDTV resolutions to 1080p and computer resolutions to 1920 x 1200. It can be configured and controlled through Ethernet, serial port, front panel buttons or IR remote control. Bidirectional IR control from input and output locations enables flexible control.

One IR remote control and two IR emitters and receivers are included with the switch; additional IR accessories can be purchased if needed for more extensive configurations. Ethernet ports on the switch and receivers can be used to connect network devices such as 100Base-T routers, hubs, smart TVs or smart Blu-Ray players.

The unit is HDCP compliant and supports external and internal EDID settings. With a 2RU design and no loss of audio or video quality between the switch and remote units, it is suitable for digital signage applications.

Interworld Electronics and Computer Industries

www.ieci.com.au



IO-LINK MASTER

Manufacturers and industrial operators can now access more detailed sensor diagnostics in harsh operating environments using the IP67-rated, Allen-Bradley ArmorBlock IO-Link master from Rockwell Automation. The device builds on the company's IO-Link portfolio with event and process timestamping capabilities for on-machine applications.

The product stores up to 40 timestamps of sensor events on each channel. This event history can help users track changes and more easily diagnose issues. Input timestamps of all sensor data also can be sent to the controller upon a change of state. These and other diagnostics available through the device can reduce issue-resolution time by as much as 90%, improve preventive maintenance and optimise overall system performance.

The device can aid end users in creating smarter operations without a complete overhaul. They can deploy the technology to monitor temperature and for margin-indication or proximity parameters in critical processes. They can also target problem areas where better diagnostics are needed to remedy issues.

The master includes connectivity for up to eight IO-Link sensors. The master and sensors share an IP address, helping end users reduce the time to commission equipment.

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PXI SOURCE MEASURE UNIT

National Instruments has announced the NI PXIe-4135 source measure unit (SMU) with a measurement sensitivity of 10 fA and voltage output up to 200 V. Engineers can use the device to measure low-current signals and take advantage of the high channel density, fast test throughput and flexibility for applications such as wafer-level parametric test, materials research and characterisation of low-current sensors and ICs.

Engineers can use the modular SMU to build parallel, high-channel-count systems in a compact form factor and benefit from up to 68 SMU channels in a single PXI chassis that can scale to hundreds of channels. Users can increase test throughput by taking advantage of a high-speed communication bus, deterministic hardware sequencing and a digital control loop technology to custom-tune the SMU response for any device under test. They can also control the SMU response through software, which removes long wait times for SMU settling and offers the flexibility to help minimise overshoot and oscillations.

The interactive soft front panels can be used for making basic measurements and debugging automated applications. The driver features help files, documentation and ready-to-run example programs to assist in test code development and includes a programming interface that works with a variety of development environments. Engineers can use the SMUs with NI's TestStand test management software, simplifying the creation and deployment of test systems in the lab or on the production floor.

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BENCHTOP MULTIMETER

The Siglent SDM3045X is a 4½-digit dual-display digital multimeter that is suited to high-precision, multifunction and automation measurement applications. It features multiple math and display choices, histograms, trend charts, bar charts, statistics, hold measurement, dBm, etc.

The multimeter's front panel features a 4.3" (480 x 272), high-resolution, colour TFT-LCD display that clearly shows the 60,000 count readings. Its clear keyboard layout and operation make it easy and quick to use. Its many interfaces for remote communication and storage include USB Device, USB Host and LAN, and the Ethernet connection interface supports the common SCPI command set.

With up to 150 readings/s, the DMM will make measurements of True-RMS AC voltage and AC current, resistance to 100 MΩ, capacitance to 10,000 microfarads, continuity and diode tests, frequency and period measurements, and temperature, with support for thermocouple and RTD sensors. It contains 1 GB of Flash memory for storage of configuration and data files, and also supports USB external storage. EasySDM software, provided free, allows for easy PC connectivity, external control and display. The device is housed in a compact (11.6" x 10.3" x 4.3") prop-stand case and weighs 3.8 kg.

The multimeter is a good general-purpose measuring tool. Applications include research and development, education, circuit testing and debug, automated production testing, etc.

TRIO Test & Measurement Pty Ltd
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10-PORT MANAGED 10 GB SWITCH RANGE

The MAXBES series switch family from MPL is equipped with eight 1 Gb ports and two 10 Gb speed ports. The product is compact and can be used as an open-frame solution or in an MIL housing with connectors of the user's choice.

