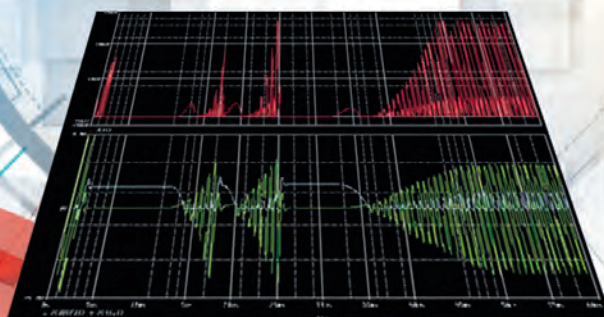
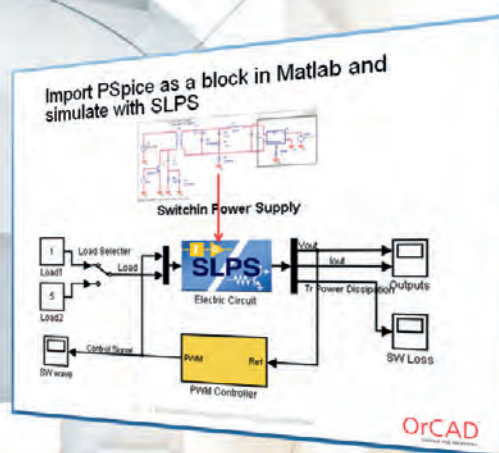
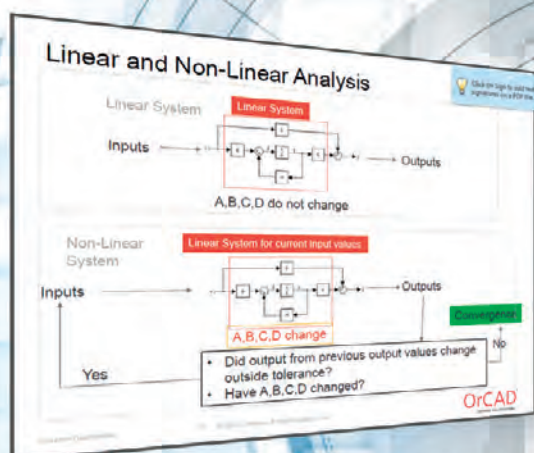


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## COVER STORY



With the new release of PSpice 17.2-2016, Cadence has delivered its most comprehensive and powerful SPICE platform ever, making it a desirable tool for engineers worldwide.

Supported by more than 33,000 free component models from a multitude of vendors, PSpice leads in its ability to simulate and characterise analogue and mixed signal circuits, enabling designers to shorten design cycles, reduce errors, cut costs and optimise product performance via a powerful 'virtual simulation' environment, which is unique to PSpice.

From AC, DC and Parametric Sweep simulations, through to advanced Monte Carlo and Smoke analyses, PSpice has been adopted by manufacturers such as ResMed (medical), TomTom (mobile devices), Solid State Logic (broadcast equipment) and TATA Motors, because it delivers on its promise to enhance productivity; and by universities such as Charles Darwin and UNSW as part of their world-class learning programs.

Recent announcements in partnership with MathWorks and XJTAG further highlight PSpice's position as the gold standard in simulation and analysis for design engineers, with options such as SLPS — a Simulink/PSpice bi-directional integration engine for system level simulations — delivering unparalleled modelling capabilities. PSpice Designer even includes OrCAD Capture (schematic entry) and an import utility for Altium, Eagle and PADS files. Learn more:

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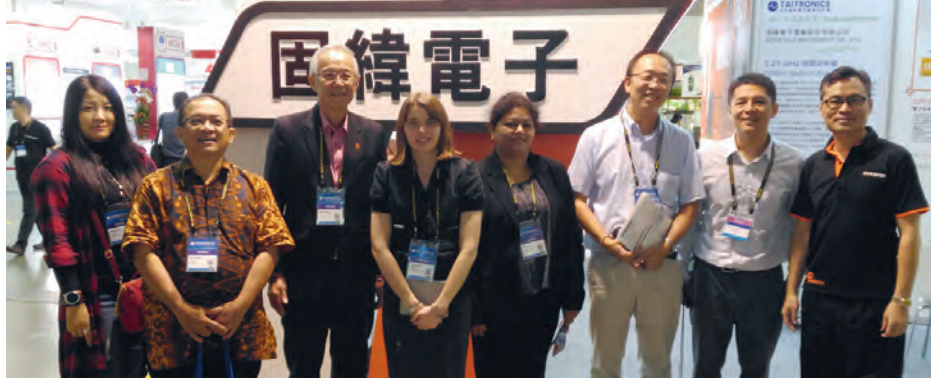
# NEW TECHNOLOGY, NEW APPLICATIONS TAITRONICS 2016

*Lauren Davis*

With continual advances being made in exciting areas such as wearable devices, smart products, the Internet of Things (IoT) and Industry 4.0, this year's Taipei International Electronics Show (Taitronics) was an event not to be missed.







The 42nd edition of Taitronics, organised by the Taiwan External Trade Development Council (TAITRA) and the Taiwan Electrical and Electronic Manufacturers' Association (TEEMA), was held from 6–9 October at the Taipei Nangang Exhibition Center. The organisers had kindly invited *What's New in Electronics* to attend, and it was clear from the outset that the scale of the show was far in excess of any electronics industry event one could expect to find in Australia.

Under the theme of 'New Technology, New Applications', exhibitors representing 530 different organisations and 11 different countries showcased their wares to around 24,000 guests. As we navigated our way through over 1000 booths, we encountered exhibition areas such as Meters & Instruments, Smart Manufacturing and Medical Care, indicating the wide range of products and applications that we would be coming across. There were also eight themed pavilions which brought together displays from a variety of vendors, covering fields such as cloud computing, smart living and smart safety.

## Innovation

For five years now, the organisers of Taitronics have presented annual Technology Innovation Awards, honouring a selection of products for their innovation, industry contribution, market value, energy-saving potential, and aesthetics and design. This year, Gold Awards were presented across three categories, with a number of runner-up Quality Awards in each.

GW Instek won the Broadband Products & Cloud Tech Gold Award for its 3.25 GHz Spectrum Analyser, which has the novel feature of being able to analyse data while in the process of collecting it. King Design Industrial won the Electronic Products Gold Award for its sunlight simulator, Apollo, for manufacturers who need to measure the efficiency of solar cells on production lines and in the laboratory. Finally, the Electronics Components & Parts Gold Award went to SFI Electronics Technology for its semiconductor-based

ESD protection device (SGD), which is said to save processing time, improve quality and reduce part of component storage space.

There were also several Quality Awards presented in each category. These included the Yantouch EyE Speaker, which combines music with a light display; the Guider Senya smart watch, which includes safety features such as location tracking and fall detection; and Transverse Industries' walking assist device, which includes a laser floor marker to help rehab patients who are learning to walk again.

## In the home

While not all the products on display could be award winners, that didn't mean they couldn't be innovative. For example, Sampo's Smart Home gateway allows you to remotely control your lighting, security and appliances. With the inclusion of sensors that indicate air quality, humidity, whether doors are open and the likelihood of rain, the user can alter their appliances' settings to match the conditions. The gateway even includes a secret camera so you can monitor what's going on in your home, *Meet the Parents* style!

Meanwhile, OUiGO was showcasing its massive 100" New TV screen, claimed to be the world's largest TV projector screen. Taking the phrase 'home theatre' to a whole new level, the screen is suitable for a projector with a laser light source, meaning the screen itself will never deteriorate and can effectively last forever. Furthermore, the picture is said to be better quality than on an LED/LCD screen, with a soft image that shouldn't damage the user's eyes.

## In the workplace

With data analytics becoming an increasingly important part of marketing, Taiwan's Institute for Information Industry (III) has launched the So Fashion Omni-Channel Commercial Solution. The platform collects both raw sales data and records of customer behaviour via social media reviews. It then analyses this data to help corporations get a bet-





ter understanding of what their customers think of them — and their competitors.

For more industrial applications, NEXCOM is making a shift to the IoT automation space. Factory owners who install their computers with the company's PLC controller will receive machine automation control, with the ability to stop, start or program machines with the tap of the screen. You can even monitor progress through your phone, so if a machine shuts down for some reason, you'll be informed immediately.

### In the great outdoors

For the more active electronics enthusiasts out there, AiQ has launched its Smart Clothing range for sport and fitness applications, as well as leisure, home care and health care. The company's BioMan fitness range, for example, features integrated wearable (and washable) electrodes that pick up signals from your skin as you exercise. These are then sent to an app on your phone, which allows you to monitor vital health information such as heart rate.

The Sightour MySight360 wearable virtual reality (VR) camera, on the other hand, is designed for hikers who want to share and relive their experiences. The lightweight (<90 g) camera is smaller than a business card, meaning it can be easily

clipped onto the user's clothes. Featuring a fish-eye lens for an immersive viewing experience, its calibration algorithm provides steady viewing. The dustproof, splashproof camera will be launched on Kickstarter in November.

### In the hospital

This heading is a bit of a cheat, since it's more about keeping people out of hospital. For example, the Ill's Postoperative Wound Analytics Service allows a discharged patient to take a photo of their wound and send it to the cloud via a smartphone. The server's analytics capability will detect if the wound could be infected and notify the doctor, who can contact the patient as needed. This eliminates the need for unnecessary appointments, which is especially useful for patients living in regional areas.

Start-up company Giant Power Biomedical Technology has meanwhile released the COMGO health bracelet — a wearable device which features both ECG (electrocardiography) and PPG (photoplethysmography) signals for precision analysis and operation. It is intended for people who would otherwise not be able to measure physiology information such as pulse, blood oxygen, blood pressure and body temperature. This makes it particularly suitable for nursing home residents.



### In the virtual world

With products such as the Oculus Rift taking the world by storm, it is clear that VR is becoming, well, reality!

There were a variety of VR entertainment options on display at the show, with Gelly Bomb Games showcasing its VR Somatosensory Game. The player flies around on a magic carpet within the game, trying to collect gems and avoid obstacles along the way. Movements within the game are controlled by the user's own balance and body movements while sitting on a real-life carpet. It was an enjoyable game to experience, but this reporter recommends wearing something other than a skirt while playing it! But VR is not all about fast-paced gaming — it can also be about art.

Taiwan's National Palace Museum offers Roaming through Fantasy Land, which adapts painter Zhao Mengfu's 'Autumn Colors on the Qiao and Hua Mountains' into an immersive VR experience. As the participant sits in a small boat, slowly rowing down the ancient Yellow River, one can almost feel the boat bobbing up and down on the water. It is a very calming experience, with the outside world all but blocked out, and quite unlike other VR experiences that are out there.





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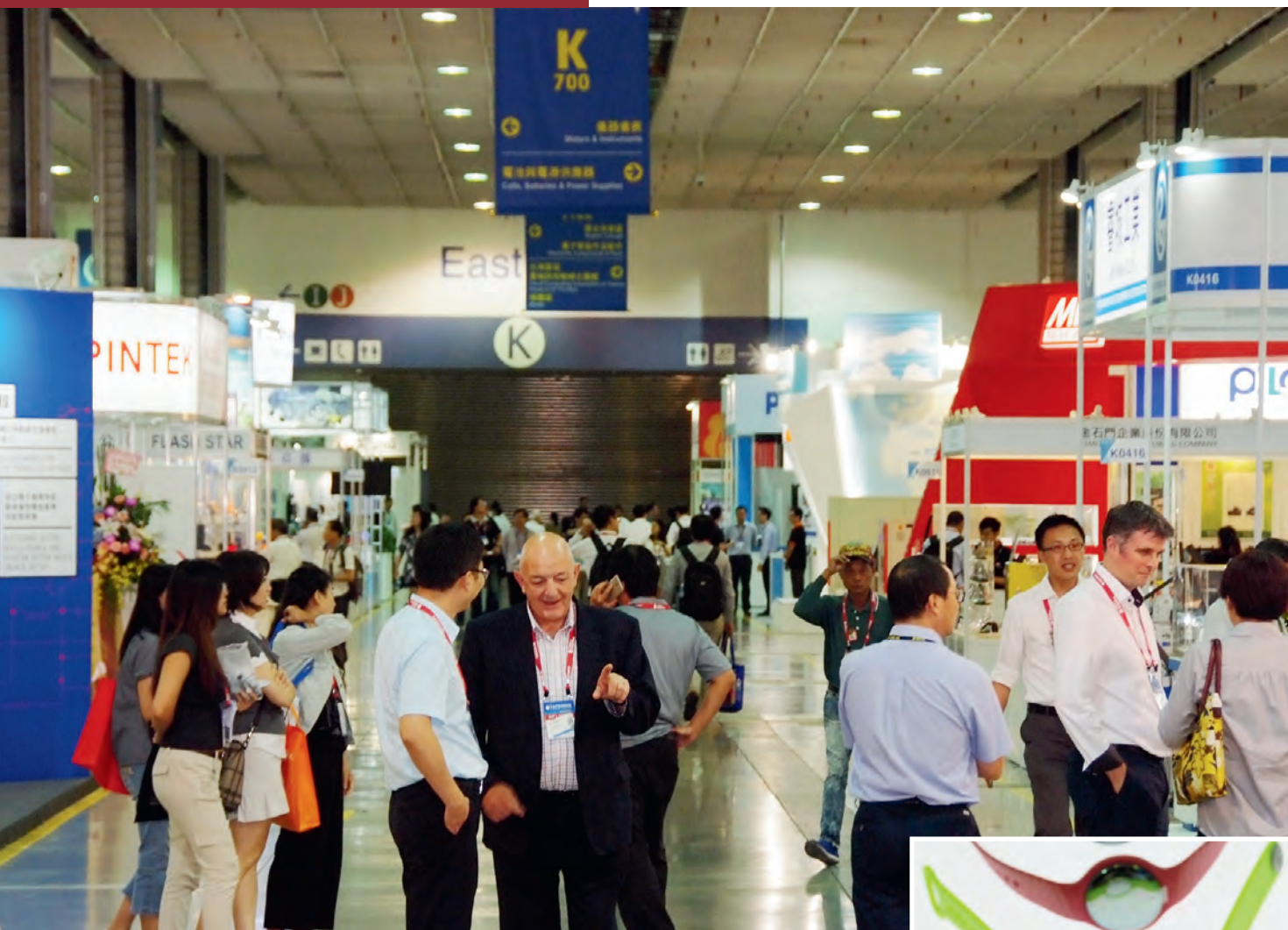
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## In the air

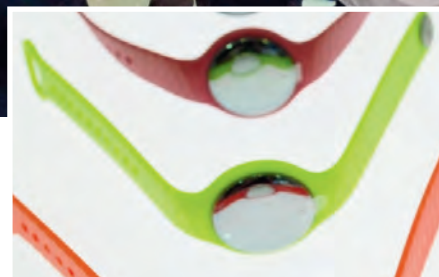
Devotees of drone technology witnessed the launch (no pun intended) of Nuvoton's M4 Drone Kit, which includes a flight control board, a joystick, a 2.4G RF module, a section board and an emulator. The package also features a complete Attitude Heading and Reference System (AHRS) Library to facilitate user control, so users no longer have to work out how to calculate the attitude and heading — instead, they can focus on perfecting the flight controls and developing flight applications.

GeoSat Aerospace & Technology went in a different direction, announcing a lightweight drone which is primarily designed for taking selfies. Named 'Venus' and intended to open up the drone market to women, the drone comes equipped with a 1.3 MP camera and a smart detection feature that automatically takes a photo if it senses a smile. Venus is expected to go on sale during the second quarter of 2017.

## In the cloud

Of course, a number of the above technologies would not be possible without cloud computing. But how do you know what type of cloud system is best for your organisation? Infinities Soft's Hybrid Cloud Management Platform is intended to optimise use of the public cloud, so users can schedule their clouds to be on or off as needed rather than running 24/7. They can also track the expenses associated with each cloud and receive regular reports, including notifications if any suspicious wastage seems to be occurring.

For private users, Beaconliance has announced the BOXIE personal mobile cloud for iOS devices. Photos and videos shot with the BOXIE app are directly stored in the cloud without taking up any of the local storage on the user's iPhone or Pad. This allows you to record a 4K video for up 100 minutes, with low battery consumption, even with a 16 GB iPhone. The app is available for pre-order now.



## In conclusion

It would be impossible to cover every exhibitor, seminar, forum and conference that took place over Taitronics' four-day runtime — if I so much as tried, we'd be here all day. I can only conclude that the best way to experience Taitronics is to attend it for yourself. You may not get a chance to see everything, but you'll see a lot more than could ever be summed up in one 1600-word article. The show will once again be open to the public in 2017, and overseas attendees can pre-register online for free entry. For more information on the show, including assistance and subsidy opportunities, contact Taiwan Trade Centre, Sydney on 61-2-9279-4800 or visit: <https://www.taitronics.tw/>.

