

# what's **new** in **e**lectronics



**Intel's 6th Generation Core™  
Processors Delivers Significant  
Performance Boost**

**BS** TECHNOLOGY  
BACKPLANE SYSTEMS

**IMMEDIATE SHIPMENT FROM THE WORLD'S LARGEST  
SELECTION OF ELECTRONIC COMPONENTS™**

**1,300,000+  
PRODUCTS IN STOCK**

**4.8 MILLION  
PARTS ONLINE**

**OVER 650  
INDUSTRY-LEADING  
SUPPLIERS**

**100% AUTHORIZED  
DISTRIBUTOR**



\*All orders are shipped via UPS for delivery within 3-4 days (dependent on final destination). No handling fees. **Australia:** Free shipping on orders over \$200 AUD. All prices are in Australian dollar.  
**New Zealand:** Free shipping on orders over NZ\$125. All prices are in New Zealand dollar. If excessive weight or unique circumstances require deviation from this charge, customers will be contacted prior to shipping order. Digi-Key is an authorized distributor for all supplier partners. New product added daily. © 2016 Digi-Key Electronics, 701 Brooks Ave. South, Thief River Falls, MN 56701, USA

Source: AspenCore 2015 Design Engineering and Supplier Interface Study

Source: AspenCore 2015 Design Engineering and Supplier Interface Study

**DISTRIBUTOR B****DISTRIBUTOR C**

DISTRIBUTOR D

**DISTRIBUTOR E****DISTRIBUTOR F**

## NEW ZEALAND

**DIGIKEY.CO.NZ**  
**800 449 837**







Neosys Technology has created the next-generation fanless embedded controller, Nuvo-5000, with ruggedness, performance and versatility. It supports Intel's 6th-Gen Core™ processors from Pentium® to Core™ i7 and remains -25°C to 70°C true wide operating temperature at 100% CPU load.

Intel's 6th-Gen Core™ platform delivers a significant performance boost. Compared to 3rd-Gen IvyBridge, the new Skylake platform offers 40% increase in terms of performance per watt.

Nuvo-5000 provides plenty of embedded I/O functions for general applications, including Gigabit Ethernet, USB3/USB2, COM and VGA/DVI/DP triple display outputs.

Neosys' Patented Expansion Cassette is an innovative way for accommodating add-on cards. The modularized design allows user-friendly installation/replacement, plus the passive cooling option for add-on cards provides more reliable operation. Commercial Off The Shelf (COTS) PCI/PCIe cards can be used to expand the versatility of Nuvo-5000 Embedded PC.

By installing an optional Neosys MezIO™ module, the Nuvo-5000 can deliver more application-oriented functions for diversified vertical markets. It offers computer signals, power rails and control signals via a high-speed connector.

Neosys provides a range of MezIO™ modules, including RS-232/422/485, isolated DIO, LVDS output, CAN bus, ignition power control and DTIO. MezIO™ presents a cost-effective way to build a tailor-made embedded system for a wide range of industrial applications.

Backplane Systems Technology Pty Ltd  
[www.backplane.com.au](http://www.backplane.com.au)

# CONTENTS

- 06 Big data and the Internet of Things – How the mobile communications industry is meeting the challenge
- 14 Connector miniaturisation
- 22 The Internet of Cars within the Internet of Everything
- 34 Wearables manufacturers are feeling the pressure
- 41 The rise of test management software
- 50 CNT slicing device to revolutionise electronics



## NOW in DIGITAL!

Your copy of *Whats New in Electronics* is available as an online eMag.  
[www.electronicsonline.net.au/magazine](http://www.electronicsonline.net.au/magazine)





life.augmented



## STM32F7

# High-performance MCUs now available with up to 2MB Flash and 512KB RAM

- 216MHz/462DMIPS/1082 EEMBC® CoreMark® Cortex-M7 core with double-precision floating-point unit and DSP instructions
- 2MB of dual-bank Flash, ST's Chrom-ART Accelerator™ for powerful graphics performance, a hardware JPEG accelerator, TFT-LCD controller, and MIPI®-DSI host controller
- Powerful audio features including an I2S interface, Serial Audio Interface (SAI), audio PLLs, and DFSDM (Digital Filter for Sigma-Delta Modulators)
- 512KB of integrated RAM, as well as large 16KB Data and Instruction caches
- On-chip Flash allows read-while-write for seamless application performance and continuous operation

### STMicroelectronics

Suite 703, 247 Coward Street, Mascot,  
2020, NSW Australia  
Tel: +61 2 8338 1172  
Email: [clifford.shi@st.com](mailto:clifford.shi@st.com)

### Authorized Distributors

ARROW Electronics Australia Pty Ltd - Tel: +61 2 9737 4900  
Future Electronics - Tel: +61 2 8084 0000

[www.st.com/stm32f7](http://www.st.com/stm32f7)

# BIG DATA AND THE INTERNET OF THINGS

HOW THE MOBILE  
COMMUNICATIONS INDUSTRY IS  
MEETING THE CHALLENGE

*Meik Kottkamp*





Projects of the future such as the Internet of Things, enhanced mobile broadband and self-driving cars require extreme mobile network performance. 5G, the next generation of mobile communications, is expected to deliver the necessary performance. But thanks to continual technological enhancements, LTE/LTE-Advanced networks provide an excellent evolution path. Here is an overview.

If we take the 1990 specifications freeze for the 900 MHz GSM standard as zero hour, digital wireless communications has just celebrated its 25th birthday.

There is, however, no sign of slowing down — far from it in fact. The hunger for data in cellular communications remains insatiable and the demand for further technological progress persists.

A tenfold increase in mobile data traffic is expected over the next six years, and experts predict an exponential increase in the number of things (Internet of Things, IoT) that communicate with each other via mobile networks. The Ericsson Mobility Report reports 87 million new mobile subscribers in the third quarter of 2015 alone (with 13 million in India, 24 million in Africa and 7 million in China). Mobile subscriptions are forecast to reach 9.1 billion by late 2021.

In 2015, the average smartphone user consumed 1.4 gigabyte of data monthly. This is expected to rise to 8.5 gigabyte by 2021. The combination of these two factors will result in exponential data traffic growth around the world.

This article describes how immense data volumes are being transmitted today and how mobile network operators are ensuring that they can offer their subscribers an excellent quality of experience in the future.