The 1 Gb ports are either available as eight RJ45 copper ports or four RJ45 copper ports and four 1 Gb SFPs. For the fibre ports, most Ethernet-compatible transceivers can be used, allowing the user to select the appropriate transceiver for each link. The open-frame version offers lockable headers instead of RJ45. All ports have status LEDs, indicating the activity and speed of each port.

As a managed switch, the product gives access to various switch settings to configure features like quality of service, VLAN, rapid spanning tree, etc. To adjust these switch settings, the company provides an easy-to-use web interface. The power supply input is 8–36 VDC and uses less than 15 W. The device can be operated at -20 to +60°C.

The switch is suitable for any rugged or industrial network applications. Due to the low power consumption and robust and flexible design, it can be used for any embedded system in a rugged, hot or other harsh environment. The device makes it easy to set up a challenging network.

Backplane Systems Technology Pty Ltd
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The Camille Bauer SINEAX 4-quadrant, AM 1000, 2000 (both class 1) and 3000 (class 0.5S) intelligent panel meters are suitable for 3-wire, 4-wire, single-phase and three-phase balanced, unbalanced and open wye circuits. Neutral current is calculated for the SINEAX AM 1000 and 2000 products, while it is calculated or measured for the 3000.

Communication options include Ethernet (Modbus/TCP, web server, NTP), RS485 (Modbus/RTU), digital I/O and 20 mA analog with linear and segmented linear outputs. Internal data storage is via Micro SD card and monitoring functions include periodic, event and disturbance recording (with pretrigger) based on half-cycle rms. Complete characterisation of three-phase parameters is provided, including imbalance, symmetrical components, harmonics to the 50th order, phase total active power and power factor, fundamental power and reactive factors, distortion reactive power and apparent power, and phasor display of voltage and current, including symmetrical components. The instruments are Cat III rated for all inputs.

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SEALED FULL TRAVEL KEYBOARD

The BLTX sealed full travel keyboard features 83 keys with an integrated touchpad. Its full travel mechanical keys provide a tactile feel, similar to a standard keyboard, while a sealed membrane beneath the keys provides IP65 protection from dust and liquids. Drainage holes are provided to prevent liquids from collecting under the keys and to facilitate cleaning. Red LED backlighting makes the product suitable for use under low ambient light conditions. The keyboard is constructed from tough industrial-grade materials. Polybutylene terephthalate (PBT) plastic is used for the key caps to maintain a surface texture that will not become worn and shiny. The legend is printed by a sublimation process and will not collect surface oil and dirt.

The small-footprint keyboard measures 304.3 x 196.3 x 32.7 mm and is suitable for use where space is limited. Anti-slip rubber feet provide stability for desktop use, while rear VESA mounting holes allow the keyboard to be securely mounted for mobile applications. The keyboard is suitable for industrial, engineering, laboratory, low-light and mobile vehicle applications.

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A SIMPLE WAY TO OPTIMISE RECHARGEABLE BATTERIES



Swiss researchers have developed a simple and cost-effective procedure for enhancing the performance of conventional Li-ion rechargeable batteries — and all it required was changing the battery's anode structure.

As noted by Claire Villevieille from the Paul Scherrer Institute (PSI), most battery materials researchers concentrate on the development of new materials. However, Villevieille, co-researcher Juliette Billaud and their colleagues at ETH Zurich took a different approach.

"We checked existing components with a view to fully exploiting their potential," Villevieille said. By optimising the graphite anode — or negative electrode — on a conventional Li-ion battery, the researchers were able to boost battery performance. The results have been published in the journal *Nature Energy*.

Anodes are made from graphite arranged in tiny, densely packed flakes, comparable in appearance to a granola bar. When a Li-ion battery is charging, lithium ions pass from the cathode, or positive metal oxide electrode, through an electrolyte fluid to the anode, where they are stored in the graphite bar. When the battery is in use and thus discharging, the lithium ions pass back to the cathode but are forced to take many detours through the densely packed mass of graphite flakes, compromising battery performance.