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# Cable Assembly & Box Build Assembly



**Electrical box assembly**



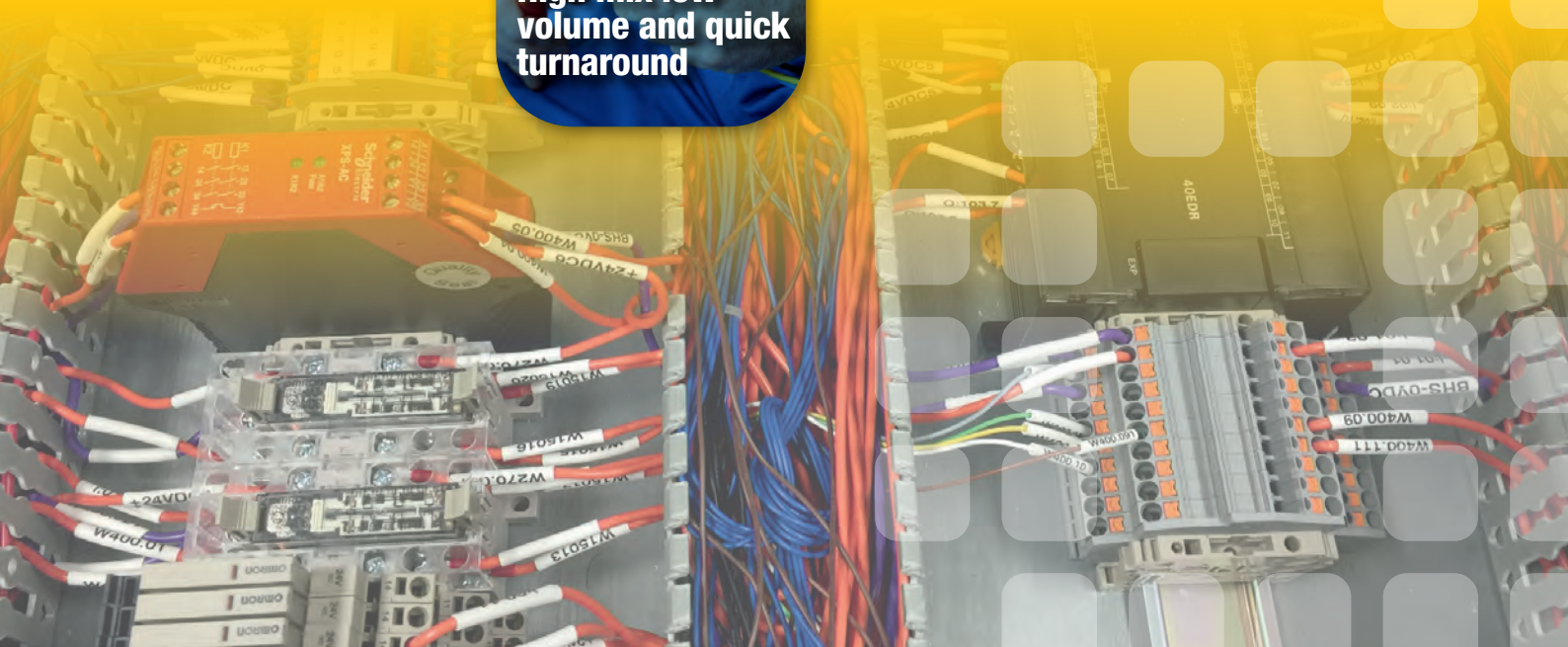
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## SURFACE-MOUNT SILICON CONTROLLED RECTIFIER

STMicroelectronics' 800 V surface-mount silicon controlled rectifiers (thyristors) are specified for operation at temperatures up to 150°C without derating, giving freedom to miniaturise power modules for applications that demand high reliability in harsh conditions.

With its 80 A current rating, the TM8050H-8 SCR, housed in the high-voltage D3PAK (TO-268-HV), enables mid-power applications in the 1–10 kW range to leverage surface-mount assembly efficiencies and reduce PCB and heatsink sizes. The package has low junction-to-case thermal resistance of 0.25°C/W, ensuring efficient heat dissipation, and a large pin-to-tab creepage distance of 5.6 mm that gives a large safety margin in the presence of high applied voltages. A TO-247 package option is also available.

The product is the latest addition to ST's family of SCRs for automotive and industrial power control. Spanning current ratings from 12 to 80 A, the devices enable designers to create compact car or motorcycle voltage regulators, induction motor starters, soft starters, industrial heater or cooker controls, solid-state relays, uninterruptible power supplies and AC-line conditioners.

With low dynamic resistance (RD) and on-state voltage (VTO) of 5.5 mΩ ( $T_j = 150^\circ\text{C}$ ) and 0.85 V respectively, and leakage current of 20 μA max (at 800 V,  $T_j = 25^\circ\text{C}$ ), the TM8050H-8 ensures high energy efficiency under all operating conditions.

**STMicroelectronics Pty Ltd**  
[www.st.com](http://www.st.com)

## DIE-CAST ENCLOSURES

The 1590 die-cast enclosures family from Hammond Electronics consists of 41 different sizes in the standard rectangular and STOMP box painted variants.

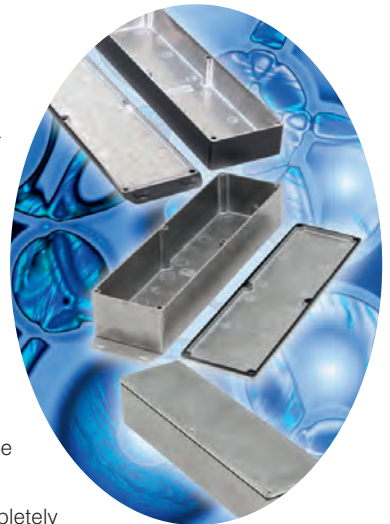
STOMP boxes are colour coded to provide visual quick identification on stage. Also known as guitar effect pedals, they are the housings for foot-operated equipment used by electric guitarists to produce preset effects such as distortion, wah-wah, delay, chorus and phaser. The 1590 BX2 (254 x 70 x 35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

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

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

All sizes can be supplied factory modified with machining and silk screening to the user's specification. AutoCAD files and PDF dimensioned drawings can be downloaded from Hammond's website.

**Hammond Electronics Pty Ltd**  
[www.hammondmfg.com](http://www.hammondmfg.com)



## HIGH-POWER LED DC LOAD SIMULATOR

The Prodigit Electronics 33430G series high power LED DC load simulator has built-in dimming control signal output for PWM dimming test of an LED driver.

It has an LED mode load for LED power driver testing and can also simulate LED forward bias voltage (Vd) and resistance (Rd).

The product has its own control and display panel, LED/CC/CR/CV/CP/dynamic mode and panel with 150 sets store/recall memory, which provides load set-up more efficiently. It can be controlled by the internet via RS232, Ethernet, USB and GPIB interface.

The product has programmable load on/off voltage, GO/NG meter check, while the voltage meter display is selectable. It has 150 sets store/recall larger memory.

The product can serve most applications including LED driver, voltage/current sources, SMPS transient response, current limit testing, as well as battery emulation, battery charger and ATE systems.

**Triplepoint Calibrations Pty Ltd**  
[www.triplepoint.com.au](http://www.triplepoint.com.au)



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# MAGNETIC INK PRINTS

## SELF-HEALING ELECTRONICS

Engineers from the University of California, San Diego have developed a magnetic ink that can be used to make self-healing batteries, electrochemical sensors and textile-based electrical circuits.

Unlike existing self-healing materials, which require an external trigger to kickstart the healing process and take anywhere from a few minutes to several days to work, the new system can repair damage within about 50 ms, without any outside catalyst.

As explained in the journal *Science Advances*, the UC San Diego engineers loaded their ink with microparticles made of a type of magnet commonly used in research and made of a metal called neodymium. Because the particles' magnetic field is much larger than their individual size, the attraction between the particles causes them to close tears — the key to their self-healing properties.

Unfortunately, the particles have poor electrochemical properties, making them difficult to use in electrochemical devices, such as sensors, on their own. To remedy this problem, the researchers added carbon black to the ink — a material commonly used to make batteries and sensors. They then realised that the microparticles' magnetic fields, when in their natural configuration, cancelled each other out, which robbed them of their healing properties.

The engineers solved this by printing the ink in the presence of an external magnetic field, which ensured that the particles oriented themselves to behave as a permanent magnet with two opposite poles at the end of each printed device. When the device is cut in two, the two damaged pieces act as different magnets that attract each other and self-heal.

The engineers tested their system by using the ink to print batteries, electrochemical sensors and wearable, textile-based electrical circuits, before cutting them and pulling them apart to create increasingly wide gaps. For example, they printed a self-healing

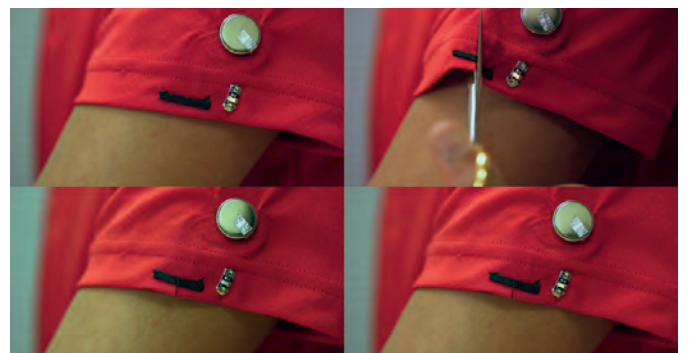


Image credit: Jacobs School of Engineering/UC San Diego

circuit on the sleeve of a T-shirt and connected it with an LED light and a coin battery (pictured). They then cut the circuit and the fabric it was printed on, at which point the LED turned off.

Within a few seconds, the LED started turning back on as the two sides of the circuit came together again and healed themselves, restoring conductivity. This continued to be the case even after repeated, widespread damage, with the devices reliably repairing tears as wide as 3 mm — said to be a record in the field of self-healing systems.

In the future, the engineers envision making different inks with different ingredients for a wide range of applications. In addition, they plan to develop computer simulations to test different self-healing ink recipes in silico before trying them out in the lab.

"Our work holds considerable promise for widespread practical applications for long-lasting printed electronic devices," said Joseph Wang, director of the Center for Wearable Sensors at UC San Diego.

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## MODULAR TRAIN CONTROL SYSTEM

The menTCS MA50C modular train control system has a mechanical design complying with the AAR S-590 standard. The freely configurable product can be used for critical train control functions such as automatic train operation (ATO) and automatic train protection (ATP), which have to meet requirements up to safety level SIL 4.

The housing is protected against dust and water jets according to IP65/NEMA-4. All boards inside the system are embedded in a conduction cooling frame, eliminating the need for fans and therefore maintenance. In addition, it helps to protect the boards from dust and gives them particular mechanical stability.

The product has a certified safe CPU board with three CPUs and certified safe I/O boards. Its design makes the control unit fit for use in regions with extreme environmental conditions.

**Dominion Electronics**

[www.oem.net.au](http://www.oem.net.au)

## POWER ANALYSER

The R&S HMC8015 power analyser is a compact tester for AC/DC load and standby current characterisation that enables measurements without additional tools such as a computer or remote infrastructure. In addition to a numerical and graphical display with 26 key parameters, the instrument delivers performance and compliance protocols in line with IEC62301, EN50564 and EN61000-3-2.

The power analyser graphically displays harmonic analysis up to the 50th harmonic on the logarithmic scale. It has a user-configurable, dual-channel trend chart function for U, I, P, S, Q and F. The instrument's 5 V measurement range provides embedded developers with a high level of resolution for power and energy measurements.

The product simultaneously displays up to 10 user-configurable measurands with a refresh rate of 10 measurements/s. A logging function makes it possible to store this data with a timestamp in CSV format for a nearly unlimited period of time. Screen content can also be saved to a USB flash drive anytime at the push of a button.

**Rohde & Schwarz (Australia) Pty Ltd**

[www.rohde-schwarz.com](http://www.rohde-schwarz.com)

## OPTICAL ENCODER

The Hengstler ACURO AX73 optical encoder offers attributes such as ease of installation, high precision and compact dimensions.

Explosion protection is the first consideration and the product carries ATEX and IECEx certification for gas and dust explosion-proof requirements. The optical encoder is suitable in applications such as winches, cranes, drills and other oil and gas industry equipment, as well as at paint plants, petrochemical facilities, bottling plants and grain mills.

The product allows the routing of cabling and the final encoder installation to be done in separate steps. This provides cost and time savings during installation, as cabling can be done in advance. Emergency servicing can also be completed more quickly, resulting from the ability to simply unplug the cable and connect it to the replacement encoder.

Another ease-of-maintenance feature includes the use of just two screws for the connection hood. Special patented screws are deployed on the product to protect against dust, water and corrosion.

The optical scanning system provides an accurate, 22-bit resolution sensor signal for wherever precision or smooth speed regulation is necessary. It is resistant to shock, vibration and external magnetic fields. In addition, the unit provides users with IP67 protection class rating for the stainless steel housing and offers an ex-related ambient temperature range of -40 to +70°C.

The product has a housing diameter of 76 mm and can be ordered with SSI, BiSS-B, BiSS-C and Profibus interfaces.

The product offers a mounting system with integrated cable.

**Automated Control Pty Ltd**

[www.automatedcontrol.com.au](http://www.automatedcontrol.com.au)



## MINIATURE THREADED INLINE LOAD CELL

The Futek LCM200 is a miniature tension and compression load cell built for endurance or inline tension or compression applications. It has a robust construction available in 17-4 stainless steel, with male threads on both ends and a 3 m-long 29 AWG 4 conductor shielded Teflon cable.

The device has nonlinearity of  $\pm 0.5\%$  and deflection of 0.002" nominal. It features resistance to high extraneous loads and low deflection. It weighs 17 g.

Utilising metal foil strain gauge technology, the product can be modified or customised to meet the user's requirements. A TEDS/IEEE1451.4 option is also available.

**Metromatics Pty Ltd**

[www.metromatics.com.au](http://www.metromatics.com.au)





## HANDHELD WIRELESS TESTER

The NetScout AirCheck G2 handheld wireless tester provides users with a simple and quick means of resolving wireless-related issues. Available to rent from TechRentals, the device is designed to assist frontline IT personnel who receive complaints about Wi-Fi and internet operation. It can conduct channel scanning, interference detection and connectivity tests with ease.

The tester allows for instant access to detailed information and provides quick troubleshooting for the most common Wi-Fi problems. These include coverage problems, overloaded networks or channels, channel interference, connectivity problems, failed access points and rogue access points.

The product supports the latest Wi-Fi technologies, including 802.11a/b/g/n/ac, and allows for quick AP backhaul and wiring verification. It also features Ethernet connectivity testing and has a one-button auto test.

**TechRentals**

[www.techrentals.com.au](http://www.techrentals.com.au)



## USB-C CONNECTORS AND CABLE ASSEMBLIES

Molex's latest USB-C connectors and cable assemblies target a wide range of electronics applications in consumer markets

as well as automation and control systems,

automotive and telecoms and data communications sectors.

USB-C is the next-generation USB connector standard. Designed to be multifunction devices, USB-C connectors are able to perform different roles depending on the application. They can work as standard USB connectors, allowing peripheral devices such as cameras, printers, keyboards or mice to be connected to PCs, tablets or mobile phones. They will also perform as power or video connectors, being compatible with the latest 4K Ultra HD television systems.

USB-C is compatible with the latest USB 3.1 protocol and transmits signals at a higher speed than previous versions of USB. The connectors are small, lightweight and reversible, which makes them easy to use. USB-C connectors and cable assemblies will allow USB-C devices to interface with legacy USB connectors that use USB 2.0 and USB 3.1 protocols and, following approval, the Lightning connector used in the latest generation of iPhones. The products include: USB 2.0 and 3.1 cable assembly (USB-C to USB-A); USB 3.1 cable assembly (USB-C to USB-C); and right-angle, PCB-mount, USB-C connector plugs and sockets.

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# FOUR STRATEGIES TO STRENGTHEN SUBASSEMBLY SOURCING

Ed Sullivan\*

Selecting subassembly manufacturers with specific capabilities can speed turnaround, improve product performance and functionality, and increase an OEM's bottom line.

**W**ith electrical and electronic components and features like touch screens, flex circuits, keypads and membrane switches becoming more technologically advanced, OEMs are becoming increasingly dependent on sourcing subassemblies to expert third-party suppliers.

At the same time, subassemblies are critical to the OEM's finished product and must be sourced carefully to achieve consistent quality, timely turnaround and competitive pricing. In many cases, contracting with suppliers that offer access to global manufacturing facilities and in-house engineering support can be instrumental to the success of an OEM.

One of the most significant challenges is locating reliable suppliers that can meet these qualifications with pricing that can improve profitability. Some of the more successful OEMs point to a few uncomplicated strategies that help strengthen subassembly sourcing, achieving faster turnaround, ensuring product quality and functionality, and increasing added profitability.

## 1. Access global resources

Selecting a domestic subassembly supplier with global manufacturing resources can provide OEMs with significant economic advantages — provided the manufacturing processes are well managed by the supplier.