### 2G/3G/4G technologies and future improvements

Looking at the different 2G (GSM, GPRS, EDGE), 3G (UMTS, HSPA, HSPA+) and 4G (LTE/LTE-Advanced [LTE-A]) mobile technologies, it becomes clear that the introduction of new transmission methods on

the air interface between base stations and wireless devices as well as the optimisation of the mobile network architecture have resulted in significant improvements. The theoretically achievable data rate per device has evolved from a few 100 kbit/s (EDGE) to 42 Mbit/s (HSPA+) to several hundred Mbit/s (LTE/LTE-A). State-of-the-art, commercially available LTE-A devices achieve 600 Mbit/s in ideal lab environments. In a real network, propagation conditions and the shared channel principle reduce achievable download speeds due to the fact that available bandwidth is divided among all active subscribers. Nonetheless, LTE/LTE-A technology has significantly enhanced available data rates and network capacity. The following innovations have been essential to this achievement:

- A wide system bandwidth of 20 MHz that can be provided to an individual subscriber as well as the ability to bundle up to five of these 20 MHz carrier frequencies for each subscriber (commonly known as carrier aggregation, CA). CA is the most significant improvement within LTE-Advanced in 3GPP Release 10.
- Use of spatial multiplexing (MIMO technology), ie, using anywhere from two to eight/four transmit/receive antennas.
- Fast OFDMA multiplexing, ie, the frequency and time resource allocation can be changed on a millisecond basis. The smallest resource that can be allocated to a wireless device is a resource block (RB) with a frequency of 180 kHz and a time duration of 0.5 ms.
- High-quality modulation methods, specifically QPSK, 16QAM, 64QAM and 256QAM. A lean network architecture and pure



packet-switched data transmission enable short network response times. LTE smartphones load internet pages much faster than with older technologies.

### LTE improvements

Introducing LTE/LTE-A has allowed network operators to meet increasing demands. The success of this technology can also be seen in the fact that 442 commercial networks have been implemented in 147 countries around the world since the first commercial LTE network was launched in late 2009. (Source: Global Mobile Suppliers Association [GSA], October 2015.) The following section explores several key LTE improvements resulting from enhancements introduced by the 3GPP standardisation body (as of Release 10, LTE is also referred to as LTE-Advanced or LTE-A).

LTE features a specific enhanced multimedia broadcast/multicast service (eMBMS) that makes it possible to allocate the same resources (frequency and time) to multiple subscribers within a cell. This is a highly efficient method of addressing mobile TV applications; for example, where many subscribers receive the same data simultaneously. This mode also allows wireless devices to install new software efficiently — a task that generally still takes place via individual data connections for each device.

Since WLAN is implemented in almost all wireless devices, WLAN connections are available in private homes and in many public locations. Many mobile network operators set up hotspots in exposed areas such as airports to provide an alternative means of accessing the internet. The user of the wireless device can simply turn the WLAN function off and on to gain access. Some wireless devices also feature a dedicated application that automatically switches the device's data connection to WLAN as soon as it detects a hotspot with sufficient performance.

In such cases, all data traffic is routed either via the mobile network or WLAN. In the 3GPP specifications, a special mode is available to use; for example, an email application running in the background via WLAN while transmitting video data via LTE. However, this has not (yet) been adopted in commercial networks. Generally, network operators gain considerably more flexibility when using WLAN and LTE and can provide their subscribers with higher data rates and more capacity.

As an alternative, operating LTE/LTE-A in unlicensed frequency bands has been enabled from a specification perspective (licensed-assisted access, LAA) and included in the 3GPP Release 13 in March 2016. Instead of



Images supplied by Rohde & Schwarz



THE INTRODUCTION OF NEW TRANSMISSION METHODS ON THE AIR INTERFACE BETWEEN BASE STATIONS AND WIRELESS DEVICES AS WELL AS THE OPTIMISATION OF THE MOBILE NETWORK ARCHITECTURE HAVE RESULTED IN SIGNIFICANT IMPROVEMENTS.

switching from LTE to WLAN, LTE is used, for example, in the unlicensed 2.4 GHz ISM band and the data rate capability is increased using the carrier aggregation feature. A listen-before-talk function is added to LTE to avoid conflicts and ensure that access to bands is granted only when sufficient capacity is available. Therefore, 3GPP provides complementary solutions using WLAN and LTE technology. Commercial deployments will decide whether and which of these solutions will be adopted.

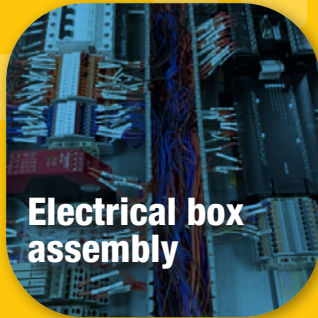
LTE networks use the same frequency in every cell, which leads to intercell interference at cell boundaries. A wireless device with an active connection to a base station receives the signals of the neighbouring cell's base station, which is sending signals to its connected devices. This causes interference and lowers achievable data rates, an effect that especially impacts heterogeneous network environments, ie, network topologies in which multiple small (femto or pico) cells are operated within a large (macro) cell.

Pedestrian zones are a good example. Small, high-capacity hotspots cover high-traffic areas, yet they may also be within the receive range of a higher-level cell that covers parts of the city. Coordinated multipoint transmission and reception (CoMP) was introduced to counteract this effect. CoMP makes it possible to transmit a signal to a wireless device at

the cell boundary in a coordinated manner. There are various ways of implementing this coordination. In the simplest case, it is merely decided which of the potentially available base stations is to be used for transmission. Other options include allocating resource blocks for wireless devices or directing the antenna beams of the base stations involved to minimise interference. Using MIMO technology and also influencing the baseband signal (precoding) in a coordinated manner allows optimal coverage at cell boundaries. An additional technology component named dual connectivity has been specified in 3GPP Release 12 to offer further improvement for heterogeneous networks. The wireless device is configured for connection to two base stations on two different carrier frequencies. The master base station (eNodeB in LTE) supplies the higher-level macro cell, and the slave eNodeB supplies the hotspot, ie, a pico or femto cell. In this configuration, the master eNodeB uses parameters such as cell traffic and device speed to decide to use the macro cell or the hotspot for the data connection.