These detours are largely avoidable if the flakes are arranged vertically during the anode production process so that they are massed parallel to one another, pointing from the electrode plane in the direction of the cathode. This alignment was achieved by André Studart and his team at ETH Zurich. The method involves coating the graphite flakes with nanoparticles of iron oxide sensitive to a magnetic field and suspending them in ethanol. The suspended and already magnetised flakes are subjected to a magnetic field of

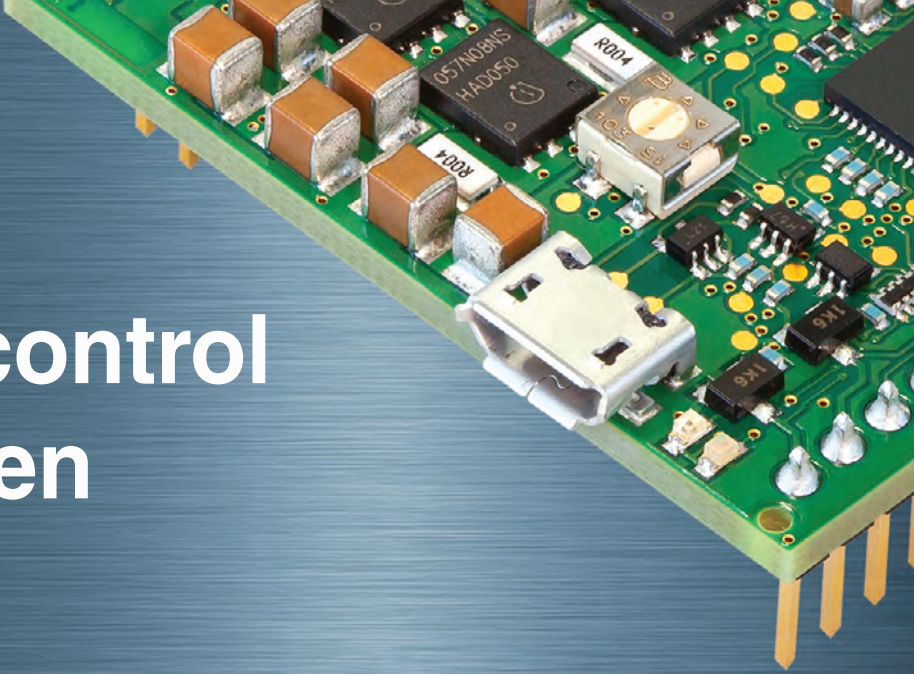
100 millitesla — about the strength of a fridge magnet.

By rotating the magnet during this process, the platelets not only align vertically but in parallel formation to one another. As a result, they are perfectly ordered, reducing the diffusion distances covered by the lithium ions to a minimum. If the magnet remains turned on during the ensuing drying process, the platelets keep their new orientation even when removed from the ethanol suspension. The flakes in the compressed graphite bar are also now parallel, enabling the lithium ions to flow much more easily and quickly while also increasing storage capacity by allowing more ions to dock during the charging process.

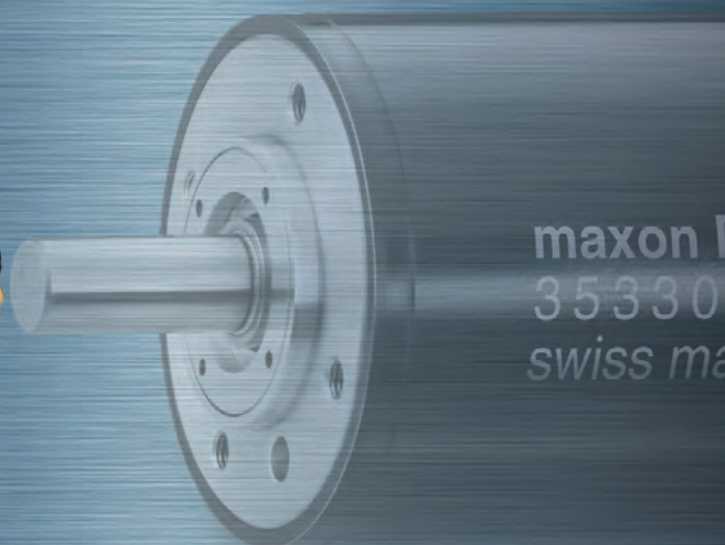
"Under laboratory conditions, we were able to enhance storage capacity by a factor of up to three," said Villevieille. And while she acknowledged that "commercial batteries will not be able to fully replicate these results", Villevieille said that "performance will definitely be enhanced, perhaps by as much as 30–50%: further experiments should yield more accurate prognoses".