For example, many OEMs that contract directly with offshore suppliers experience communication difficulties that can lead to er-

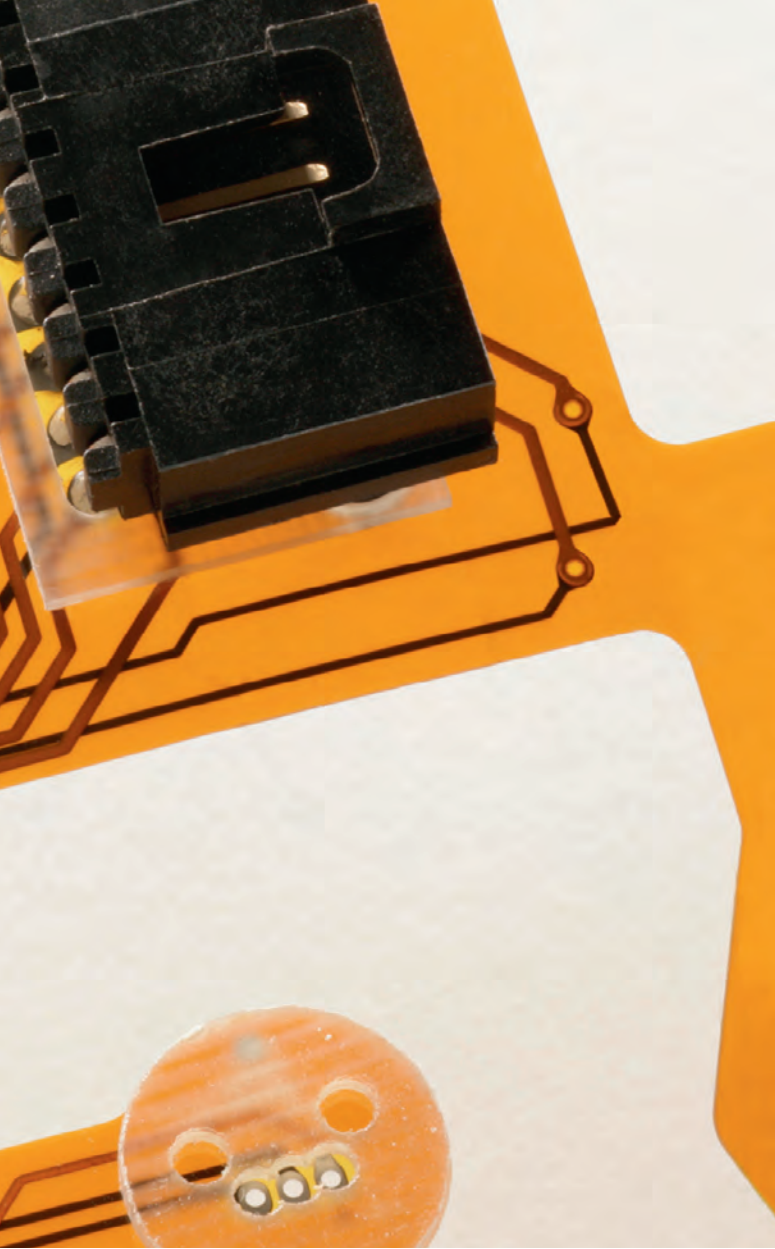
rors with subassembly materials or dimensions, avoidable logistical difficulties or even cost miscalculations.

However, some OEM suppliers have no problem in providing high-quality products through relationships with offshore fabricators that work seamlessly with the domestic supplier's engineering and management team.

"We have found that offshore fabricators can be effective partners in manufacturing for North American subassembly suppliers, provided the proper communications and management controls are in place," said Hector Macias, director of Northpoint Technologies, El Paso, Texas. Macias added that such fabrication partnerships can also be financially beneficial to OEM customers by providing saving on costs and eliminating the need for capital investments.

Northpoint Technologies is a manufacturer of components and subassemblies used in electronic and electric devices used in the medical, automotive, defence, telecommunications, industrial and consumer markets. The company's expertise includes silicon and membrane switches, flexible PCBs and assemblies, touch screens and wire harnesses.

When Justin Blush was in search of a silicon membrane for a microscope control switch, he found Northpoint Technology. Blush, lead technician at Prescott's, a remanufacturer of surgical microscopes, said his company's own moulding and machine shop was unable to fabricate the membrane, which was incorporated into a switch that enabled a model of microscope to zoom in and out on



a subject. Northpoint advised Blush that the membrane would be designed at its headquarters in El Paso, but would be fabricated at a plant in Asia.

"I was happy just to have a supplier and expected the fabrication and shipping process to take at least 6–8 weeks, as with our traditional suppliers," Blush explained. "I was amazed to learn that the membrane required only a two-week turnaround, and at a fraction of the price I expected."

## 2. Faster, functional prototypes

The timely delivery of prototypes and quick turnaround of revisions are vital to expediting the manufacturing process. When subassembly suppliers with offshore manufacturing facilities can produce prototypes in-house with quick turnaround times, the process is much more efficient.

Due to those factors, prototyping is one of the functions that successful suppliers seldom outsource. Macias considers prototyping a critical step in product development. These are produced via aluminum or 'soft' moulds, and are of such quality that they are usually considered to be product samples or the equivalent of first article production pieces.

"The prototypes we require are real, functional samples that we send to customers to inspect and test," said Terry Swick, president and co-founder of Swick-White, a manufacturer of electric enclosures, control panels, membrane switches and graphic

overlays. "Assuming they meet specifications, they can install them as finished subassemblies in products and ship them out to customers — with confidence."

At other times OEMs will have requirements that are outside of the usual request. Suppliers who have the in-house capabilities to produce complex items domestically can satisfy the extra demand by producing additional functional prototypes that have been approved for production.

For example, Stoehr said that on one occasion, he made such a request. "I said, 'We're doing a prototype run of 10 control panels, so can you provide 10 sample keypads?' And they were able to do that with no delays."

## 3. Look for volume flexibility

Whether subassemblies or piece parts are fabricated domestically or overseas, minimum volume requirements can force OEMs to purchase more parts than they require. However, a few subassembly suppliers are moving away from volume requirements to better serve the OEM.

When Steve Stoehr, engineering manager at GS Global Resources (GSGR), was sourcing a keypad as part of switch and control panels installed on some heavy-duty equipment such as agricultural machinery or fire trucks, he expected to make a sizable volume commitment to the keypad manufacturer. GSGR develops and implements a broad range of electronic and hydraulic control systems for various OEMs.

"Most of our suppliers want high-volume orders, just like other industries," explained Stoehr. "Five or six years ago we found Northpoint Technologies, which has been very good about taking on even low-volume projects. That's a real plus for us and our customers."

## 4. Add significant value

Finally, many OEMs are finding suppliers that provide significant value-added services, with offerings ranging from engineering assistance to recommendations for streamlining the manufacturing process.

In some cases, graphic design assistance, such as special icons or other symbols on keypads and other controls, can provide important safety or security features.

In another example, Stoehr found that subassembly suppliers could bring important value-add through the kitting of loose piece parts. He arranged with Northpoint to have special kits, containing 20 loose keypad buttons, to be packaged in order to expedite assembly on the production line.

"Getting great value-added services through a single source is important to GSGR," Stoehr said. "It is not only more convenient, but when you couple that with consistent quality, quick turnaround and competitive prices, it helps us provide better service to our customers as well."

*\*Ed Sullivan is a Hermosa Beach, California-based writer. He has researched and written about high technologies, health care, finance and real estate for over 25 years.*





## MODULAR IPC PLATFORM

The Advantech MIC-7500 is a compact modular inter-process communication (IPC) platform. The system's fanless, ruggedised design supports a wide input power range, ensuring the durability to withstand harsh industrial environments. Advantech i-modules can be integrated with the product and provide flexible expansion on demand.

The device supports diverse communication requirements and devices, including external sensors, controllers and displays. The i-modules comprise two slots, four slots and two slots with a 2 x 2.5" hot-swappable tray, with plans to develop additional modules in the near future. The i-modules are easy to assemble and have a simple upgrade path. The platform can be integrated with a wide range of i-modules to support diverse applications.

The platform is powered by a 6th generation Intel Core i processor that delivers up to 10% additional CPU performance and 30% faster graphics compared to the previous generation. The series is also compatible with a wide range of CPU platforms, including the Intel Xeon (for server applications) and Intel Atom (for entry-level operations).

The standalone design of the i-modules allows Advantech to release engineering samples for advance testing to eliminate customer concerns regarding the lengthy development time. Furthermore, the comprehensive range of easily configured modularised options reduces lead times for Advantech's configure-to-order service (CTOS).

The product supports a wide operating temperature range of -20 to 60°C. The ruggedised design and cast aluminium case offer vibration and shock protection, as well as a passive thermal solution that ensures silent operation.

Designed for the industrial automation market and to withstand harsh environments and 24/7 operation, all electronic components satisfy certification standards for environmental protection, EMI/ESD tolerance and high-voltage surge requirements (2 kV). The device supports the Microsoft Windows 7/8/10 and Linux operating systems and is equipped with Advantech's SUSIAccess remote management software utility for convenient management and system protection.

**Advantech Australia Pty Ltd**  
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## MICROCONTROLLERS

The Renesas RL78/G11 microcontrollers are a group of small-package, low-power MCUs that will enable users to easily and quickly prototype and develop systems that support low-power sensor hubs and sensor application systems.

Designed to connect to multiple sensors and convert the sensor output signals to digital data, the product is used in a wide range of applications.

The 24- and 25-pin versions support 11 analog input channels and six serial communications channels. It can support signal inputs from a maximum of 13 sensors. Processing of the signal inputs from the sensors by the built-in analog functions and serial communications (reception) functions that operate even in standby mode allows low-power control, even in systems with multiple sensors.

The product provides extended features, such as high-speed wakeup, which transitions the CPU from standby mode to CPU operation in 4  $\mu$ s, and flash operating mode transitions that optimise the CPU operating performance and that contribute to energy savings.

Other features include timer functions that support complementary PWM output and forced cut-off; safety functions that can detect and diagnose incorrect hardware operation; multichannel serial communications functions; timer functions that support flyback control; and an INTFO function that can directly output interrupt signals from external pins. Peripherals can be connected internally to reduce CPU workload and can save overall power consumption.

**Renesas Electronics**  
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## WAVEFORM GENERATOR

The RIGOL DG1022Z waveform generator enables makers, educators and IoT designers work-

ing with both electrical and RF applications to build long complex arbitrary waves, generate 8th order harmonics, create advanced modulations and inject random noise. The product has 25 MHz max sine wave and square wave frequency, two full function independent channels, long Arb memory length, and 160+ built-in waveforms.

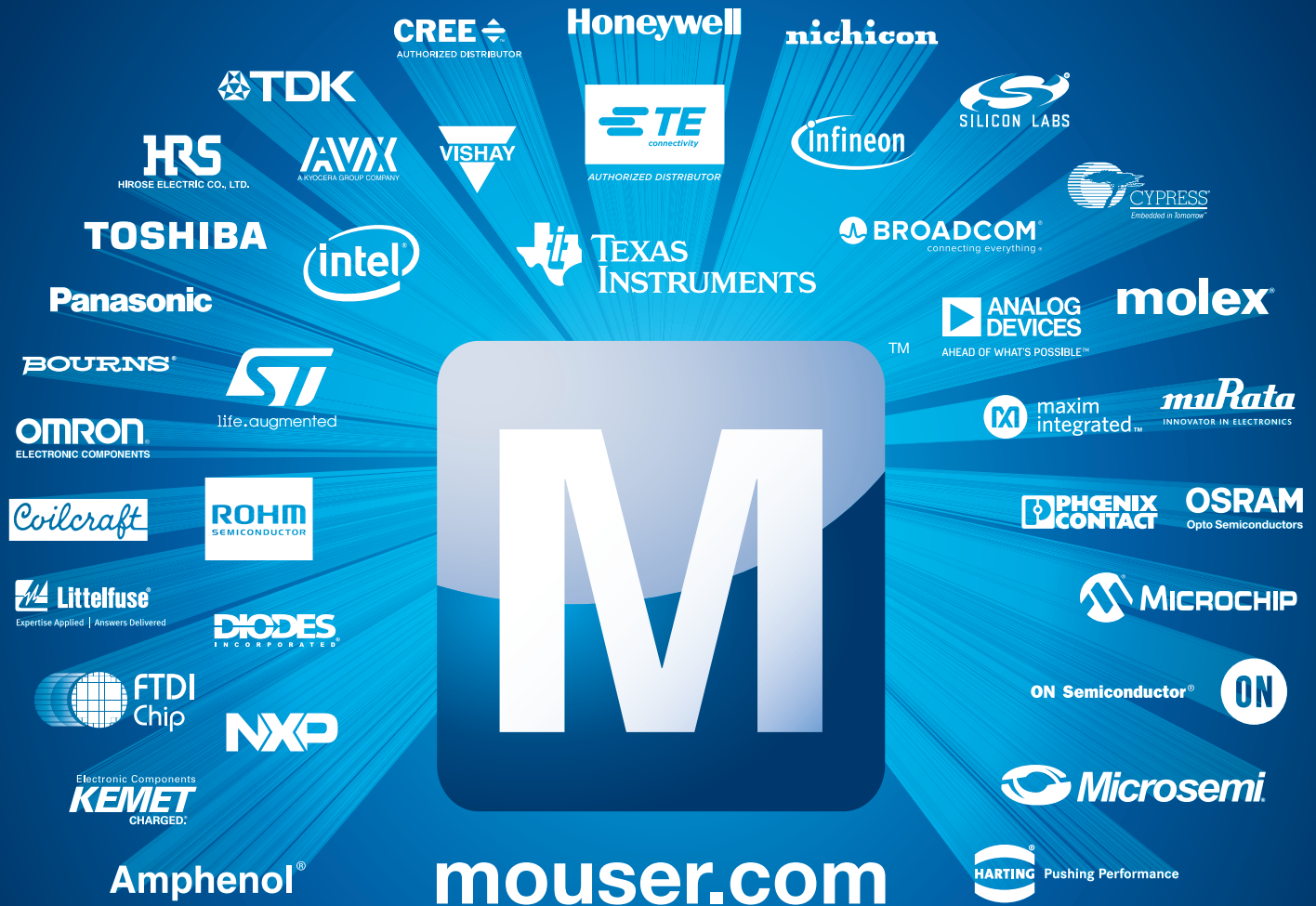
Features include 25 MHz sine/25 MHz square; 2 full function independent channels; 8 order harmonic generator, AM, FM, PM, ASK, FSK, PSK and PWM modulation; 2 Mpts standard memory (16 M optional); SiFi sampling technology for improved signal fidelity; built-in 7-digit counter; and +160 standard waveforms.

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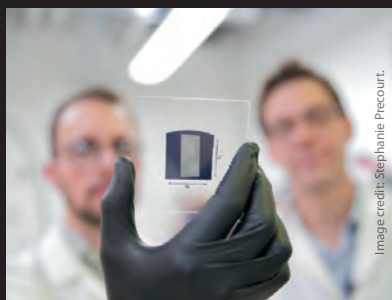
Distributing semiconductors and  
electronic components for design engineers.





## CARBON NANOTUBE TRANSISTORS OUTPERFORM SILICON

Carbon nanotube transistors have so far lagged far behind semiconductors in high-performance electronics. Now, for the first time, materials engineers have created carbon nanotube transistors that outperform state-of-the-art silicon transistors.



The University of Wisconsin-Madison team created carbon nanotube transistors that achieved a current 1.9 times higher than silicon transistors.

"This achievement has been a dream of nanotechnology for the last 20 years," said Michael Arnold, a UW-Madison professor of materials science and engineering.

"Making carbon nanotube transistors that are better than silicon transistors is a big milestone. This breakthrough in carbon nanotube transistor performance is a critical advance toward exploiting carbon nanotubes in logic, high-speed communications and other semiconductor electronics technologies."

The advance could pave the way for carbon nanotube transistors to replace silicon transistors and continue delivering the performance gains the computer industry relies on and that consumers demand, the engineers say. The new transistors are particularly promising for wireless communications technologies that require a lot of current flowing across a relatively small area.

The researchers reported their advance in a paper published in *Science Advances*.

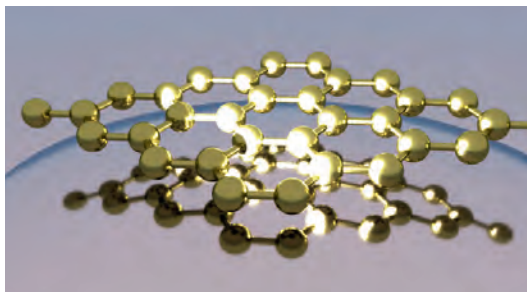
## BETTER OPTOELECTRONICS FOR SMARTER SMARTPHONES

Smarter smartphones could be on the way, thanks to a new theoretical framework that will help physicists and device engineers to design better optoelectronics. The research, conducted by Queen's University Belfast and ETH Zurich, could lead to optoelectronic devices with less heat generation and power consumption.