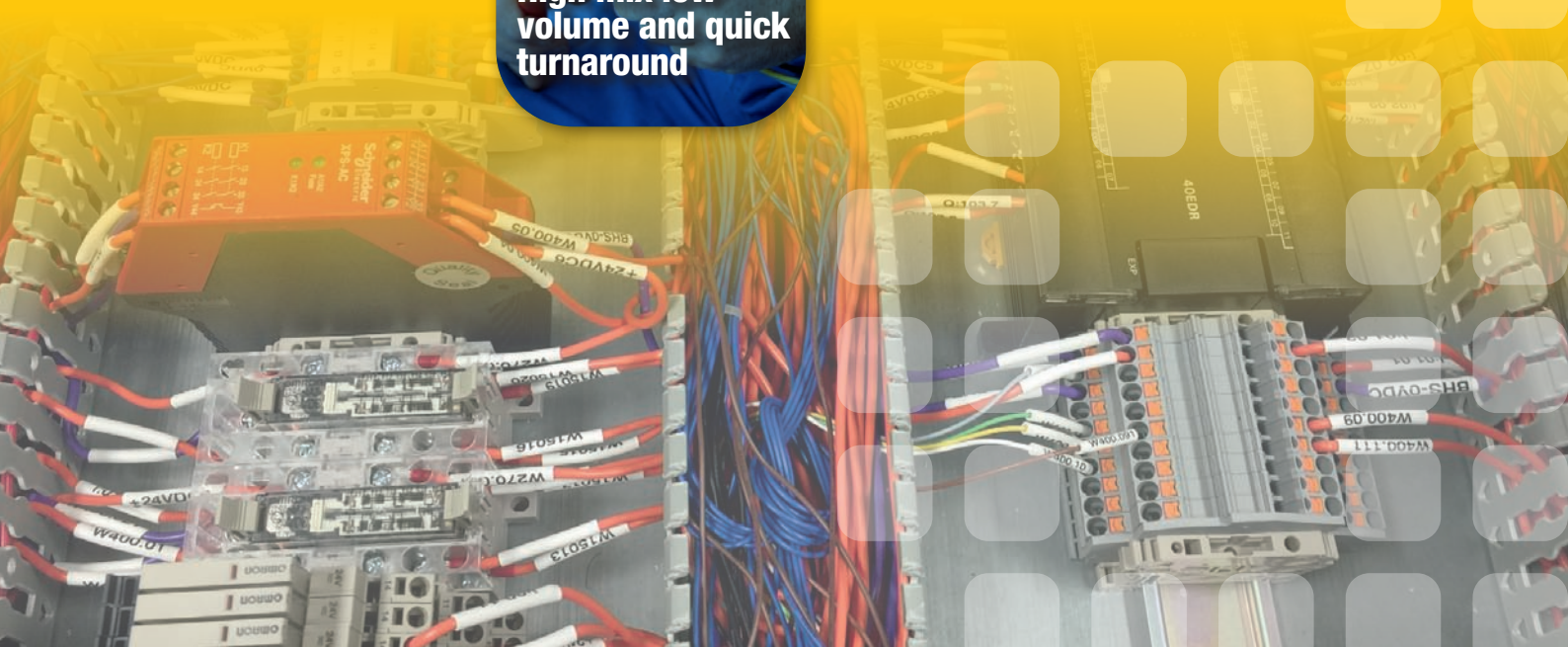
Switching between the two is extremely fast and requires no additional signalling. This saves signalling capacity and minimises handover errors. In wireless devices, interference at cell boundaries can be countered by employing improved receivers that recognise these specific types of interference

# Cable Assembly & Box Build Assembly



**Metal Work**  
**Label and Wire Marker**  
**CNC Engraving and Machining**  
**Functional Test and Logistic Service**

**@Ampec** we specialise in manufacturing of custom design cable assemblies as well as turnkey electronic and electric product assemblies.



**+61 2 8741 5000**  
**e** [sales@ampec.com.au](mailto:sales@ampec.com.au)  
**w** [www.ampec.com.au](http://www.ampec.com.au)





**EVEN THOUGH LTE/LTE-A NETWORKS ARE INCREASING IN PERFORMANCE, COMPREHENSIVE 4G COVERAGE WILL TAKE TIME. EFFICIENT HANDOVER TO 2G AND 3G TECHNOLOGIES REMAINS CRITICAL.**

and use appropriate algorithms to remove them from the received signal. Additional information about potential interference can also be provided by the network to improve such calculations. In the LTE standard, these technology components are called further enhanced intercell interference coordination (FeICIC, included in 3GPP Release 11) and network assisted interference cancellation and suppression (NAICS, included in 3GPP Release 12).

### D2D capabilities

The introduction of device-to-device (D2D) capabilities is of special importance, as these provide two fundamental new functions. First, the network-supported discovery function makes it possible for two spatially neighbouring wireless devices to detect each other.

Second, these devices and others in their vicinity will be able to exchange data directly, ie, without going through the base station covering the area. However, at least for the in-coverage case, ie, if at least one device is located within cellular coverage, the whole process is authenticated and configured by the network. The introduction of this completely new functionality was primarily motivated by public safety considerations. Fire service and police applications need to exchange large amounts of data (images, videos) within small groups of individuals, some of whom may be located outside network coverage areas, eg, in the basement of a burning building. Exchanging data between wireless devices connected in this manner will initially be limited to public safety and security applications.

Initially, use by the general public will be confined to application-related broadcast services. Other commercial usage models are conceivable and are also under discussion as part of the 5G development process. In particular, automotive use cases are applicable, ie, potentially supporting autonomous driving.

Even though LTE/LTE-A networks are increasing in performance, comprehensive 4G coverage will take time. Efficient handover to 2G and 3G technologies remains critical. There are also many use cases where low data rates are sufficient. Here, the focus is on cost-efficient solutions with long battery life. In such machine-to-machine (M2M) environments, modules with, for example, GPRS technology designed to last years are often used. However, LTE/LTE-A has already ushered in several improvements to serve M2M applications. For example, there is a category 0 for LTE user equipment that reduces the effort required to implement this class of devices (lower data rate requirements and no MIMO support). Processes have also been introduced to prevent mobile network overloading when large numbers of M2M devices attempt to access the network at the same time. Other enhancements, such as a reduced bandwidth (200 kHz) and even a reduction of the subcarrier offset from 15 kHz to 3.75 kHz, are currently discussed in 3GPP standardisation (Release 13).

In summary, for the time being LTE/LTE-A technology covers the increasing requirements of mobile data traffic as well as M2M/IoT. Enhanced mobile broadband and IoT are also major aspects of the comprehensive discussion taking place on the next generation (5G).