The procedure is simple, cost-effective and scalable for use in rechargeable batteries in all areas of application — from wristwatches to smartphones, laptops and cars. It is also transferable to other anode-cathode batteries, such as those based on sodium.

Furthermore, improving existing components requires less developmental input than a new battery design using new materials. Villevieille stated, "If a manufacturer were willing to take on production, enhanced batteries could be ready for the market within one or two years."



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WHAT HAPPENS INSIDE AN ATOMICALLY THIN TRANSISTOR?

Have you ever wondered what happens inside an atomically thin semiconductor? Well, wonder no more: a team of physicists at the University of Texas at Austin has, and they've written about it in the *Proceedings of the National Academy of Sciences*.

They've also discovered that an essential function for computing may be possible within a space so small that it's effectively one-dimensional.

In the *PNAS* paper, the researchers describe seeing the inner workings of a new type of transistor that is two-dimensional.

Transistors act as the building blocks for computer chips, sending the electrons on and off switches required for computer processing. Future tech innovations will require finding a way to fit more transistors on computer chips, so experts have begun exploring new semiconducting materials including one called molybdenum disulfide (MoS_2). Unlike today's silicon-based devices, transistors made from the new material allow for on-off signalling on a single flat plane.

Keji Lai, an assistant professor of physics, and a team found that with this new material, the conductive signalling happens much differently than with silicon, in a way that could promote future energy savings in devices. Think of silicon transistors as light bulbs: The whole device is either turned on or off at once. With 2D transistors, by contrast, Lai and the team found that electric currents move in a more phased way, beginning first at the edges before appearing in the interior. Lai said this suggests the same current could be sent with less power and in an even tinier space, using a one-dimensional edge instead of the two-dimensional plane.

"In physics, edge states often carry a lot of interesting phenomenon, and here, they are the first to turn on. In the future, if we can engineer this material very carefully, then these edges can carry the full current," Lai said. "We don't really need the entire thing, because the interior is useless. Just having the edges running to get a current working would substantially reduce the power loss."

Researchers have been working to get a view into what happens inside a 2D transistor for years to better understand both the potential and the limitations of the new materials. Getting 2D transistors ready for commercial devices, such as paper-thin computers and cell phones, is expected to take several more years. Lai said scientists need more information about what interferes with performance in devices made from the new materials.

"These transistors are perfectly two-dimensional. That means they don't have some of the defects that occur in a silicon device. On the other hand, that doesn't mean the new material is perfect," said Lai. Lai and his team used a microscope that he invented and that points microwaves at the 2D device. Using a tip only 100 nanometres wide, the microwave microscope allowed the scientists to see conductivity changes inside the transistor. Besides seeing the currents' motion, the scientists found thread-like defects in the middle of the transistors. Lai said this suggests the new material will need to be made cleaner to function optimally.

"If we could make the material clean enough, the edges will be carrying even more current, and the interior won't have as many defects," Lai said.

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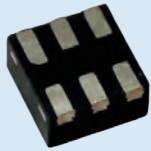
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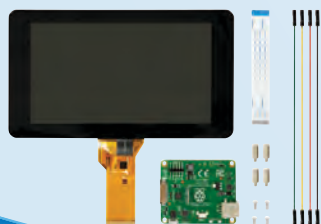
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Raspberry Pi 3 Model B

The Raspberry Pi 3 Model B builds upon the features of its predecessors with a new, faster processor on board to increase its speed. It also features WiFi and Bluetooth Low Energy capabilities to enhance the functionality and the ability to power more powerful devices over the USB ports.



Raspberry Pi 7" Touchscreen Displays

The 7" Touchscreen Monitor for Raspberry Pi gives users the ability to create all-in-one, integrated projects such as tablets, infotainment systems and embedded projects. The 800 x 480 display connects via an adapter board which handles power and signal conversion. It is truly interactive as the latest software drivers will support a virtual 'on screen' keyboard, so there is no need to plug in a keyboard and mouse.

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