The research enables scientists and engineers to quantify how transparent a 2D material is to an electrostatic field.

"In our paper we have developed a theoretical framework that predicts and quantifies the degree of 'transparency' up to the limit of one-atom-thick, 2D materials, to an electrostatic field," said Dr Elton Santos from the Atomistic Simulation Research Centre at Queen's. "Imagine we can change the transparency of a material just using an electric bias, eg, get darker or brighter at will. What kind of implications would this have, for instance, in mobile phone technologies? This was the first question we asked ourselves.

"We realised that this would allow the microscopic control over the distribution of charged carriers in a bulk semiconductor (eg, traditional Si microchips) in a nonlinear manner. This will help physicists and device engineers to design better quantum capacitors, an array of subatomic power storage components capable to keep high energy densities, for instance, in batteries, and vertical transistors, leading to next-generation optoelectronics with lower power consumption and dissipation of heat (cold devices), and better performance. In other words, smarter smartphones." Explaining how the theory could have important implications for future work in the area, Dr Santos added, "Our current model simply considers an interface formed between a layer of 2D material and a bulk semiconductor. In principle, our approach can be readily extended to a stack of multiple 2D materials, or namely, van der Waals heterostructures recently fabricated. This will allow us to design and predict the behaviour of these cutting-edge devices in prior to actual fabrication, which will significantly facilitate developments for a variety of applications. We will have an *in silico* search for the right combination of different 2D crystals while reducing the need for expensive lab work and test trials."



*The transparency of a device at the 2D limit can be tuned using an electric bias, where different types of optical processes that simply define the way we see objects can be modified externally. This gives the control on properties that until very recently were not thought to be manipulated arbitrarily.*

## AVNET ACQUIRES PREMIER FARNELL

Electronic component distributor Avnet has announced its acquisition of Premier Farnell in an all-cash merger for £1.85 (\$2.95) per share, which equates to an equity value of approximately £691 million (\$1.10 billion). The acquisition was approved by Premier Farnell shareholders representing 99.9% of the votes cast and has received all regulatory approvals. Headquartered in Leeds, UK, Premier Farnell is a global distributor of electronic components that utilises a digital platform to provide innovators and engineers with the latest products, services and development software. The company supports a registered community of more than 430,000 members in 36 countries. It trades in Australia under the name element14. "The combination of Premier Farnell with Avnet's components business will create a truly unique distribution model that supports customers at every stage of the product life cycle," said Avnet CEO William Amelio. "By pairing our deep expertise in large volume broadline distribution with Premier Farnell's specialisation in proof of concept and design, we can offer true end-to-end solutions that accelerate a customer's time to market and moves their products seamlessly from prototype through to volume production." The transaction is expected to be immediately accretive to earnings.



## 'WARM' SUPERCONDUCTOR CRYSTAL STRUCTURE IDENTIFIED

Researchers in Japan have made a huge step towards room-temperature superconductors. The research team has clarified the crystal structure of hydrogen sulfide in its superconducting phase at  $-70^{\circ}\text{C}$  — a relatively high temperature for superconductors.



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While the possible scenarios for superconductor use are manifold, such as using them as energy transmission lines without energy loss, widespread use is difficult as costs for cooling are high. In 2015, hydrogen sulfide set a new record for the highest superconducting transition temperature under high pressure. However, its crystal structure, necessary for understanding its superconductivity mechanism, was not understood.

Researchers have now succeeded in clarifying this structure by simultaneously conducting measurements of high-pressure electrical resistance and X-ray diffraction.

Since hydrogen sulfide consists of light elements, measurements required a special set-up. Conducted at one of the world's largest synchrotron radiation facilities, SPring-8, these measurements consisted of a diamond anvil cell to conduct measurement under high pressure and low temperature, and the high-pressure beamline BL10XU with which high-intensity, high-energy and microdiameter X-ray beams for X-ray diffraction can be used, in order to examine the material's crystal structure. The researchers clarified that under high pressure,  $\text{H}_2\text{S}$  molecules underwent a structural change to  $\text{H}_3\text{S}$  and that this  $\text{H}_3\text{S}$  structure exhibited superconductivity.

Furthermore, from simultaneously measuring changes in pressure of superconducting transition temperature, they discovered that  $\text{H}_3\text{S}$  displayed two superconducting phases: one with a cubic structure, the other with a hexagonal structure. They thereby managed to prove previous predictions from theoretical calculations. The results of this study will contribute to clarifying the mechanisms of the high-temperature superconductivity observed in hydrogen sulfide. They also mark a considerable step in developing room-temperature superconductors and provide new insights that will be useful in the development of new materials that spread under high pressure.

## AUSTRALIAN DEFENCE FORCE RECEIVES ELECTRONIC WARFARE BOOST

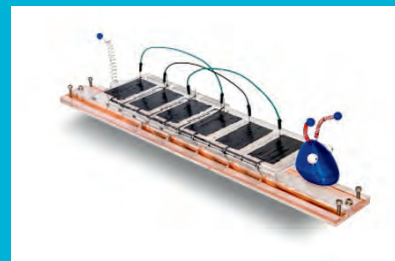
The Australian Defence Force's electronic warfare capabilities have been boosted by the approval of a \$500 million project to provide electronic warfare equipment and infrastructure to naval ships and army units.

The Electronic Warfare Operations Support for Maritime and Land Forces project will see approximately 75% of the \$500 million spent locally over the lifetime of the project. Australian companies are set to benefit, Defence Industry Minister Christopher Pyne says, with the bulk of the budget driving local jobs and economic growth.

The project will deliver a range of testing equipment, tools and laboratories and construct a new purpose-built facility within the Edinburgh Defence precinct in Adelaide to house laboratories, simulation equipment and testing support systems.

Australian companies BAE Systems Australia and Ultra Electronics Avalon Systems, and their Australian subcontractors, will deliver the major items of equipment through the acquisition phase of the project. This will include design, integration and production. These companies will also provide through-life support of the major items of equipment throughout their expected service life. The program will build on the existing Electronic Warfare Operations Support for the ADF's air capability.

## MEET TREVOR, THE BIOMIMETIC CATERPILLAR



Researchers at the University of Auckland have invented a biomimetic caterpillar named Trevor, said to be the first of his kind. Trevor is powered by a DC voltage that activates artificial muscles — otherwise, he is entirely electronics-free.

Artificial muscles are made of soft, electroactive polymers, differentiating them from the hard and stiff components that are common today. Scientists have already discovered how to make many different devices out of them, including sensors, switches, motors and generators.

Researchers have used this technology to produce an artificial muscle-artificial neuron network — a so-called dielectric elastomer oscillator — which uses piezoresistive dielectric elastomer switches (DESs). The DESs comprise reflexive switching upon mechanical strain and are stimulated by the movement of adjacent artificial muscles in a direct feedback mechanism.

The researchers integrated this technology into Trevor, supporting his artificial muscles in a skeleton-like plastic frame. When Trevor is fed a single DC voltage through his feet, the combination of artificial muscles and reflexive artificial neurons can spontaneously generate all necessary voltages to stimulate his muscles and make him move. The result is that Trevor creeps forward just like a regular caterpillar, his body moving in a wave-like pattern due to the interaction between the muscles and the flexible zig-zag tracks painted on their surfaces.

While a biomimetic caterpillar is not particularly useful in and of itself, the researchers believe the same technology applied to Trevor could one day be used for soft fluid pumps or conveyors.

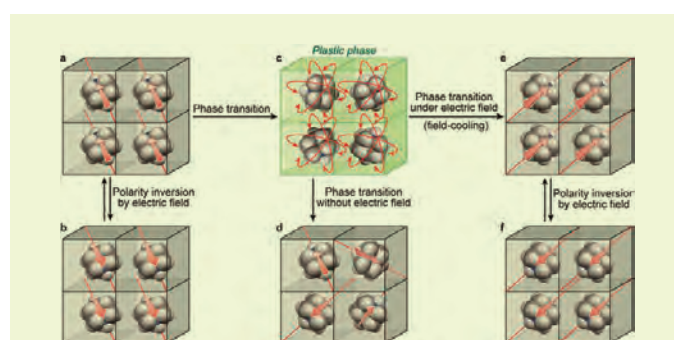




## A PLASTIC CRYSTAL THAT CAN SWITCH POLARISATION

Researchers from Japan's Hokkaido University have developed a ferroelectric plastic crystal with switching properties that make it suitable for memory-related applications.

Like other ferroelectric materials, the crystal's atoms have the ability to 'switch' their electric polarisation from one direction to another, making one side of the material positive and the other negative — a particularly useful property for storing binary bits of data in memory devices. Unlike other materials, the crystal is non-toxic, cost-efficient and flexible.



The newly synthesised crystal is ferroelectric above room temperature (a-b, e-f) and turns into 'plastic phase', meaning highly deformable, at higher temperature (a-c). The electric polarity of each molecule can be aligned in one direction by applying electric field as it cools (c-e). Harada J et al, 11 July 2016, *Nature Chemistry*, DOI: 10.1038/NCHEM.2567.

The researchers combined quinuclidine, an organic amine, with perrhenic acid to form the crystalline salt quinuclidinium perrhenate. Quinuclidinium perrhenate consists of globular ionic molecules that give the crystal unique characteristics, described by the researchers in the journal *Nature Chemistry*.

The crystal is ferroelectric above room temperature, then turns into a plastic, more pliable phase at higher temperatures. At the higher temperatures, the molecules in the crystal have randomly different polarity axes, but they can be aligned in one direction by applying an electric field as the crystal cools, bringing it back to a ferroelectric state. Being able to control the polarity addresses a major challenge faced by researchers working with organic compound-based ferroelectric crystals, which are less symmetric than inorganic crystals and can thus be polarised only in one direction, leading to a very weak overall polarisation of randomly oriented crystals.

Furthermore, the crystal has the distinct advantage of transitioning to a plastic state when heat is applied. This plasticity — as opposed to fracturing that occurs in regular organic and inorganic crystals when a mechanical stress is applied — makes it suitable for use as a thin ferroelectric film in devices. One such application could be in non-volatile ferroelectric random-access memory devices, which maintain memory when the power is turned off.

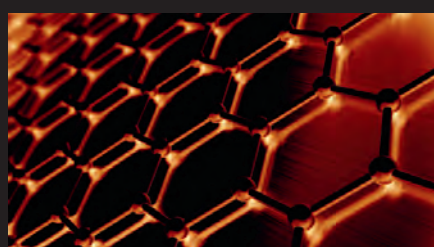
Exploring crystals composed of molecules similar to quinuclidine could lead to the discovery of more ferroelectric crystals, according to the researchers, who added that chemical modifications of the molecules' constituent ions could also improve their performance.

## SILICENE FINALLY COMES UNSTUCK

For some time, researchers have been stuck on silicene — literally. Silicene, the thinnest possible form of silicon, comprises a two-dimensional layer of silicon crystals and is heralded as the key to even smaller, more flexible, transparent and low-energy-cost electronics.

But the problem with silicene is that, until now, it has been 'grown' on a metal surface — and researchers had no way of freeing it from the substrate to create a freestanding material that could then be incorporated into electronic devices and components.

Dr Yi Du and his team at the University of Wollongong's Institute for Superconducting and Electronic Materials (ISEM) have used oxygen to separate a single-atom-thick layer of silicon from its surface, overcoming the key hurdle preventing the production of a material with potential to supercharge electronics. "We know silicene crystals prefer to



firmly attach on the metallic substrate and because they are too thin to be peeled off by any mechanical tools, it's impossible to remove them from the substrate," Dr Du said. Researchers have experimented with the idea of using 'chemical scissors' to break the bond between silicene and the substrate and the breakthrough for Dr Du and his team came through using oxygen molecules as chemical scissors to cut the silicene from its substrate.

The work involves several special techniques that can be done only at ISEM with the help of its powerful tools, including a scanning tunnelling microscope, which creates an ultrahigh vacuum environment about a

hundred times higher than the vacuum level experienced in orbit at the International Space Station.

"Because the vacuum levels are so high, we can inject the oxygen molecules into the chamber and they become a 'molecular flux' that follows a straight pathway," Dr Du said.

"This allows us to direct these molecules precisely into the silicene layers, acting like scissors to separate the silicene."

The result is a layer of freestanding silicene — with an appearance much like a honeycomb lattice — that could be transferred to an insulating substrate to make advanced transistors.

"This work solves the long-lasting problem of isolating this super material for further device development. It challenges the entire scientific literature on silicene since its discovery," Dr Du said.

"These findings are relevant for the future design and application of silicene-based nanoelectronic and spintronic devices."



## LORA STARTER KIT

The MultiConnect Conduit Starter Kit for LoRa Technology is designed to enable users to obtain sensor information and display it in the cloud within minutes of opening the box. The starter kit features the MultiConnect Conduit — a configurable, manageable and scalable cellular communications gateway for industrial IoT applications.

The product includes temperature, light, pressure and accelerometer sensors, plus GPS included in the MultiConnect mDot Box. There is the flexibility to conduct LoRa site surveys and/or develop end-to-end a LoRa proof of concept from scratch.

All MultiConnect Conduit LoRa components required for connectivity — from edge sensors to the cloud — are bundled together in one box to reduce confusion and simplify the IoT POC ordering process. Out-of-the-box connectivity to IoT cloud platforms enables data insight, analytics and visualisation in minutes.

All major components of the kit are preconfigured for use with the Conduit platform and select MultiTech cloud platforms and only require simple actions. Preconfigured with Australian code, it is able to adopt New Zealand, Singaporean, South Korean and other available frequencies in the future.

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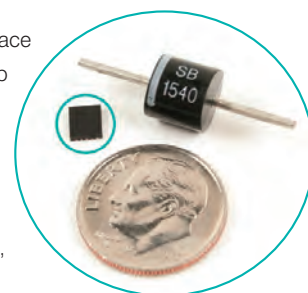
## CELL-STRING OPTIMISERS

Maxim cell-string optimisers are highly integrated DC-DC converters that replace the bypass diode and perform maximum power point tracking (MPPT) deep inside the PV module. By replacing each diode with a MPPT device, the on-off response to performance mismatch is eliminated. Every cell-string contributes maximum power without interfering with the power production capability of others. This flexibility leads to increased energy production. It eliminates collateral performance loss due to module mismatch, degradation, soiling, localised shading and row shading loss mechanisms.

The product increases energy harvest, with 30% additional power over diodes. It eliminates hotspots and minimises the impact of power degradation mechanisms. It also enables flexible design, incorporating multiple string lengths, orientations and expanding modules into partially shaded areas. Operation is simplified by requiring no additional hardware, specialised inverters or data services.

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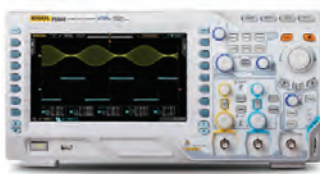
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## THERMAL IMAGING CAMERA

The Flir E60-II is suitable for applications involving the inspection, maintenance and troubleshooting of electrical, mechanical and HVAC/R systems. It is available to rent from TechRentals.

The product offers high performance and usability, with a temperature range of -20 to 650°C, 2x and 4x digital zoom, 3.1 MP visible light camera (with LED lamp), scalable IR picture-in-picture (PiP), laser pointer and multispectral dynamic imaging (MSX).

MSX provides real-time visible spectrum detail on infra-red video and images. This results in detailed shots not normally attainable with thermal imaging. In many cases, reports no longer require accompanying digital photos.

The device also features a smartphone/tablet connection through a Wi-Fi application, MeterLink connectivity with compatible devices for collaboration of diagnostic data, Bluetooth support for voice annotations and automatic screen orientation based on camera positioning.

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## INRUSH CURRENT LIMITING NTC THERMISTORS

Ametherm MS35 series inrush current limiting NTC thermistors are designed to withstand high input energy from 500–900 J and steady-state currents from 10–50 A.

The product has a rugged design and is optimised for high-power applications, including solar inverters, battery chargers and DC/DC converters.

It consists of seven thermistors featuring resistance from 0.5 to 20  $\Omega$ , dissipation constants from 78–102.45 mW/°C and thermal time constants from 65–240 s. The devices can handle body temperatures up to 235°C at 100% of their maximum current rating and they offer maximum capacitance from 1000–1800  $\mu$ F at 680 VAC.

Featuring diameters of 37 and 38 mm and thickness down to 6.50 mm, the thermistor handles the same amount of energy as power resistors in a smaller package, saving valuable circuit board space. In addition, it provides simple, one-component alternatives to using power resistors with timers and relays, reducing costs and simplifying designs.

**Mouser Electronics**

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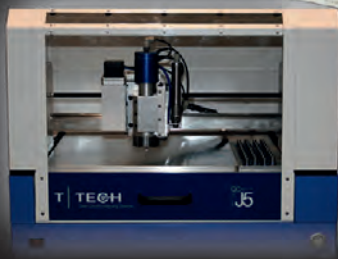
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## INTERCHANGEABLE NTC THERMISTORS

Ametherm's ACCU-Curve NTC thermistors deliver long-term stability for temperature sensing, control and compensation in medical, industrial and automotive applications. The devices offer interchangeability over a broad temperature range and eliminate the need to individually calibrate or provide circuit compensation for part variability.