What is motivating the industry to introduce a new generation of mobile communications as early as 2020? (Or even 2018 on a regional basis.) First, due to the constantly increasing number of subscribers and data rates, even LTE/LTE-Advanced with all of their enhancements will not be able to cover the demand in the long term. Second, the definition of a new industry-wide use case class to significantly improve mobile network latency. These use cases will at least partly require extremely secure and reliable connections. It will then be possible to use cellular communications in the automotive industry (eg, supporting autonomous driving) and in Industry 4.0 applications, opening up new sources of revenue. Latency requirements in the 1 ms range are impossible to implement with LTE/LTE-A. In addition to technology-based arguments, the previous development cycle indicates that the next technological step will take place in 2020. GSM was introduced in 1990, UMTS in 2000 and LTE in 2010. It should be mentioned that the 2020 Olympic Games will be hosted by Japan — a country that is heavily involved in the development of 5G (naturally not only for this reason).

Research institutes and development departments in major wireless communications companies are already conducting extensive studies in the field of 5G technology. These efforts are primarily dedicated to four technology blocks, which are being discussed as the solution for future requirements. Initial research efforts will identify which additional frequency bands can be made available by substantially increasing the bandwidth. This research covers the spectrum up to 100 GHz



# Maintaining control has never been easier.



If decentralised drive intelligence is called for, maxon motor control provides the answer: all speed and positioning controllers are designed to match with brushed and brushless DC motors up to 700 watts power. The EPOS2 positioning controller enables you to connect quickly through the network and, using the Interpolated Position Mode, to synchronously run a preset path specified by interpolating points in real time.

maxon motor is the world's leading supplier of high-precision drives and systems.

[www.maxonmotor.com.au](http://www.maxonmotor.com.au) Tel +61 2 9457 7477

customer specific solutions | high quality | innovation | competitive prices | worldwide distribution network

**maxon motor**  
driven by precision

with bandwidths up to 2 GHz. Here, the significantly changed channel propagation conditions play a key role. Researchers must analyse these conditions before they can develop and evaluate appropriate channel models to assess new technologies. The use of large numbers of transmit and receive antenna elements (order of magnitude: 100) is also under evaluation. They can be used to increase data rates in the frequency spectrum below 6 GHz through advanced MIMO techniques. In the high frequency range, they are necessary to provide the antenna gain required to achieve appropriate cell sizes. New air interface technologies are being discussed in connection with significantly higher frequencies and as a way to enable extremely short reaction times. Some of these interfaces have additional filter functions based on the OFDM technology implemented in LTE.

Examples include universal filtered multicarrier (UFMC), filter bank multicarrier (FBMC), generalised frequency division multiplexing (GFDM) and filtered (sometimes called flexible) OFDM (f-OFDM).

A more efficient network topology is also being looked into, a topology that is already starting to be used today. The fundamental idea is to design software functions that are specific to mobile communications and to implement them on open hardware platforms.



This would make it possible to more affordably implement enhanced packet core (EPC) node functions in mobile core networks as well as baseband functions of base stations. It would also enable operators to move these functions to alternative platforms in the case of a hardware failure. Ultimately, the processes will be similar to those already in place in data centres today. Network function virtualisation

(NFV) and software defined networking (SDN) as well as network slicing are helping drive the flexible implementation of these functions in mobile networks. It should be noted that security aspects are extensively discussed in this context.

### Summary

The high performance of LTE /LTE-A technology, its seamless cooperation with existing 2G/3G networks and the complementary use of WLAN enable network operators to meet their subscribers' continuously growing big data requirements. Broadcast/multicast solutions enhance system flexibility. M2M applications are already playing a major role. The increasing number of things that will be communicating with each other in the future (IoT) and new demands stemming from vertical branches of industry (automotive industry, health care, robot control, etc) are expected to dictate a need for further significant enhancements. That is why researchers in the mobile communications industry are already discussing 5G as they look towards 2020 and beyond.

Rohde & Schwarz and its subsidiaries SwissQual and ipoque offer a comprehensive portfolio for today's T&M tasks and are actively involved in 5G research and development.

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

**new**  
PRODUCTS

### MIXED DOMAIN OSCILLOSCOPES FOR RF AND WIRELESS APPLICATIONS

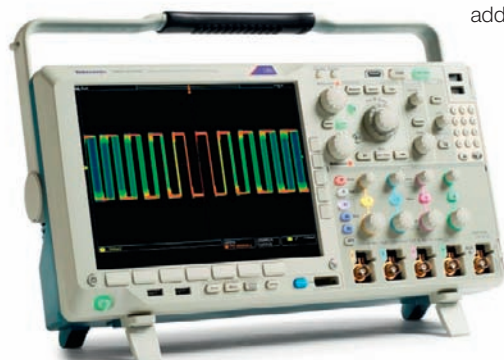
The Tektronix MDO4000C series of mixed domain oscilloscopes will appeal to embedded engineers for applications in the Internet of Things (IoT), RF and wireless.

The oscilloscope can be configured with up to six instruments in a single unit, including a full spectrum analyser. As with previous generations in the MDO4000 series, the product provides a synchronised view of analog and digital waveforms along with RF spectrum traces, making it a suitable debug tool for IoT and other embedded engineering applications.

Engineers can upgrade their instruments over time to meet their most demanding challenges and add functionality as needs change. The core oscilloscope functionality can be expanded with options to add a spectrum analyser, arbitrary/function generator, logic analyser and protocol analyser.

The device features 20 Mpoint record length, fast sample rate and >340,000 waveform capture rate to help uncover elusive problems. With a 50% larger display and up to 6 GHz spectrum analyser with good spectrum analyser performance, the unit has the ability to synchronise views across time and frequency domains, as well as to perform vector signal analysis.

Logic analyser timing resolution is down to 60.6 ps and independent logic thresholds per channel enable capture of multiple logic families at once. The product provides protocol analysis for up to three buses simultaneously with triggering up to 500 Mbps.



**element14**  
au.element14.com





See why Long Term Rental is the smart choice for your business



# Detect Network Problems up to 30% Faster

Rent the Viavi (formerly JDSU) HST-3000 ADSL2+/VDSL2 Network Tester from TechRentals

## Features:

- ✓ Single and bonded pair ADSL2+/VDSL2 testing
- ✓ Fault locator and Pulse Echo Tester (PET)
- ✓ Load coil detection
- ✓ Digital Volt Meter (DVM)
- ✓ Web browser and advanced IP suite
- ✓ Portable design ideal for use in the field



## SUCCESS!

The Viavi HST-3000 in action recently for an FTTN install in Cannington. The first of its kind for Western Australia!

With over 40 years' experience, you can rest assured TechRentals can deliver for all of your test & measurement needs, no matter how big or small.

For more information, contact us today:

1800 632 652    [rent@techrentals.com.au](mailto:rent@techrentals.com.au)    [www.techrentals.com.au](http://www.techrentals.com.au)







# CONNECTOR MINIATURISATION

Connectors continue to shrink in size but how much smaller can they really get?

*Bob Stanton\*, Omnetics Connector Corporation*

The connectors in our phones, laptops and TVs all seem to be getting smaller and denser. Even the military is demanding smaller and lighter connectors for their portable electronics. Bob Stanton from Omnetics discusses the factors that will enable further connector miniaturisation, as well as what limitations there might be.

It's important to remember that different applications have different performance and reliability requirements. The low-cost products designed for home use are dramatically different from those designed for aircraft and deep space applications.

Technological advances have led to rapid development of application-specific connectors and size reduction. As circuit chip technology evolves, the chip performance and capability is improving. The evolving circuit chips demand much lower voltages and current flow but also run significantly faster, store and process substantially more data, and provide long battery life.

New software solutions facilitate easy modelling of smaller connectors, and CNC machines offer the ability to manufacture or cut out new shell sizes and shapes within minutes. These developments allow designers, who are bent on using every last millimetre of space on their interconnection systems, to create prototypes faster at a reasonable cost. Often, designers pick a standard connector off the web to begin their circuit testing but eventually require a quick-design variation of that standard. Now many connector manufacturers offer online design consultation and/or two-day turnaround on new connector formats. Connector size requirements, however, are often based on a few key application factors and performance constraints.

### Electrical current load

Each connector contact must offer a low resistance interface with its mate and carry enough electrical current to satisfy the circuit it is serving. Fortunately, current flow rate is reducing, which allows interconnecting elements to get smaller as long as they stay within a safe range for good performance, with some variations for power and signal surges. Often, the current limits are going to be set by the diameter of the wire in the cable because wire length times resistance will set the performance and thermal capabilities of the interconnection system.

### Signal integrity

Even as connectors and circuit modules squeeze into tighter spaces, circuits must still function independent of adjacent circuits. Designs must include protection against signal cross-talk and oftentimes protect from electromagnetic emissions and/or reception of other signal noise in and about the system. Some modern shielding tricks and/or filtering often allow for additional size reduction.

### Environmental conditions

Ruggedised connector designs are often controlled by specifications that ensure continuous signal flow during high shock and vibration and/or performance during extreme heat and cold cycles. In some portable applications, connectors are subject to immersion, water spray and, in extreme cases, salt spray. Ingress protection ratings (IP standards) are specified to meet international standards in moisture conditions. Elastomeric seal rings are often built into the connectors to ensure moisture does not penetrate the connector and enter into the circuitry. Smaller seals will be needed as the connectors continue to miniaturise.

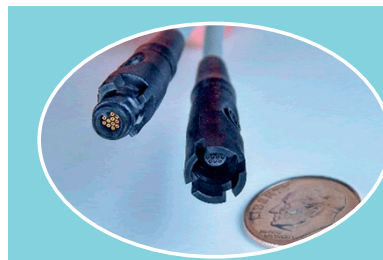
### Circuit mobility

Fitting interconnects into robotic hands, squeezing them into probe tips, adding cable to small weather satellites and mounting cameras on soldier helmets are examples of the drive to squeeze more and more into portable electronics.

Standard designs are reviewed for potential fit and function, then tailored using solid model designs to meet both size and reliability requirements. Pin-and-socket sizes are reduced to minimum sizes that meet the above criteria and still squeeze into the space allowed. Flat leads are used and can be reduced even further when some of the performance and rugged reliability requirements are reduced. The trend of combining two or three connectors into one has now taken centre stage. Power, RF and digital signals are all run through one connector with isolation techniques to avoid crosstalk and EMI concerns.

### The market

Miniature connectors provide great performance, carrying charging power and signal routing in one element. This method of using a single flat-strip or lead-frame interconnection has led the way for higher-speed digital signal processing. Careful use of shape and spacing offers another level of high-density interconnection. Use of unique low-dielectric-strength insulator materials also allows size reduction as circuit speed increases and size decreases. Price and ruggedness continue to play key roles in how small we can design our connectors. Board-to-board connectors that use pins or press connections consume very little space and cause only minute aberrations in signal transfer.



*Breakaway ruggedised waterproof nano-circular connector.*

Larger connectors like the circular 38999 are now being replaced by smaller and lighter micro-circular connectors that use 0.050" pitch. We are now seeing nano-circular connectors at 0.025" pitch handling multiple high-speed signals well.

Companies like Neoconix are finding new ways to reduce connector profile height, size and weight for highly mobile instruments. As routing limitations on the printed circuit boards are overcome, these high-density arrays will route flat flex-like cable into and out of highly stacked sets of boards to further reduce electronics' size and weight. The key for us all is to know our application needs and the limits of how tiny we can go to still ensure signal integrity in our electronics.

*\*Bob Stanton is director of technology for Omnetics Connector Corporation.*

*For more information, please contact Robin Pearce, Bishop & Associates, via email at [rpearce@bishopinc.com](mailto:rpearce@bishopinc.com).*

*Bishop & Associates  
[www.connectorindustry.com](http://www.connectorindustry.com)*



### IoT GATEWAY STARTER KIT

Advantech has announced its IoT Gateway Starter Kit. Designed to jumpstart IoT innovations with open gateway technologies, the package includes a ready-to-run system, IoT software platform service, software development kit and technical support service. Advantech's hardware is verified to work with the Microsoft Azure cloud platform.

The starter kit gives the flexibility to create and deploy secure IoT solutions for a wide array of industrial applications. It provides powerful turnkey building blocks to connect various existing things including machines, devices and sensors and unifies different protocols as IoT standard MQTT, empowering IoT application development for data streaming, analytics and prediction solutions.

The kit provides a preconfigured system featuring an Intel Celeron J1900 SoC and WES7E with 4 GB memory and 500 GB HDD. There are two gateways selected for the starter kit which have been verified through the Microsoft Azure Certified for IoT program: the ultrasmall ARK-1123H and the multiple I/O ARK-2121L. They are both designed to withstand harsh environments, with good scalability for networking and versatile I/O communication.

Besides the ready-to-run gateway system, a software solution is also included in the package. This includes WISE-PaaS/RMM Pro version IoT device remote monitoring and management software for data management, device monitoring/control and security (Intel Security McAfee). It is ready on Microsoft Azure Marketplace to enable big data analytic services.