Offering diameters of 2.4 mm and 32 AWG tinned-copper leads, the epoxy-coated devices are available in four resistance values at 25°C — 2.252, 10, 30 and 100 k $\Omega$  — with tight tolerances of  $\pm 0.2^\circ$ C between 0°C and 70°C. The thermistors feature a dissipation constant of 1 mW/°C and thermal time constant of 10 s.

The thermistors deliver the tight tolerances required for temperature measurement in critical medical instrumentation and can be potted in a variety of housings for temperature compensation circuits in industrial and automotive applications.

**Digi-Key Corporation**

[www.digikey.com](http://www.digikey.com)



## SIGNAL QUALITY ANALYSER

The explosive growth in data traffic is driving the need to increase communication speed between servers and network equipment. The next generation of 400 GbE Ethernet standard uses the PAM modulation method to increase data transfers per unit time by increasing the symbol rate and adding more lanes.

PAM4 signals have an advantage over non-return-to-zero (NRZ) signalling by doubling the amount of data transferred per unit time; however, they can also result in technical issues, such as lowering the power consumption and increasing the S/N ratio. High-quality signal sources and high-input-sensitivity measurements are therefore required.

Anritsu's MP1800A series signal quality analyser supports the evaluation of devices and optical modules meeting the latest communications standards and, with the addition of the MP1800A series multichannel pulse pattern generator (PPG) and error detector (ED), can easily support high-baud-rate NRZ and PAM4 methods as well as BER measurements using G0374A 64 Gbaud PAM4 DAC and MP1862A 56G/64 Gbps DEMUX.

The signal quality analyser is a plug-in module type bit error rate tester (BERT) that can generate up to eight channels of synchronised signals using the 32G multichannel PPG module. The G0374A is an accessory for the series that is used in combination with the MU183020A 32 Gbps multichannel PPG to generate 64 Gbaud NRZ/PAM4 signals by simple conversion of half-rate 32 Gbps NRZ signals. It can also be combined with the MP1862A 56G/64 Gbps DEMUX and MU183040B 28G/32 Gbps high-sensitivity ED to support BER measurement of high-baud-rate PAM4 signals.

**Anritsu Pty Ltd**  
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## First PIC32 MCUs with Core Independent Peripherals

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As the first PIC32 microcontrollers to offer Core Independent Peripherals, the PIC32MM family delivers cost-effective, low-power embedded control for IoT, consumer, industrial and sensorless BLDC applications.

The Core Independent Peripherals, such as Configurable Logic Cells (CLCs) and Multiple Output Capture Compare PWMs (MCCPs), offload tasks from the CPU to deliver lower power consumption and lower design complexity. Additional power savings, enabled by low-power sleep modes, plus small, 4 x 4 mm package options support longer battery life in space-constrained applications.



### Contact Information

Microchip Technology Australia  
Email: [aust\\_nz.inquiry@microchip.com](mailto:aust_nz.inquiry@microchip.com) Phone: +61 (2) 9868-6733

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## FANLESS MULTITOUCH PANEL COMPUTER

The Axiomtek GOT3187WL-834-PCT is a fanless multitouch panel computer for infotainment and light industry applications. The industrial-grade widescreen touch panel PC adopts an 18.5" WXGA TFT LCD display with projected capacitive touchscreen and 250 nits high brightness. To provide good system performance, the all-in-one touch panel PC supports quad-core Intel Celeron processor J1900 low power consumption. The 7H surface hardness provides durability. Its multitouch screen and slim and lightweight design increase the system's overall ease of use. The product is suitable for self-services, digital signage, light factory automation and more.

The product is equipped with IP65-rated water/dustproof front bezel and has a wide operating temperature range from 0 to +40°C. It is designed to operate reliably under 1 G of vibration.

The industrial human machine interface supports one 204-pin DDR3L-1333/1600 SO-DIMM with up to 8 GB memory capacity. To meet different application needs, the widescreen touch panel PC provides two PCI express mini card slots and WLAN antennas for 3G and wireless network connectivity. One 2.5" SATA HDD and one CFast/mSATA are available for sufficient storage. The I/O interfaces include two USB 3.0 ports, two USB 2.0 ports, two Gigabit Ethernet ports, one audio (line-out) and two RS232/422/485 ports.

The product provides a wide input voltage range from 12 to 36 VDC and offers flexible mounting options including panel mount, VESA arm, desktop stand and wall mount. It has passed CE standard testing and is ready for Windows 8.1, Windows Embedded 8 Standard, Windows 7 and Windows Embedded Standard 7.

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## MULTICHANNEL CIRCUIT BREAKERS

Phoenix Contact has released compact, all-in-one, multichannel CBM electronic device circuit breakers. With a choice of either a 4- or 8-channel CBM electronic device circuit breaker, users no longer need to stack single 18 mm-wide circuit breakers together in a control cabinet. At 41 mm wide, the compact design ensures technicians can place the device into smaller cabinets, leaving more space within the cabinet for technicians to add other components.

The electronic circuit breakers protect susceptible 24 VDC electronic equipment against voltage dips, overloads and short circuit currents. They feature remote status signalling and a remote reset to clear a tripped channel, eliminating the need for a technician to have to be present to reset a circuit — the channel can be cleared from the convenience of a programmable logic controller or at the operator interface.

The circuit breakers also feature an adjustable current per channel of 0.5 to 10 A. This allows technicians to choose from six ranges and to set the required protection level for individual circuits. An electronic locking mechanism prevents accidental changes to the set nominal currents and push-in technology enables fast and easy connection.

Each unit also comes with an in-built alarm that delivers an early warning when a channel exceeds 80% of the set nominal current. A multistage status indicator that is available for each channel provides constant information about the status of the connected loads.

**Phoenix Contact Pty Ltd**  
[www.phoenixcontact.com.au](http://www.phoenixcontact.com.au)

## REMOTE POWER CONTROL UNITS

The ENVIROMUX IPDU series remote power control units allow the user to remotely reboot and control up to eight servers or other powered devices from any location via secure web interface, RS232, SSH or Telnet. The series includes models with two, four and eight outlets. All models allow two external environmental sensors to be attached.

Power control and management features include: on/off/reboot/default switching; outlet sequencing and power-up delays; manual/scheduled/associated reboot modes; current/line voltage/line frequency/power factor monitoring; normally open (NO) or optional normally closed (NC) relay contacts; and overload protection via a circuit breaker.

Environmental and IP monitoring features include: temperature/humidity/water detection via external sensors; ping monitoring of up to eight IP network devices; and alert notifications via email/syslog/LEDs/webpage/SNMP. SMS messages sent via an external USB 3G modem are available on the four- and eight-outlet models.

The two- and four-outlet models can be cascaded to increase the number of power outlets and sensor ports. A maximum of 17 systems can be combined via RS485, with one acting as the master controlling 16 slave units.

**Interworld Electronics and Computer Industries**  
[www.ieci.com.au](http://www.ieci.com.au)





## PC TAIL VERSIONS OF CONNECTORS

Conxall's Sensor-Link series of over-moulded cable assemblies include the Mini-Mizer, AC Micro-Mizer, DC Micro-Mizer and the Nano-Mizer. The assemblies are designed as interconnects for a variety of sensor devices but have a wide range of applications as general disconnects. They provide environmental sealing and strain relief for flexing applications and are rated IP67, IP68 and NEMA 6P.

The company has expanded the Nano-Mizer M8 (8 mm) connector series to include PC tail versions of the three- and four-position panel mounts with male contacts. They are available in two backshell lengths and are compatible with industry-standard M8 connectors. Compatible with both snap-in and threaded connectors, they are rated for 3 A and 50 VAC/60 VDC with a rugged, nickel-plated brass housing.

**Clarke & Severn Electronics**  
[www.clarke.com.au](http://www.clarke.com.au)

## MULTIFUNCTION ETHERNET I/O MODULES

Acromag has expanded its BusWorks XT Series of ethernet I/O modules to include models with multiple I/O functionality.

The series is a rugged, flexible line of ethernet I/O modules that features channel versatility with housing to withstand harsh industrial environments. Rugged construction, high-density design and USB programming make the instruments suitable for applications including remote monitoring, distributed control and SCADA.

Each module processes I/O signals on up to 16 channels and features dual ethernet ports, as well as pluggable front-facing terminals, for convenient wiring. Users can choose to interface signal devices on any of three different protocols: Profinet, EtherNet/IP and Modbus/TCP with i2o peer to peer. This arrangement allows the daisy-chaining of modules to simplify installation and minimise switch requirements.

Model XT1530 is a multifunction ethernet I/O module with 4-channel analog current output, 4-channel discrete I/O and 12-32 VDC power. Model XT1540 is a multifunction ethernet I/O module with 8-channel analog voltage output, 4-channel discrete I/O and 12-32 VDC power.

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### DIE CUT AND LASER CUT GASKETS

Screen Process Circuits die cut and laser cut gaskets can be manufactured in many shapes, sizes and thicknesses and from a variety of different materials to meet sealing requirements. Accurate, consistent and repeatable results are key.

The product has a high degree of tolerance and short lead time. It is available in low-volume to high-volume runs with custom cut shapes.

Every die cut gasket requires a material that is best suited to its application. Non-metallic materials are available, including foams, silicon, tapes, rubber, polyester and self-adhesives. Important factors to consider when selecting the material include temperature, pressure at the joint and chemical compatibility.

#### Screen Process Circuits

[www.screenprocesscircuits.com.au](http://www.screenprocesscircuits.com.au)

### POWER ELECTRONIC PLATFORM

The SKAI 2 off-the-shelf power electronic building block family, from SEMIKRON, covers a broad range of vehicle electrification applications.

The power electronic platform — now in its second generation — comprises a highly integrated motor controller which provides a suitable powertrain solution for mobile electric and hybrid applications. Power densities of up to 20 kVA/L are said to provide a notable size reduction compared with other available standard motor controller products.

The MOS-based SKAI 2 LV motor controller uses established Skiip technology with a low-inductive connection to the DC-link capacitors, driver electronics, DSP controller and current, voltage and temperature sensors. It is integrated in a waterproof IP67 enclosure and can withstand high vibration amplitudes up to 10 G<sub>RMS</sub>.

The SKAI 2 LV is available as single- or dual-motor controller for supply voltages between 24 and 115 V. QUASAR motor control software functionally complements the system and completes the package.

SEMIKRON provides engineering services to support customers in the integration of the motor controller systems. Available services include lifetime estimation, field application support, individual parameterisation of motor control software, etc.

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# 'PESCOELECTRIC' ENERGY HARVESTERS



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## FOR SELF-POWERED ELECTRONICS

Researchers from India's Jadavpur University have explored recycling fish by-products into an energy harvester for self-powered electronics. Their study has been published in the journal *Applied Physics Letters*.

**T**he basic premise behind the researchers' work is simple: fish scales contain collagen fibres that possess a piezoelectric property, which means that an electric charge is generated in response to applying a mechanical stress. But while it is well known that a single collagen nanofibre exhibits piezoelectricity, until now no-one had attempted to focus on hierarchically organising the collagen nanofibrils within the natural fish scales.

"We wanted to explore what happens to the piezoelectric yield when a bunch of collagen nanofibrils are hierarchically well aligned and self-assembled in the fish scales," said Dipankar Mandal, a co-author on the study.

Mandal explained that the researchers "collected biowaste in the form of hard, raw fish scales from a fish processing market and then used a demineralisation process to make them transparent and flexible". The collagens within the processed fish scales served as an active piezoelectric element.

"We were able to make a bio-piezoelectric nanogenerator, aka energy harvester with electrodes on both sides, and then laminated it," Mandal said.

"And we discovered that the piezoelectricity of the fish scale collagen is quite large (~5 pC/N), which we were able to confirm via direct measurement." The bio-piezoelectric nanogenerator is capable of scavenging several types of ambient mechanical ener-

gies — including body movements, machine and sound vibrations, and wind flow. Even repeatedly touching the bio-piezoelectric nanogenerator with a finger can turn on more than 50 blue LEDs. Furthermore, Mandal noted, "no-one else has been able to make a biodegradable energy harvester in a cost-effective, single-step process".

The group's work could potentially be for use in transparent electronics, biocompatible and biodegradable electronics, edible electronics, self-powered implantable medical devices, surgeries, e-healthcare monitoring and in vitro/in vivo diagnostics, apart from its myriad uses for portable electronics.

"In the future, our goal is to implant a bio-piezoelectric nanogenerator into a heart for pacemaker devices, where it will continuously generate power from heartbeats for the device's operation," Mandal said. "Then it will degrade when no longer needed. Since heart tissue is also composed of collagen, our bio-piezoelectric nanogenerator is expected to be very compatible with the heart."

The nanogenerator may also help with targeted drug delivery, which is currently generating interest as a way of recovering in vivo cancer cells and also to stimulate different types of damaged tissues. According to Mandal, "Our end goal is to design and engineer sophisticated ingestible electronics composed of non-toxic materials that are useful for a wide range of diagnostic and therapeutic applications."





## CAN TRANSCEIVERS

Texas Instruments has released its TCAN1042 fault-protected CAN transceivers with flexible data rate. The transceivers work with the TI CAN evaluation board to perform CAN (controlled area network) evaluation. This includes the load and termination settings required for electronic design engineers looking to evaluate CAN transceiver operation and performance in factory and building automation, smart grids, automotive infotainment and advanced driver assist systems, communications infrastructures and more.

The transceiver family meets the requirements of the ISO11898-2 high-speed CAN physical layer standard. It also has simple connections to the TCAN1042DEVM evaluation board, which is equipped with the necessary jumpers for flexible device pin and CAN bus configuration. All devices are designed for use in CAN FD networks up to 5 Mbps.

The transceiver comes equipped with protection features including ESD protection of bus pins, undervoltage protection on supply pins, thermal shut-down protection, TXD and RXD receiver with dominant time out. It has a high operating temperature of +125°C and is AEC-Q100 qualified.

Other benefits include: common mode choke not required (per OEM); a wide VCC range (4.5 to 5.5 V) for start and stop without boost; wide I/O voltage level adapting reduces external components; extended bus-fault protection supporting 48 V systems; hot swap support with glitch-free bus I/O on power up and down; and P2P compatible packaging.

**element14**

au.element14.com



## FANLESS BOX PC

Neosys Technology's Nuvo-6000 series is a fanless box PC that features up to five PCIe/PCI slots. Powered by the Intel 6th-Gen LGA1151 socket-type CPU, it is said to

deliver up to 30% CPU performance

improvement over former CPU generations.

The PC has front-accessible I/O, such as GbE, USB 3.0 and COM ports, for general industrial usage. The combination of x16 PCIe, x8 PCIe and PCI slots allows the installation of sophisticated add-on cards for high-end vision and motion applications.

The compact, fanless construction offers the same computing power and expandability as conventional IPC. The product has been designed to be a durable system while maintaining the same TCO in most demanding industrial applications.

Two derivative models are available for the series. The Nuvo-6032 has five-slot capacity and the slimmer Nuvo-6002 offers two PCIe slots. With versatile mounting options, users can easily install into desktop, DIN rail, cabinet or 19" rackmount applications.

Other features include an operation temperature of -25 to 60°C, dual DVI display outputs and optional automatic temperature sensing and fan control.

**Backplane Systems Technology Pty Ltd**

www.backplane.com.au

## INDUSTRIAL ATX MOTHERBOARD

The Axiomtek IMB500 industrial ATX motherboard is powered by 6th generation Intel Core, Pentium and Celeron processors in the LGA1151 socket with Intel Q170 chipset.

The product supports four 288-pin DDR4-2133/1866 SO-DIMM sockets, with a memory capacity of 64 GB to enhance overall system performance. Designed for customisation and flexibility, the product comes with expandability options including one PCIe x 16 slot, two PCIe x 4 slots, four PCI slots, one PCI Express mini card and SIM slot.

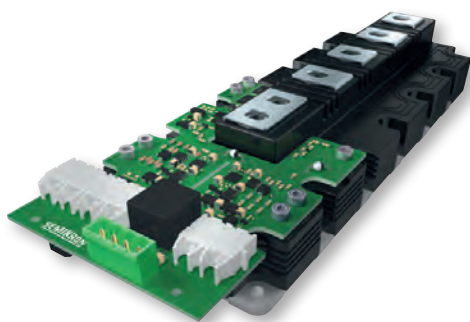
The embedded board features triple-display capability through DisplayPort, HDMI and VGA interfaces. With these capabilities and features, the product is suitable for industrial automation, advanced communication, gaming, industrial and automation applications.

The product is equipped with multiple high-speed I/O connectors, including two RS232/422/485 ports, four RS232 ports, one PS/2 keyboard and mouse, four USB 3.0 ports, eight USB 2.0 ports, five SATA-600 with RAID 0/1/5/10, one mSATA, two Gb LAN ports, and eight channels digital I/O, HDMI, DisplayPort and VGA interfaces. The product supports watchdog timer and hardware monitoring features.