**Advantech Australia Pty Ltd**

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



### 3D MAGNETIC SENSOR

The 3D magnetic sensor TLV493D-A1B6 offers three-dimensional sensing with low power consumption in a small 6-pin package. With magnetic field detection in the x, y and z directions, the sensor measures three-dimensional, linear and rotation movements.

Applications include joysticks, control elements, multifunction knobs, anti-tampering for e-meters and any other application that requires 3D measurements in combination with low power consumption.

**Infineon Technologies Australia Pty Ltd**

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



### LONG-RANGE TRANSCEIVER MODULE

The RFM96(W) transceiver features the LoRa long-range modem that provides ultralong-range spread spectrum communication and high-interference immunity while minimising current consumption. Using Hope RF's LoRa modulation technique, the product can achieve sensitivity of over -148 dBm.

The high sensitivity, combined with the integrated 20 dBm power amplifier, makes the device suitable for any application requiring range or robustness. LoRa also provides advantages in both blocking and selectivity over conventional modulation techniques, solving the traditional design compromise between range, interference immunity and energy consumption.

The product delivers good phase noise, selectivity, receiver linearity and IIP3 for lower current consumption than competing devices, according to the company. It can be used for applications including automated meter reading; home and building automation; wireless alarm and security systems; industrial monitoring and control; and long-range irrigation systems.

**AMATEK DESIGN**

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







---

# SMART DEVICES REQUIRE SMARTER AUTOMATED TEST SYSTEMS

---

The old approach to automated test isn't scaling, but you already knew that. Look at your balance sheet. To test smart devices, you need a smarter test system built on a platform of NI PXI, LabVIEW, and TestStand. More than 35,000 companies deploy NI technology to lower their cost of test—what are you waiting for?

---

Prepare for the future at [ni.com/smarter-test](http://ni.com/smarter-test)

---



NI PXI, LabVIEW, and TestStand

#### NI ASEAN and NI ANZ

**Singapore** (65) 6226 5886

**Philippines** (632) 659 1722

**Other ASEAN Countries** (65) 6226 5886

[asean@ni.com](mailto:asean@ni.com)

**Malaysia** (603) 7948 2000

**Vietnam** (84) 8 3911 3150

**Australia** 1800 300 800

[info.australia@ni.com](mailto:info.australia@ni.com)

**Thailand** (662) 298 4800

**Indonesia** (62) 21 2924 1911

**New Zealand** 0800 553 322

[info.newzealand@ni.com](mailto:info.newzealand@ni.com)

## PCB TESTER

The BoardMaster, from ABI Electronics, is a tester that gathers together 25+ measurement tools for multiple applications. Some of the tests can be carried out even without any power being applied to the DUT or PCB. Not only can the system run DEF Standard compliant in circuit dynamic functional tests, it can also identify unknown devices that can be tested later.

The user interface, the SYSTEM 8 Ultimate software, is an integral part of the system and requires a standard Windows PC to run. It brings together functionalities such as hardware self-test, user management, instrument customisations, test report generation and more.

The product comes with six modules pre-installed; however, different mixes and configurations are available. Each module brings different applications developed for a wide range of tests that will help operators deal with hard-to-find faults without the frustration. The instrument will also show voltage readings for every pin; indicate wiring configuration such as links, shorts to VCC, etc; and give V-I plus thermal analysis results in one go.

The software gives access to a built-in library with tens of thousands of components. Through a test clip or device adapter, the system can run multiple tests in a few seconds. The final analysis result is achieved following the nearly instantaneous completion of 14 checks. The user will quickly receive a definitive PASS or FAIL for the component that they are testing.

**Embedded Logic Solutions Pty Ltd**

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



## PUSH-PULL CONNECTORS

Switchcraft has introduced the HS Series Dura-Pull Push Pull Connectors. The harsh environment circular connectors are waterproof to IP68 and are durable even in the most critical applications, including medical devices, audio connections, outdoor data acquisition devices and safety and security.

The specialised latch allows for easy blind mating and locks automatically, preventing accidental disconnect. It is easily released by simply pulling on the locking collar.

The ½" connector features 360° EMI shielding and a nickel-plated brass housing with a medical-grade plastic insulator. It is available with up to five #20 or nine #26 gold-plated contacts, which can be soldered or crimped. The front mount panel connector is flush mounted and three cable clamp sizes accommodate a wide range of cable diameters up to 5.5 mm. Optional IP68 sealed caps are available.

**Clarke & Severn Electronics**

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

## RF CABLES, CONNECTORS AND ASSEMBLIES BROCHURE

Times Microwave Systems has updated its High Power RF Cables, Connectors & Assemblies brochure covering 50Ω flexible cables for use in demanding high-power applications such as high-power radar and lasers, pulse power, medical equipment (MRI), semiconductors, flat panel and solar panel manufacturing, and particle physics.

The product range includes MIL-C-17 cables and Times-designed high-power cables such as SFT, HP, FBT, LMR-LLPL and LMR-FR cables. The recently added HPL cable series, featuring a TPV-TPE jacket, has good flexibility and is suitable for applications up to 125°C.

The brochure includes a comprehensive connector list for the most popular high-power cables. Cables are available for use at continuous operating temperatures up to 200°C and custom high-power coaxial cable assemblies are also available.

**Rojone Pty Ltd**

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





## RASPBERRY PI 3 COMPUTER

element14 has announced the launch of the Raspberry Pi 3 Model B. The board is faster and more powerful than its predecessors and comes with built-in wireless and Bluetooth connectivity.

The product is built on a QUAD Core Broadcom BCM2837 64-bit ARMv8 processor (running an ARMv7 operating system) at 1.20 GHz, a significant increase from 900 MHz on the Raspberry Pi 2. It has improved power management and an upgraded switched power source up to 2.5 A to support more powerful external USB devices.

With support for Bluetooth Low Energy and Wireless LAN, the board can support exciting application areas 'out of the box', such as IoT connectivity, streaming to Bluetooth headphones or speakers, Wi-Fi gateways and home cloud storage.

To further extend the company's extensive ecosystem and enable users to get even more out of their Raspberry Pi 3, element14 is launching three accessories: the 16 GB NOOBS Micro SD card, featuring all of the software users need to get started quickly and easily; a 2.5 A Raspberry Pi power supply, which will enable users to power their Pi and 'add on' boards all from one power source; and a Raspberry Pi 3 case.

**element14**

[au.element14.com](http://au.element14.com)



## Fast and accurate power meters. The new champions from Rohde & Schwarz.

For decades, RF professionals have trusted power measurement solutions from Rohde & Schwarz. With their unrivaled speed and fidelity, the Rohde & Schwarz USB and LAN capable power sensors are the market leaders.