**Braemac Pty Ltd**

www.braemac.com.au



## IGBT DRIVER WITH OPTICAL INTERFACE

The SKYPER Prime O is an IGBT driver with an optical interface, galvanically insulated temperature and DC link signals.

The product is designed and qualified with the IGBT module SEMITRANS10 and offers a plug-and-play bundle with improved SOA characteristics. This saves on qualification and redesign loops and is said to offer significant performance advantages in various applications.

The driver offers galvanically isolated, DC-link and temperature signals as a PWM signal to the controller. Compact, high-power inverters can be built without sense circuits, cabling effort or power supplies. In addition, second source requirements are covered, both on the driver and the module side. Electrical and optical interfaces are available.

**Semikron Pty Ltd**

[www.semikron.com.au](http://www.semikron.com.au)

## BLUETOOTH LOW ENERGY MODULE

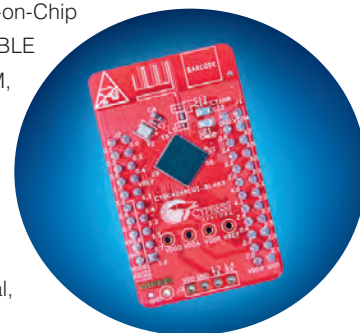
Cypress Semiconductor has released a fully certified Bluetooth Low Energy (BLE) module for creating a complete BLE system with Bluetooth 4.2 features such as data length extension, upgraded privacy and enhanced security — all of which are critical for IoT applications.

The Cypress CY8CKIT-143A Programmable System-on-Chip (PSoC) 4 BLE 256K module features a PSoC 4 BLE device with 256 KB of Flash and 32 KB of SRAM, 24 MHz and 32.768 kHz crystals, a PCB antenna and other passives while providing access to all 36 general-purpose inputs and outputs (GPIOs) of the device. The module's compatibility with Cypress's small-footprint (10 x 10 x 1.8 mm) CYBLE-222014-01 Bluetooth 4.2 module makes it suitable for medical, home automation and wearables applications.

The single-chip solution integrates a programmable analog front end, programmable digital peripherals and CapSense touch-sensing technology, and includes a royalty-free stack and radio compatible with Bluetooth 4.2. The module's programmable architecture supports a number of peripheral functions (ADC, timers, counters, PWM) and serial communication protocols (I2C, UART, SPI). The module can be used standalone with an external programmer like the CY8CKIT-002 MiniProg3 or plugged into the CY8CKIT-042-BLE Bluetooth Low Energy Pioneer Kit for easy prototyping with the PSoC Creator integrated development environment.

**Mouser Electronics**

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## Street lighting sensory network in Swaziland

gridComm, a leader in smart street light solutions and IoT sensor networks, has partnered with investment firm Somerset Group to install smart street lighting sensory networks across the Kingdom of Swaziland — a developing country flanked by the Republic of South Africa and the Republic of Mozambique.

gridComm's smart street lighting sensory network technology delivers intelligent, eco-friendly lighting to Swaziland, saving energy and money while also limiting carbon emissions. Based on the existing street lighting infrastructure, the technology establishes a ready-to-use Internet of Things (IoT) sensory network which can be used to monitor crops, weather and more via data analytics. This will assist Swaziland's farming communities by helping to optimise productivity and increase agricultural output.

"By deploying gridComm's solution, the practice of sending engineering experts physically out into the field to fix connectivity issues becomes a thing of the past, as they can now be remotely monitored," said gridComm CEO Mike Holt.

The sensory network system is built with hybrid communication technologies comprising a next-generation multichannel OFDMA (orthogonal frequency division multiple access) power line communication (PLC) transceiver (gridComm's GC2200) and a wireless physical layer. gridComm uses its PLC and digital power supply technologies to convert traditional street lighting into energy-aware and remotely managed and

monitored web-based networks. PLC is said to be more reliable than wireless technologies for street light control — particularly low-power radiofrequency technologies — which are more prone to interference in outdoor environments. Because many IoT sensors run on batteries, hybrid power line and wireless communication technology ensures connectivity between these sensors when they are in the vicinity of smart street lights. With gridComm, IoT sensors can be introduced to the network as they are needed. The company's modules are designed to automatically attach to the nearest gateway without on-site tuning or configuration for true plug-and-play connectivity.

"For a developing country like Swaziland, adopting the right technology solutions is crucial to shaping a sustainable environment," said Henri Thompson, group managing director of Somerset Group, South Africa. "We envision that gridComm's smart technology will deliver the data analytics needed to boost crop yields and positively affect Swaziland's economic development."

"Our technology has been thoroughly proven to be exceptionally robust and reliable, and our recent successes in more than 12 cities across Asia underscore this fact," added Holt. "We look forward to delivering more deployments in Swaziland and other parts of Africa in conjunction with Somerset Group."

**gridComm**

<http://www.gridcomm-plc.com/>

## ENCAPSULATION RESINS

Electrolube develops, manufactures and supports a wide variety of resin products. One of the company's latest epoxy resins is the epoxy ER2224, a modified formulation of the ER4001 thermally conductive epoxy resin system, which offers an improved method of cure and subsequent health and safety benefits for the user.

The resin is particularly suited to automotive applications (for both traditional and electric power train types) that generally require high thermal conductivity and good thermal cycling performance. The resin is also suitable for use in LED lighting units where it helps to promote heat dissipation and prolong unit service life.

Electrolube is also launching two polyurethane resins which are specifically aimed at helping LED lighting manufacturers provide environmental protection for their products. UR5638 is a tough, low-exotherm product, providing a clear, transparent finish. The low exotherm of the resin makes it particularly suitable for applications involving the encapsulation of larger LED lighting units. It is an aliphatic polymer offering good UV stability and transmission of visible light, making it a suitable resin for white light LEDs.

UR5639 is a low-exotherm, low-viscosity, low-hardness, flexible, clear/transparent resin designed for encapsulating a variety of electrical components — particularly LEDs. The level of flexibility achieved by the cured resin means that the connecting legs of components are not placed under high levels of stress during the cure.

**Electrolube**

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## E-PAPER DEVELOPMENT KIT

Pervasive Displays (PDi) announces a second-generation extension kit to support evaluation and development of its e-paper displays (EPDs). The EPD Extension Kit Gen 2 (EXT2), with its powerful PDi Apps utility, allows equipment designers to explore EPD technology with features like global updates and fast partial updates. The kit can be also used as a bridge

to replace an existing display while developing a new application, easing the design task and speeding time to market.

The EPD driving interface and open-source driving code provided by the kit expedite the design of EPDs, while the board provides FPC connector types that support the majority of PDi's e-paper displays. The board also features a socket that allows it to be directly stacked on various Texas Instruments LaunchPad development kits through the BoosterPack plug-in module to enable different applications.

The kit supports connections to the MSP-EXP430F5529LP LaunchPad kit and MSP-EXP432P401R LaunchPad kit for ultralow power applications as well as the EK-TM4C123GXL LaunchPad kit. It will support the SimpleLink Wi-Fi CC3200 LaunchPad kit, the CC2650 Bluetooth Low Energy wireless LaunchPad kit and the SimpleLink Sub-1 GHz CC1310 LaunchPad kit for IoT-enabled e-paper designs soon. Designers can use the onboard headers of EXT2 to bridge with a current product design or any other development kit. Additionally, the product provides onboard driver circuits to support applications with EPDs that use external or internal timing controllers (eTC or iTC) and builds with different material films.

**Digi-Key Corporation**  
[www.digikey.com](http://www.digikey.com)



*Schroff*

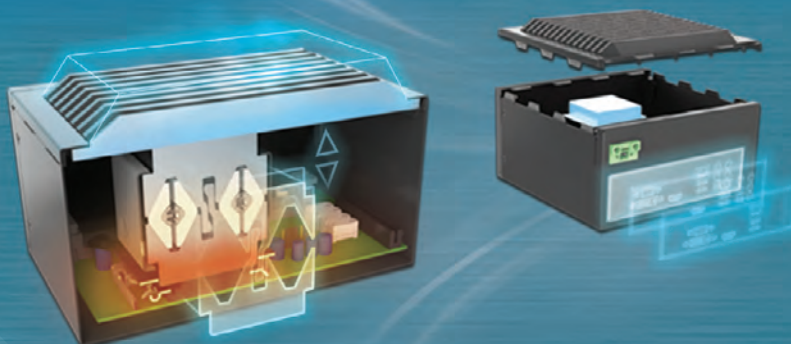
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# BOROPHENE MAY BE BEST FOR FLEXIBLE ELECTRONICS

US scientists have claimed that 2D materials like graphene may be too flat and hard to stretch to serve in flexible, wearable devices. The solution to this problem lies in a material called borophene.

**T**heoretical physicist Boris Yakobson, from Rice University, and his team observed examples of naturally undulating, metallic borophene — an atom-thick layer of boron — and suggested that transferring it onto an elastic surface would preserve the material's stretchability along with its useful electronic properties. Their research has been published in the journal *Nano Letters*.

Highly conductive graphene has promise for flexible electronics, Yakobson said, but it is too stiff for devices that also need to stretch, compress or even twist. But borophene deposited on a silver substrate develops nanoscale corrugations. Weakly bound to the silver, it could be moved to a flexible surface for use.

Rice collaborated with experimentalists at Argonne National Laboratory and Northwestern University to study borophene, which was made in small quantities. Under the microscope, borophene displays corrugations that demonstrate its wavy nature, meaning it can be highly stretched once removed from the substrate or reattached to a soft one, Yakobson said.

The group built computer simulations to analyse the properties of materials from the atoms up. Simulations by first author Zhuhua Zhang, a postdoctoral researcher in Yakobson's group, showed that hexagonal vacancies in borophene help soften the material to facilitate its corrugated form.

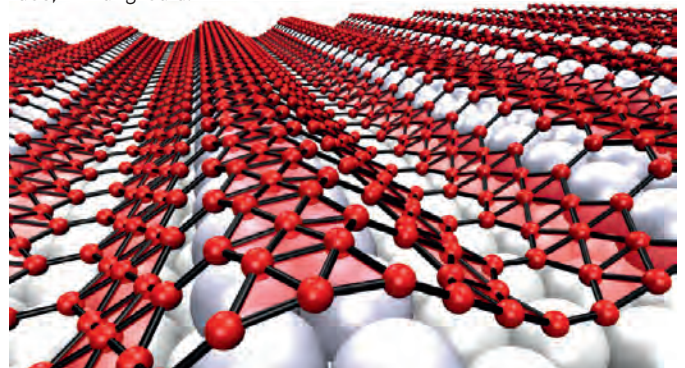
"Borophene is metallic in its typical state, with strong electron-phonon coupling to support possible superconductivity, and a rich band structure that contains Dirac cones, as in graphene," Yakobson said.

There is, however, a hitch: borophene needs the underlying structure to make it wavy. When grown on a featureless surface,

its natural form resembles graphene, the flat, chicken-wire arrays of carbon atoms. Zhang said borophene is better seen as a triangular lattice with periodic arrays of hexagonal vacancies.

Borophene prefers to be flat because that's where its energy is lowest, Yakobson said. But surprisingly, when grown on silver, borophene adopts its accordion-like form while silver reconstructs itself to match. The corrugation can be retained by 'regluing' boron onto another substrate.

"This wavy conformation so far seems unique due to the exceptional structural flexibility and particular interactions of borophene with silver, and may be initially triggered by a slight compression in the layer when a bit too many boron atoms get onto the surface," Zhang said.



*When grown on silver, the two-dimensional form of boron, which is called borophene, takes on corrugations, helped by atomic vacancies in the lattice that make it more flexible. Image credit: Zhuhua Zhang/Rice University.*





## Protecting India's forests with satellite location technology

A navigation and positioning chip from wireless company u-blox is at the heart of a new high-tech initiative that protects forests, wildlife and endangered species, and promotes sustainable resource development.

The Indian state of Odisha is larger than most European countries, but 30% of its area is forest, including national parks that are home to protected wildlife, tiger reserves and over 100 species of wild orchid. Now, the Forest Minister of Odisha has unveiled a locally developed handheld GNSS device, the Sxtreo T51 PDA, based on the u-blox M8 GNSS chip, which will be used by thousands of rangers to protect and manage forest resources.

The T51 was developed by India's Stesalit Systems, which worked with Swiss-based u-blox to create a handheld PDA for the Indian subcontinent, where GNSS can be enhanced by signals from India's own GAGAN (GNSS Aided GEO Augmented Navigation) system to improve standalone accuracy down to the 2 m range. This potentially makes a u-blox M8-equipped device precise enough to geotag locations of individual trees and animals.

"u-blox provided the right kind of GNSS chips with the features needed for India," said Hemant Khemka, Stesalit's managing director.

The 72-channel u-blox M8 chip acquires up to three global navigation satellite systems (GNSS): Galileo, BeiDou and GLONASS, concurrently. This makes it suitable for challenging environments where the sky may be partly obscured by thick forest cover, mountainous terrain or buildings. In addition, the chip is flexible and futureproof, as accuracy upgrades and support for new positioning systems or augmentation systems, such as GAGAN, can be added via firmware updates — even out in the field.

India's forest rangers and guards will use the rugged T51, which is designed for harsh outdoor conditions, for foot patrol navigation, geospatial validation of forestry accounts, incident reporting, monitoring of poaching and tree felling, and surveying and demarcation of forest land. The Linux- and Android-based T51 provides functions similar to a mobile phone, including communications and a camera, all fully integrated with the u-blox M8's navigation and location support.

The Odisha Forestry Department is looking to equip 3000 forestry staff with GNSS PDAs so that field offices and the public can keep updated on their work.

**u-blox Singapore Pte Ltd**  
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## IN-VEHICLE RUGGEDISED NETWORK VIDEO RECORDERS

Advantech and RTSoft have released their application-ready building blocks for satellite navigation seconded video processing solutions. They are designed, tested and verified to build video data-based fleet monitoring and surveillance solutions, as well as live video-based infotainment systems that offer augmented reality functions like adding house numbers or location-based advertisements in real time to the video stream.

The system building blocks include Advantech's PoE-capable ARK-V&S series of in-vehicle ruggedised network video recorders (NVR), cameras from cooperation partners and RTSoft's MONTRACK software for continuous monitoring of vehicles and mobile objects. These verified building blocks ensure that users can get GNSS and video-based fleet monitoring solutions and augmented reality infotainment up and running quickly. Designed for decentralised intelligence on clients, the MONTRACK structure matches the design of the ARK-V&S series. Global navigation satellite systems (GNSS) such as GPS, GLONASS or Galileo, as well as cellular and satellite links for remote communication, are supported. Besides cabs, buses and trains, even auto rallies in deserts can be tracked, video-monitored and served with augmented reality information.

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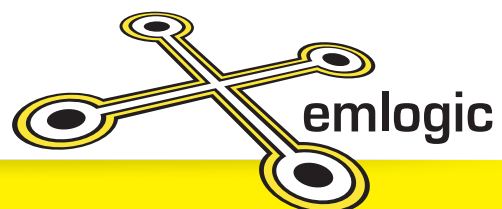




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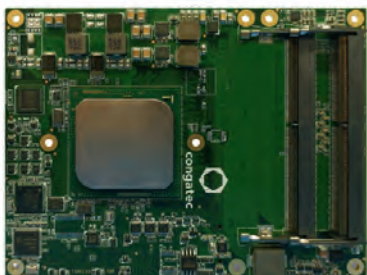
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## SERVER-ON-MODULES

congatec B7XD COM Express Type 7 server-on-modules come in a headless design and are available with 10 different server processors.

The modules feature 10 Gb Ethernet interfaces, 32 PCIe lanes and headless server performance currently with up to 16 server cores and 48 GB of DDR4 ECC RAM.

They are set for the industrial temperature range -40 to +85°C.

The product has two 10 Gb Ethernet ports. It also supports the NC-SI network controller sideband interface for connecting a baseboard management controller (BMC) allowing out-of-band remote manageability.

System extensions including flash memory can be connected via up to 24 PCI express gen 3.0 lanes and 8x PCIe gen 2.0 lanes. 2x SATA 6G ports are available for conventional storage media. Further I/O interfaces, including 4x USB 3.0, 4x USB 2.0, LPC, SPI, I2C bus and 2x UART, are featured.

It has operating system support for all Linux distributions and Microsoft Windows variants, including Microsoft Windows 10 IoT. A range of accessories, such as standardised cooling and a carrier board for evaluation, simplifies the design.

**Congatec Australia Pty Ltd**

[www.congatec.com](http://www.congatec.com)

## ROBUST MINIATURE CONNECTOR SERIES

The ODU AMC High-Density miniature connector series features a diameter of less than 10 to 18.5 mm and a pole density of up to 40 contacts with different versions for power (up to 15 A), signal and data transmission (USB 3.0 at a rate of 5 Gbps), providing high performance and functionality in a compact package.

Designed in response to demand from the military and security technology fields, the miniature connector has a long service life of more than 5000 mating cycles — even under severe environmental conditions such as water, dirt, salt and temperature. Blind mating and optimised mechanical and colour coding ensure safe and simple handling. The Break-Away function enables the connection to be released with a tug on the cable, making it possible to change or separate connections in a second.

ODU is creating dependable, sensitive connections for medical technology, sensor systems and communication technology. The product is IP68 rated and salt spray resistant.

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## IOT GATEWAY AND RF MODULES

Multitech LoRa IoT Solutions consists of the MultiConnect Conduit (MTCDDT) — a configurable, manageable and scalable cellular communications gateway for industrial IoT applications — and LoRa Client Node powerful, low power consumption mDot and xDot modules.

MTCDDT is a programmable, industrial-grade IoT gateway which is embedded with a cellular LTE/3G option and the capability of fitting two Semtech LoRa-based wireless sensor networks in the same unit. With the Linux development platform and Node-RED development platform option, it can be used as a packet forwarder with a third-party server or a standalone LoRa IoT server. MTCDDT is also available with an IP67-rated enclosure unit which is suitable for many applications.

MultiConnect mDot and xDot are secure, CE/FCC/RCM certified, ARM mbed programmable, low-power RF modules that provide long-range, low bit rate M2M data connectivity to sensors, industrial equipment and remote appliances. They are LoRaWAN 1.0x compliant, providing bidirectional data communication up to 15 km away and 2 km into buildings, using sub-GHz ISM bands in Australia, New Zealand, Southeast Asia, South Korea, North America and Europe.

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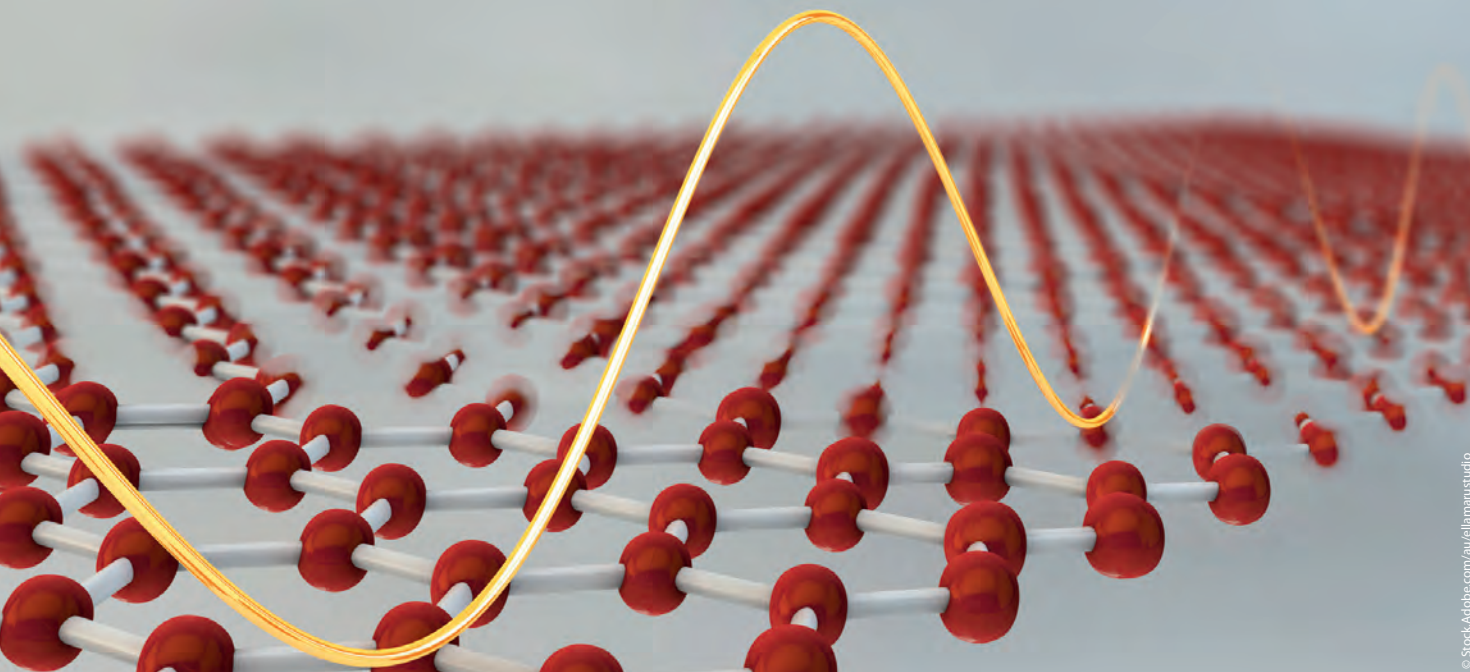
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# CONTROLLING THE MOMENTUM OF ELECTRONS IN GRAPHENE

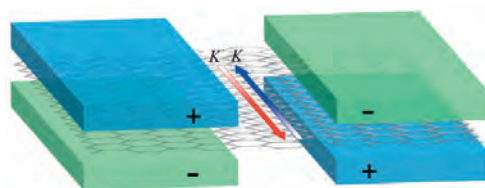
Pennsylvania State University researchers have developed a device made of bilayer graphene — an atomically thin arrangement of carbon atoms — which provides experimental proof of the ability to control the momentum of electrons. Published in the journal *Nature Nanotechnology*, the study is one step forward in a new field of physics called valleytronics.

“Current silicon-based transistor devices rely on the charge of electrons to turn the device on or off, but many labs are looking at new ways to manipulate electrons based on other variables, called degrees of freedom,” said Associate Professor Jun Zhu, who directed the research. “Charge is one degree of freedom. Electron spin is another, and the ability to build transistors based on spin, called spintronics, is still in the development stage. A third electronic degree of freedom is the valley state of electrons, which is based on their energy in relation to their momentum.”

Zhu suggested thinking of electrons as cars and the valley states as blue and red colours. Inside a sheet of bilayer graphene, electrons will normally occupy both red and blue valley states and travel in all directions. The device her PhD student, Jing Li, has been working on can make the red cars go in one direction and the blue cars in the opposite direction.

“The system that Jing created puts a pair of gates above and below a bilayer graphene sheet,” Zhu said. “Then he adds an electric field perpendicular to the plane.”

Li elaborated, “By applying a positive voltage on one side and a negative voltage on the other, a bandgap opens in bilayer graphene, which it doesn’t normally have. In the middle, between the two sides, we leave a physical gap of about 70 nanometres.”



*One-dimensional wires created in bilayer graphene gated by two pairs of split gates above and below the sheet. Wires travelling in opposite directions carry electrons of different valley states labelled as K and K' in the figure. Image credit: Jun Zhu/Penn State.*

Inside this gap lives one-dimensional metallic states, or wires, that are colour-coded freeways for electrons. The red cars travel in one direction and the blue cars travel in the opposite direction. In theory, coloured electrons could travel unhindered along the wires for a long distance with very little resistance. Smaller resistance means power consumption is lower in electronic devices and less heat is generated.

“It’s quite remarkable that such states can be created in the interior of an insulating bilayer graphene sheet, using just a few gates,” said Zhu. “They are not yet resistance-free, and we are doing more experiments to understand where resistance might come from. We are also trying to build valves that control the electron flow based on the colour of the electrons.”

## BUCK-BOOST REGULATORS

Vicor Corporation has announced the addition of two buck-boost regulators to its Cool-Power ZVS Regulator portfolio.

Delivering up to 200 W at greater than 97% efficiency, the regulators incorporate Vicor's high-frequency zero-voltage switching (ZVS) technology and feature good conversion efficiency, power density and performance. Engineered and optimised as a complete solution, the PI3741-0x regulators are suitable for demanding, automotive, industrial, test, automation, lighting, battery regulation and telecom applications.

ZVS buck-boost regulator technology minimises switching losses and maintains high efficiency over the specified input voltage range while enabling high-frequency operation (1 MHz) for improved power density and fast dynamic response to line and load transients. The regulators have a wide operating temperature range of -40 to 125°C and require only minimal external components to form a complete high-performance regulator. Both regulators operate over a wide input voltage range of 21–60 VDC and integrate a ZVS controller, power switches and support circuitry within a high-density, thermally adept, 10 x 14 x 2.5 mm SiP. The PI3741-00 delivers a user-definable output voltage in the range of 21–36 VDC while the PI3741-01 supports a higher output voltage in the range of 36–54 VDC.

Other features include: single-wire current sharing for parallel operation; over-/undervoltage, overtemperature and overcurrent protection; an integrated current monitoring amplifier; a user-configurable, high-bandwidth differential amplifier; bidirectional synchronisation options; and over 200 W peak power or up to 6.5 A continuous current in a 10 x 14 mm package.

**Vicor Corporation**

[www.vicorpower.com](http://www.vicorpower.com)



## MODEM TECHNOLOGY PLATFORM

The u-blox UBX-R3 LTE modem technology platform supports the LARA-R3 module series. It features a combination of a Cat 1 LTE modem and GNSS technology.

It provides positioning information based on an onboard receiver and has a singlemode configuration. It is aimed specifically at applications for things connected to the internet (IoT).

Designed and qualified for reliable communication in harsh environments, the product comes with robust system design, long-term availability and full component traceability. The software-defined modem architecture in the platform offers specific features for IoT, like power minimisation, signalling optimisation and load and throughput control, all compatible with latest standard releases. System complexity has been adapted for LTE-only support and the device can be modified to meet specific customer requirements.

The platform can support end-to-end security features (secure firmware boot, secure transport layer, secure interfaces, secure APIs) that are tightly integrated within the module.

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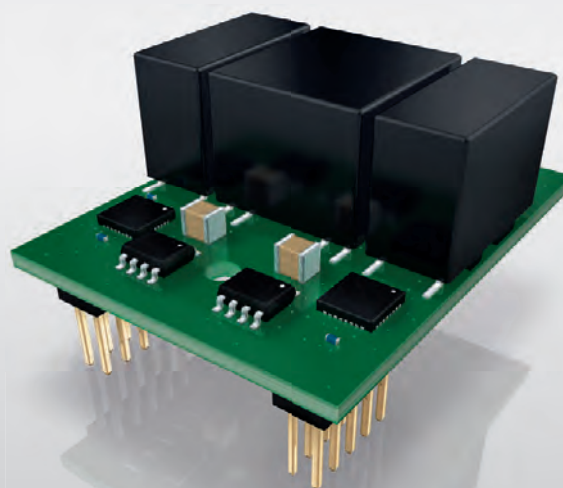
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## RUGGED TABLET

Panasonic has launched the Toughpad FZ-A2 tablet, combining Intel and Android productivity with full ruggedisation. The product features a sunlight-viewable 10-finger multitouch IPS display, flexible configurable ports and business expansion capability, plus enterprise-class security.

The lightweight unit weighs 880 g and is 16.4 mm deep. It can withstand drops from 1.2 m and is sealed against dust and water spills with an IP65 ingress protection rating.

The 10.1" daylight-readable display (1920 x 1200) with high visibility (800 cd/m<sup>2</sup>) provides clarity of vision in all conditions both outside and indoors. It will work in temperatures below 0°C or above 50°C and the 10-point capacitive touch-screen display can be used by hand, with gloves or with the capacitive stylus pen for accurate annotation or signature collection in the rain.

The tablet has a user-removable battery with a 9 h working life, with an optional hot-swappable battery capability for when around-the-clock usage is required. It supports live videoconference capabilities and is equipped with Full HD front web and 8 MP rear camera with flash. It also features built-in directional array microphones, making it suitable for communication, videoconferencing and voice recognition software.

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## ELECTRONIC CIRCUIT PROTECTOR

The E-T-A REX12-T electronic circuit protector has a protective element for mechanical engineering and process control. The electronic overcurrent protection combines flexibility with a compact design and is tailor made to the technical and economic demands of machine construction.

The user does not require any additional accessories to connect the individual components electrically and mechanically. Ease of mounting and minimised wiring time help save time and money.

The single-channel circuit protector, which can be mounted side by side, uses the EM12-T supply module for installation. Both modules feature push-in technology and allow no-tool time-saving wiring. Due to its unique hinged connection mechanism, up to 16 circuit protectors can be placed and connected side by side on a symmetrical rail. No bridges, jumpers or busbars are required.

The product also provides selective overcurrent protection. It offers visual failure indication by means of LEDs and auxiliary contacts and thus provides ease of troubleshooting and increased machine run times.

Depending on the output current, the product disconnects after approximately three seconds in the event of an overload, and in less than 10 ms in the event of a short circuit. Thus overloading the power supply will reliably be prevented. Capacitive loads of up to 20,000  $\mu$ F can be switched on without problems.

The user can operate and selectively protect even sensitive and intelligent loads. The circuit protector is available in all standard current ratings from 1–10 A. The internal fail-safe element (blade fuse), which is adapted directly to the current rating of the circuit protector, allows easy adjustment to the cable cross section.

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## SIGNAL GENERATORS

The Siglent SDG1000X series of function/arbitrary waveform generators output sine, square, ramp and pulse waveforms to 60 MHz, with a 14-bit sampling rate of 150 MSa/s at up to  $\pm 20$  V. The generator features Siglent's EasyPulse technology for low jitter and fast rising and falling edges that are frequency-independent even at low duty cycle settings. The generator is capable of generating square waveforms up to the full 30 or 60 MHz frequency with low jitter.

With 0 dBm output, the total harmonic distortion (THD) is less than 0.075%, with harmonics and spurious less than -40 dBc throughout the entire bandwidth. The rise/fall times can be set independently to the minimum of 16.8 ns at any frequency and to the maximum of 22.4 s. The adjustment step is as small as 100 ps. Pulse widths can be fine-tuned to a minimum of 32.6 ns with adjustment steps as small as 100 ps.

Multiple modulation functions are included in the series: AM, FM, PM, ASK, FSK, PWM, DSB-AM, linear/logarithmic sweep and burst. These instruments have a clear, straightforward front-panel with a large 4.3" TFT-LCD display, and the user-friendly layout with its built-in help system simplifies their operation. USB host, USB device and LAN (VXI-11) interfaces are provided, with GPIB available as a factory-fitted option. Applications include research and education, IC and circuit testing, environmental and medical signal simulation, etc.

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## FIBRE COMPOSITE 3D PRINTER

The Markforged Mark X fibre composite 3D printer offers prototyping- and manufacturing-scale parts printing in mining, manufacturing, renewables, medical prosthetics and electronics/telecommunications applications. The product introduces a set of print capabilities that includes in-process laser inspection as well as a fine, 50  $\mu$ m surface finish.

A laser sensor affixed to the print head will scan parts at any layer designated, in order to measure whether the most critical tolerances are met. The product includes a high-precision build plate, encoders on the print head, silent stepper motors and a high-stiffness Z-axis motor. The build volume is 330 x 250 x 200 mm, while the footprint of 575 x 467 x 928 mm.

**Emona Instruments Pty Ltd**  
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## INTERACTIVE DIGITAL SIGNAGE

The Elo 02-Series professional-grade 46" interactive digital signage features an ultrathin form factor of just 2". It is a large-format wall tablet platform suitable for immersive interactive applications.

The 46" size adds to the existing 32" and 42" sizes of the series displays, available with either projected capacitive 'PCAP' or infrared touch technologies. This provides a fast and sensitive response similar to mobile devices.

The low-profile design with zero bezel and glass to edge integrates seamlessly into modern interiors for commercial markets including retail, hospitality, gaming, corporate and medical applications. With no plastic border to trap dirt or grease, the product is suitable for commercial-grade use.

An embedded touch on screen display allows programming of key display features without the need for a handheld remote. Seamless snap-in peripherals enhance e-commerce and hospitality services including webcam, NFC reader, mag stripe reader and barcode scanners. Optional, high-performance computer modules which turn the display into a completely integrated all-in-one computer, without the need for any cables or additional mounting hardware, are available. All models are supported with a three-year warranty.

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## POWER FACTOR CONTROLLERS

The NHP RL8 and RG8 power factor controllers are designed for the automatic switching of capacitor banks to achieve target power factor.

With an intuitive interface, the new product offers plug-and-play accessory modules, providing flexibility to meet application requirements with options from master/slave configurations to contactor or dynamic switching of capacitor banks.

Features provided as standard include IP65 front protection; eight relay outputs expandable to 14 steps; voltage and current THD up to 15th harmonic; two expandable slots; and built-in temperature sensor.

Communication modules are available as plug-and-play for RS485 or Ethernet MODBUS connectivity for both controllers.

Advanced features include eight relay outputs expandable to 16 steps; voltage and current THD up to 31st harmonic; eight configurable user alarms; four expandable slots; dynamic switching via thyristor control module (NPFCEXP1001); advanced programmable I/O functions; built-in temperature sensor; and master/slave functionality.