## MAGNETIC FIELD METER

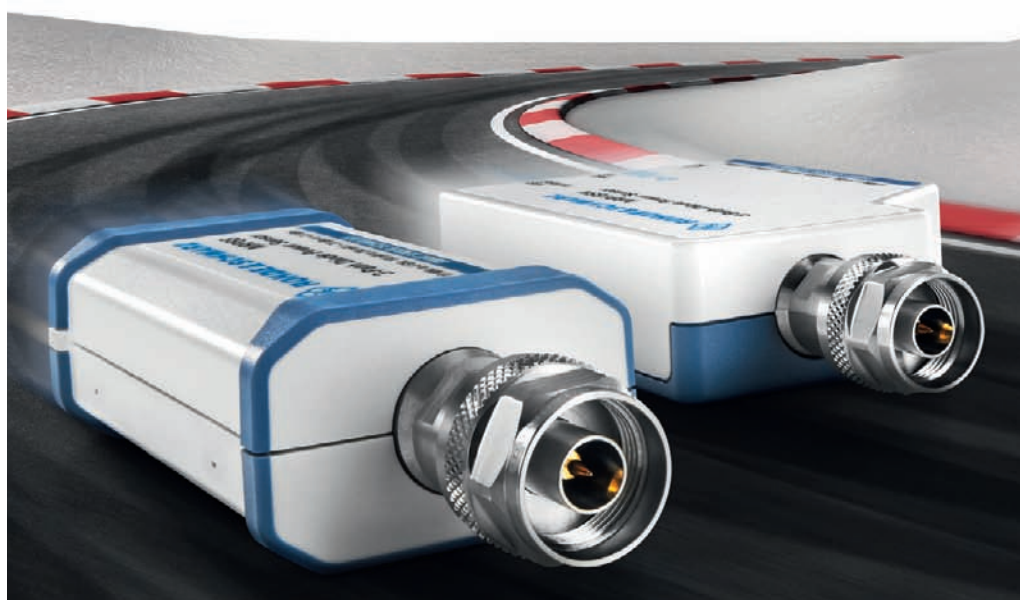
The Holaday HI-3627 kit comprises a meter with a probe that provides magnetic field measurements from any ELF source using three orthogonal field sensing elements. It is available to rent from TechRentals.

The remote sensor and field meter determine ELF field distributions in applications such as power-line emissions, home ambient environments and high-current factory locations. A data logger can be connected to the HI-3627 output to monitor field variations over time.

Other features include: a dynamic range of 0.2 to 20 mG; isotropic response; true RMS detection; and a frequency range of 5 Hz to 2 kHz with an in-built 30 Hz high pass filter.

**TechRentals**

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



[sales.australia@rohde-schwarz.com](mailto:sales.australia@rohde-schwarz.com)  
[www.rohde-schwarz.com/ad/powersensors](http://www.rohde-schwarz.com/ad/powersensors)

**ROHDE & SCHWARZ**



## COMMAND ENCLOSURE

The multiPANEL profile enclosure, with dimensions of between 150 and 800 mm in length and width, can be produced to meet user requirements to the exact millimetre. Decorative inlays in brushed stainless steel fully encircle the enclosure body of extruded aluminium profiles. The enclosure can be powder-coated in any RAL colour to adapt the visual appearance to user-specific requirements. An optional ergonomic handle improves the handling of the command enclosure.

The command enclosure features flexibility for the internal mounting of controls. The three available enclosure depths of 70, 85 and 130 mm are achieved through the choice of the corresponding door. All common designs of system controls can be easily integrated into the multiPANEL

— from glass fronts with touch applications and front plates with cutouts for switches to the direct internal mounting of panel PCs.

Two basic variants are available to make it easier for mechanical engineering customers and their users to select the right enclosure from the large range of options. The multiPANEL Display has been designed almost borderless and facilitates the full surface installation of front plates or glass fronts, eg, with touch functionality.

The multiPANEL Kommando has a 22 mm-wide framework and has been designed to accommodate a panel PC or a front plate. A small recess in the framework enables almost flush integration of the PC. Front plates can be inset in the frame from the front or rear and fastened in place with clamping pieces.

**ROLEC OKW Australia New Zealand P/L**

[www.rolec-okw.com.au](http://www.rolec-okw.com.au)

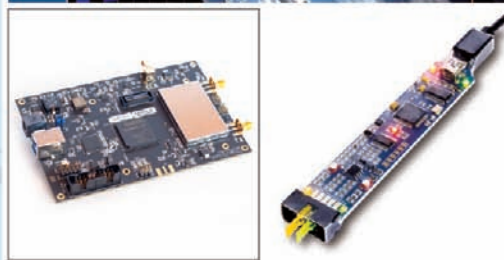
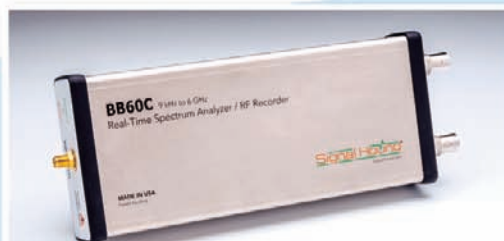
*Silvertone*



**Silvertone Electronics:** Distributors of quality test and measurement equipment.

- **Signal Hound** - USB based spectrum analysers and tracking generators to 12GHz.
- **Nuand BladeRF** SDR 60kHz - 3.8GHz Rx & Tx systems.
- **Virtins Technologies DSO** - Up to 80MHz dual input plus digital trace and signal generator.
- **Bitscope Logic Probes** - 100MHz bandwidth mixed signal scope and waveform generator.
- **Flamingo UAV** platform for surveillance and communications missions.

Manufacturer of the Flamingo 25kg fixed-wing UAV.  
Payload integration services available.