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## ROBUST AC CAPACITORS

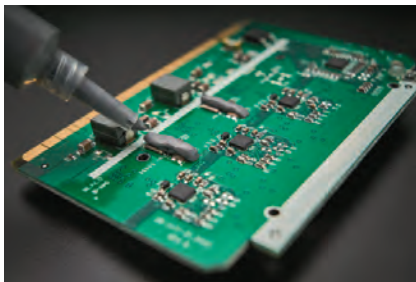
TDK Corporation presents two series of EPCOS alternating current (AC) capacitors. Both the cans and the tops of the components are constructed of aluminium, making them particularly robust. All capacitors in the B33331 and B33335 series are CE-compliant and have both VDE approval in accordance with EN/IEC 60252-1 Class A and UL approval.

Due to their robust design and integrated overpressure disconnect, the capacitors meet the requirements of safety class S2 as specified by EN/IEC 60252-1. The rated voltage is 450 VAC (50/60 Hz) and the permissible operating temperature is between -40 and +85°C. This results in life expectancy of 30,000 h.

The B33331 series covers a capacity range from 2 to 50 µF. Depending on the capacity, the dimensions range from 30 x 55 mm to 50 x 100 mm.

The B33335 series features two capacitors installed in one enclosure. With these double capacitors, different combinations of capacitance values are offered. The current standard range covers values between 12 + 1.5 µF and 60 + 8 µF, while the dimensions range from 50 x 57 mm to 63.5 x 102 mm. The double capacitors are particularly suitable for use in air-conditioning systems, in which the larger capacitance is used for the compressor motor and the smaller capacitance for the fan motor.

**EPCOS**  
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## THERMAL MANAGEMENT MATERIALS

The DuPont Temprion thermal management materials are completely non-silicone and include thermal greases, thermal gap fillers, electrically insulating films and adhesive thermal tapes.

In applications such as handheld devices, computers, car batteries and high-power electronic motors where heat dissipation is a major concern, the use of the product can improve performance and reduce the risk of failure.

The product offers good thermal conductivity, lower thermal resistance, greater heat dissipation and improved thermal stability during continuous use.

Electrically insulating films offer thermal conductivity and thermal resistance and are suitable for power electronic, consumer devices and lithium-ion batteries.

Thermal greases are dispensable and designed for thin bond-line applications such as in LEDs and CPUs.

Thermal gap fillers are dispensable and designed for thick or multiple bond-line applications such as in power modules and automotive applications.

Adhesive thermal tapes offer low thermal resistance at low application pressure for bonding heatsinks or heat spreaders in applications such as computers and LED lighting.

Adhesive thermal tapes offer low thermal resistance at low application pressure for bonding heatsinks or heat spreaders in applications such as computers and LED lighting.

**DuPont (Aust) Limited**  
[www.dupont.com.au](http://www.dupont.com.au)

## INTEGRATED HIGH-SPEED DRIVER

The Peregrine PE29100 integrated high-speed driver is designed to control the gates of external power devices, such as E-HEMT (enhancement-mode high electron mobility transistor) gallium nitride FETs.

The outputs of the product are capable of providing switching transition speeds in the subnanosecond range, for hard switching applications up to 33 MHz.

High switching speeds result in smaller peripheral components and enable applications like the Rezero wireless power transfer standard from A4WP.

Key features include high- and low-side FET drivers, dead-time control, fast propagation delay of 8 ns, tri-state enable mode, subnanosecond rise and fall time, 2 A/4 A peak source/sink current and flip chip package.

### Wireless Components

[www.wirelesscomponents.com.au](http://www.wirelesscomponents.com.au)



## RAIL-TO-RAIL COMPARATOR

Squeezed in a footprint smaller than 1 mm<sup>2</sup>, STMicroelectronics' TS985 comparator combines battery-friendly micropower performance with enhanced dynamic range and high speed. The 0.8 x 1.2 x 0.52 mm chip-scale package (CSP) makes the device suitable for space-constrained applications such as smartphones, smart watches, digital cameras, Internet of Things (IoT) devices and portable test equipment.

The product can operate from a supply voltage from 1.8 to 5 V, allowing use in systems powered from a single cell or generally designed to operate from low voltages to save overall power consumption. Typical operating current of 14  $\mu$ A also helps minimise drain on the battery. High-speed performance is assured, as typical propagation delay of 300 ns ensures rapid response to fast-changing analog signals.

Through its rail-to-rail input, the unit accepts signal amplitudes up to the supply voltage. This enables designers to take full advantage of the limited dynamic range when operating from a low voltage and so create portable systems that deliver quality performance and features. Other features include 400  $\mu$ m ball pitch, push-pull output and high ESD tolerance of 2 kV HBM/200 V MM.

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## PCB DESIGN TOOL

Version 1.2 of Altium CircuitStudio is a professional PCB design tool that is ready to pick up and go. With powerful schematic capture, feature-rich PCB editing and centralised component management, it will inspire designers to invent the future, instead of being preoccupied with just making it work.

The PCB design system features a balanced blend of powerful features and intuitive interfaces, making it easy for designers to achieve perfection in their design process. Design Rule Driven Interactive Routing enables designers to quickly and efficiently route without worrying about breaking any preset design rules. Built-In Autorouter Engine provides the routes from one pin to another automatically based on predetermined rules set by the designer, allowing more time to focus on other aspects of the design. Powerful Native 3D PCB Visualization Engine allows designers to ensure their boards fit their mechanical enclosures the first time, effectively reducing design spins and saving precious time and resources.

The latest version of the software includes improvements to usability and increased functionality, including: pad objects that support square and slotted holes; subversion (SVN) support; the ability to generate an EDIF Netlist; additional schematic and PCB shortcut keys for common object placement commands; and improved rearranging of library documents within the Projects Panel.

**element14**

au.element14.com

## IN-SYSTEM PROGRAMMING TECHNOLOGY

XJTAG XJFlash in-system programming technology provides users with fast programming when configuring memory attached to the processor subsystems of the FPGA SoCs.

This includes Xilinx Zynq and Altera Cyclone V SoCs, which feature dual ARM Cortex-A9 processors.

The product allows simple memory configuration at high speed through the JTAG port of the FPGA, without the need for any additional PCB connections.

It is able to access and configure memory devices connected to a wider range of FPGAs. This decreases the time taken to configure onboard memory during development, production and rework. Support for the ARM Cortex-A9 based SoCs extends to partial reconfiguration and optimised erase, delivering further productivity benefits. This enables memory devices to be partially erased and reconfigured without having to reprogram the entire device and also minimises the erase time when regions of a device are already blank.

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The four basic operating modes are CC, CV, CR and CP. Short-circuit test, battery discharge test and sequential test functions with 10  $\mu$ s as the smallest and 100,000 s as the largest step rate provide a large range of protocols. Rapid transient measurement of the DUT permits high/low level and rise and fall time measurement. Remote sensor connector sockets and trigger connector socket are included. OCP, OVP, overtemperature and polarity reversal protection are provided. The instruments are suitable for mounting in 19" racks.

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## How to solve an LED potting problem in 24 hours

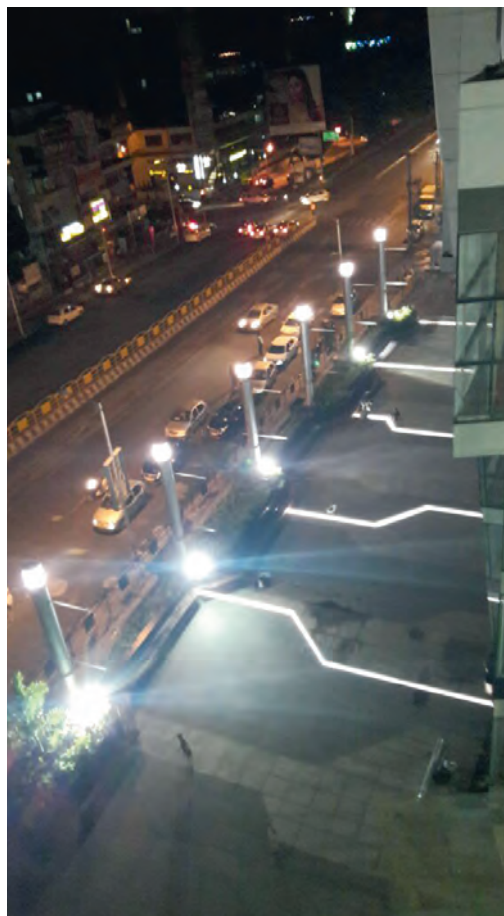
Electrolube's Indian subsidiary recently solved an LED lighting unit potting problem, following consultations with the company's UK-based technical division. The resin encapsulation was causing an unacceptable colour shift in the light from an LED strip luminaire, and the UK technical team had little more than 24 hours to come up with a solution.

It all started when Rockforest Technologies India was contracted to supply LED strip lighting units for luminaires destined for a shopping complex in Bangalore. The specification stipulated that Rockforest's LED lighting strips should provide a 'neutral white' (4000K) colour and that the LEDs in the luminaires be potted in order to protect them from adverse environmental conditions.

Electrolube India conducted some initial trials, potting the strip luminaires to a specified depth of 5.5 mm using Electrolube's UR5634 — a semirigid, optically clear polyurethane resin that is widely used for encapsulating LED lighting systems. With good protective and decorative properties, the UR5634 resin is also UV resistant, making it useful as an encapsulant for applications exposed to direct sunlight.

In this particular application, the resin caused a colour shift from the LED array from the specified 4000K (neutral white) to 'cool white' (6500K). Rockforest was under considerable pressure to solve this problem, as the 4000K colour was a non-negotiable specification; moreover, the customer requested that a new reference sample, which met the 4000K colour specification, be made available for retesting in just 24 hours.

Electrolube India General Manager Padmanabha Shaktivelu needed to act quickly to help Rockforest meet this tight deadline, so he approached Electrolube's technical support team in the UK for advice. The UK team suggested two different approaches



that Rockforest might consider in order to solve the problem. The first of these was a recommendation that they use an LED that provided a colour temperature below the specified colour temperature — in this case, one operating in the 2500–3000K range. By potting these with the UR5634 resin to the specified 5.5 mm depth, it potentially could bring the light back to the desired colour. The second option was that Rockforest assesses the amount and type of resin they were using for this project to see if a thinner layer of resin over the top of the LED array would reduce the colour shift effect.

Shaktivelu persuaded Rockforest to switch to UR5635, Electrolube's semirigid polyurethane resin, formulated with a hazy/cloudy appearance that is suitable for dispersing light. The diffused light produced by this resin meant that an additional diffuser medium was no longer necessary, allowing the customer to achieve the required aesthetic appearance and, through trials with various resin potting depths, the correct colour temperature. During these trials, the rapid gel time of UR5635 caused a complication, but Padmanabha solved this problem by suggesting a staged potting procedure.

"Time was not on our side when we made the discovery of the colour shift from these potted LED units," said Bipin Rajgopal, Rockforest Technologies India's managing director. "Our client needed a rapid solution, so we turned to Electrolube India, and Padmanabha Shaktivelu's help was instrumental in achieving the tight turnaround demanded.

"The switch to UR5635 proving especially successful as it avoided the need for an additional diffuser medium, thereby saving costs for our client."

**Electrolube**

[www.electrolube.com.au](http://www.electrolube.com.au)





While mobile working is now a given for many employees, a key challenge has been to deploy wireless networks that are robust enough to manage bandwidth-hungry applications with low tolerance for latency, such as unified communications (UC).

Employees expect that collaborating via UC should be as simple as launching an app on their smartphone or tablet. And with more and more applications being run on organisations' wireless infrastructure, including supporting BYOD initiatives, user mobility and UC, enterprises need to ensure that wireless performance issues won't significantly impact user productivity and cause potential revenue loss.

Surveys have shown that personnel say mobile device integration is a very important UC capability. Furthermore, Gartner says enterprises should consider adopting a mobile-first strategy where UC applications are designed first around the mobile user experience and then extended for PCs, rather than the other way around.

Wireless mobility comes with new IT headaches. Deploying reliable wireless networks requires networking best practices and ongoing network analysis, monitoring and management. If the wireless network has performance issues, then users will find it impossible to use UC solutions effectively, resulting in wasted time and money for the enterprise.

There are three key steps network engineers should take to effectively deploy and troubleshoot wireless networks:

### 1. Design specifically for mobile UC

Ensure cells have appropriate overlap without putting too many access points (APs) in place, which can cause poor roaming choices for users. Consider user density and other networked applications that may interfere with the UC application's performance.

### 2. Validate deployment based on true end-user experiences

Run active, passive, throughput and spectrum surveys to gain a full and comprehensive understanding of how the network is performing.

It's important to remember that signal strength is not a reliable indicator of network performance. Interference is one of the most forgotten but common causes of network performance issues — and it can come from anywhere, such as a microwave oven or Bluetooth device you're not even aware of. It's important to map sources of interference for best analysis. Throughput tests are critical since users will notice even minuscule latency issues in calls. For UC over wireless, you may need up to 45% cell overlap, compared with typical Wi-Fi applications that only require a maximum of 20% overlap.

### 3. Fast and accurate troubleshooting

Network engineers need to gain full visibility, which isn't possible using AP-level analysis, freemium apps, packet analysis or looking only at the network as opposed to other potential sources of interference. Full wireless troubleshooting means the engineer must behave like a user to gain an accurate understanding of user issues.

Network engineers need to take a more proactive, systematic approach to deploying and troubleshooting wireless networks, especially when they are to be used for mobile UC. Using a commercial testing and troubleshooting software suite such as NetScout's AirMagnet suite can simplify the process and lead to better outcomes and lower costs for organisations.

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ENHANCING THE

# WORLD'S MOST PRECISE CLOCK

The cryogenic sapphire oscillator (Sapphire Clock), said to be the world's most precise clock, allows users to take ultrahigh-precision measurements to improve the performance of electronic systems. Now, the clock has been enhanced by researchers from the University of Adelaide to achieve near attosecond capability.

Increased time precision is an integral part of radar technology and quantum computing, which have previously relied on the stability of quartz oscillators and atomic clocks. However, while atomic clocks are the gold standard in time-keeping for long-term stability, electronic systems need short-term stability over a second to control today's devices. The Sapphire Clock has a short-term stability of around  $1 \times 10^{-15}$  — equivalent to only losing or gaining one second every 40 million years — making it 100 times better than commercial atomic clocks.

The 100 x 40 x 40 cm clock has a 5 cm cylinder-shaped crystal that is cooled to  $-269^{\circ}\text{C}$ . Microwave radiation is constantly propagating around the crystal with a natural resonance. The clock uses small probes to pick up this faint resonance and amplifies it back to produce a pure frequency with near attosecond performance. It is this frequency that is used to maintain a steady oscillator signal.

"An atomic clock uses an electronic transition between two energy levels of an atom as a frequency standard," explained lead researcher Associate Professor Martin O'Connor.

"The atomic clock is what is commonly used in GPS satellites and in other quantum computing and astronomy applications, but our clock is set to disrupt these current applications."

The development group is currently in the process of modifying the device to meet the needs of industries including defence, quantum computing and radioastronomy. Associate Professor O'Connor noted, "We can now tailor the oscillator to the application of our customers by reducing its size, weight and power consumption, but it is still beyond current electronic systems."

The lab-based version already has an existing customer in the Defence Science and Technology Group (DST Group) in Adelaide, but Associate Professor O'Connor said the research group is looking for more clients and is in discussion with a number of different industry groups.

"Our technology is so far ahead of the game, it is now the time to transfer it into a commercial product," he said. The research group is currently taking part in CSIRO's On Prime pre-accelerator program, which helps teams identify customer segments and build business plans. Commercial versions of the Sapphire Clock will be made available in 2017.

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Sapphire crystal on display at the University of Adelaide



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**Head Office**  
Cnr Fox Valley Road & Kiogle Street,  
(Locked Bag 1289)  
Wahroonga NSW 2076 Australia  
Ph: +61 2 9487 2700 Fax: +61 2 9489 1265

**Editor**  
Lauren Davis  
[wnie@wfmedia.com.au](mailto:wnie@wfmedia.com.au)

**Editorial Assistant**  
Amy Steed

**Publishing Director/MD** Geoff Hird

**Art Director/Production Manager**  
Julie Wright

**Art/Production**  
Tanya Barac, Odette Boulton, Colleen Sam

**Circulation Manager** Sue Lavery  
[circulation@wfmedia.com.au](mailto:circulation@wfmedia.com.au)

**Copy Control** Mitchie Mullins  
[copy@wfmedia.com.au](mailto:copy@wfmedia.com.au)

**Advertising Sales**

**Industrial Group Sales Manager**  
Nicola Fender-Fox – 0414 703 780  
[nfender-fox@wfmedia.com.au](mailto:nfender-fox@wfmedia.com.au)

**Account Manager**  
Courtney Van Den Berg – 0424 417 329  
[cvandenberg@wfmedia.com.au](mailto:cvandenberg@wfmedia.com.au)

**Account Manager**  
Sandra Romanin – 0414 558 464  
[sromanin@wfmedia.com.au](mailto:sromanin@wfmedia.com.au)

**Asia**  
Tim Thompson - 0421 623 985  
[tthompson@wfmedia.com.au](mailto:tthompson@wfmedia.com.au)



Contact the editor

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to industry and business professionals



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