Australian UAV Technologies Pty. Ltd. | ABN: 65 165 321 862 T/A Silvertone Electronics  
1/8 Fitzhardinge Street, Wagga Wagga NSW, 2650 Australia | Ph. 02 6931 8252 | [contact@silvertone.com.au](mailto:contact@silvertone.com.au)

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





### SINGLE SERVO CABLE SYSTEM

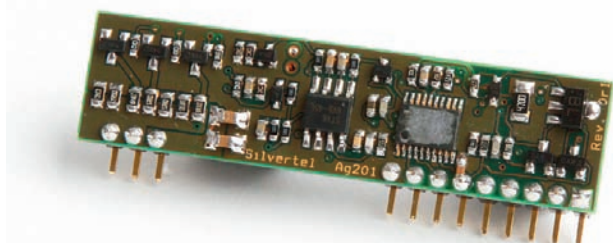
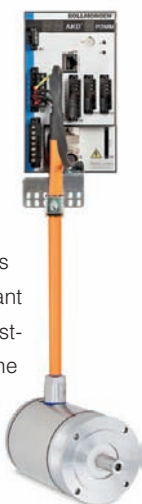
Kollmorgen's third-generation 'Smart Feedback Device' (SFD3) single servo cable system combines the advantages of single-cable technology with robust resolver

feedback. This extends the range of available feedback options.

The product's digital resolver technology can simultaneously transfer motor ID and temperature data and it only requires two wires instead of the customary four wires for resolver feedback. One cable and feedback combination is suitable for all applications, both conventional and high-end.

The product is suitable for use with Kollmorgen's AKMH Stainless Steel IP69K food-grade compliant servo motors. Due to the high interference resistance, data can be transferred safely within one cable without EMC problems.

**Motion Technologies Pty Ltd**  
[www.motiontech.com.au](http://www.motiontech.com.au)



### PROGRAMMABLE LED DRIVER

The Ag201 module from Silvertel is a versatile, low-voltage DC input LED driver module. The flexible, feature-rich product is delivered in a tiny package.

Multiple values of programmable constant current output allow connection with a variety of LEDs. The module's buck-boost DC-DC converter topology means the input voltage can be either higher or lower than the string (output) voltage, allowing for ease of design with a wide range of DC input voltage and LEDs.

Flexible communications arrangements are built in with options of both I<sup>2</sup>C and DALI. The simple addition of an external program resistor sets the module output current from the preset range. Minimal additional components are required to complete the design.

All this functionality is delivered in a package measuring 56 x 14 x 10 mm. The product has been designed as an easy-to-program modular solution that is simple to design into a variety of applications by virtue of its wide input range and flexible output current capabilities.

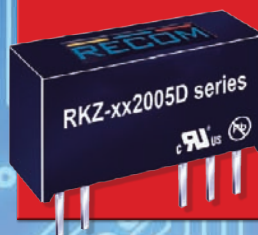
**Fairmont Marketing**  
[www.fairmontmarketing.com.au](http://www.fairmontmarketing.com.au)



## High Performance Gate Drive DC/DC Converter

**Designed for  
for IGBT & SiC application**

- Power: 1W & 2W
- Up to 6.4kVDC isolation
- Asymmetric dual outputs
- Low isolation capacitance
- UL / IEC / EN 62368-1 & UL / IEC / EN 60950 certified



**RECOM**

**WE POWER YOUR PRODUCTS**  
[www.recom-power.com](http://www.recom-power.com)



# THE INTERNET OF CARS

Edoardo Merli\*

## WITHIN THE INTERNET OF EVERYTHING

The Internet of Everything envisions an optimised confluence of people, things, data and processes, all intelligently connected to and part of the internet. The goal is to achieve human-to-human, human-to-machine and machine-to-machine interactions that enhance all our activities and enrich our lives.

Since the internet came into being, users have had a strong desire to keep their connections 'always on' and to connect a whole gamut of appliances for a broad range of uses. Hence, early on, there were attempts to connect the TV, the refrigerator and, in a clear sign of the apocalypse, even the toaster.

Born of this desire came the idea for the smart connected home. Since time at home is a significant portion of our lives, making the home smart and connected made sense. But the home is more than just a place to sleep and serves different functions to different people. Hence, not every function of the home could find itself a good reason to get connected.

The car, on the other hand, just might prove to be an even more compelling platform to realise the complete concept of the Internet of Everything. Indeed, within the car, people, things, data and processes can interact seamlessly within their own ecosystem, as well as with other cars and even the external cloud, via the internet.

### The car as a technology hub

Today's car is already packed with electronics and, in fact, has among the highest densities of electronic components of all consumer machines. As a supplier of many of the silicon technologies inside the car, STMicroelectronics already sees it as a technology hub. A plethora of technologies powers the car today and these technologies fall into three domains: safety and security; infotainment and telematics; and powertrain/fuel economy.

Apart from the more traditional solutions such as airbags, stability control and anti-lock braking systems, safety and security issues are increasingly addressed by newer technologies such as autonomous braking, active safety (camera and sensor based) and night vision. Infotainment and telematics are addressed by technologies that enable smart traffic management, positioning and location-based services, car-to-car and car-to-infrastructure communication and, in the future, perhaps autonomous driving. The powertrain/fuel economy domain is addressed by technologies in engine control,





© stockadoba.com/au/vege

shift-by-wire, stop/start, engine downsizing, vehicle electrification and street predictability.

All these technologies within the car are already interconnected and centrally controlled. Some are even connectivity features in their own right such as positioning and car-to-infrastructure. The car as a technology hub has already begun to fulfil the Internet of Everything concept with people, things and processes interacting seamlessly. Collect, manage and analyse data, then connect everything to the internet, and you've got the full picture. The Internet of Cars becomes a full platform within the Internet of Everything. Safety and security and infotainment and telematics are richly enhanced with the benefit of connectivity and data transfer. Powertrain/fuel economy may not produce significant benefits from operating in the connected world.

### Safety and security

Safety is without doubt the number one concern for car users. Similar to the internet concept of harnessing the strength of the



connected crowd, cars when connected together can help each other to be safer. Armed with smart sensors to detect the environment around the car, connectivity to be online and satellite positioning to establish relative location, cars can inform each other of traffic and road conditions and other concerns ahead.

Already today, telematics applications can automatically execute emergency assistance calls in the event of accidents. Vehicle maintenance, the preventive route to car safety, is already being greatly enhanced. Remote diagnosis of the vehicle and data logging can keep track of and highlight the need for maintenance work. Telematics also enables anti-theft features as a stolen car can be tracked and its whereabouts reported to the authorities.

On a macro level, the Internet of Cars can enable intelligent traffic forecast and management through a unified communication network for vehicles that is leading to safer roads, less congestion and lower emissions caused by cars sitting in traffic jams.

All these 'connected' safety features, together with traditional passive safety technologies such as airbags, braking and stability control, are creating an integrated approach bringing car safety to a whole new level.

Like anything 'connected', security is of course a concern. Critical parts of the vehicle, including the electronic control unit for the engine and other safety systems, need to be protected against malicious attacks. Likewise for the large amounts of data the connected car will generate.

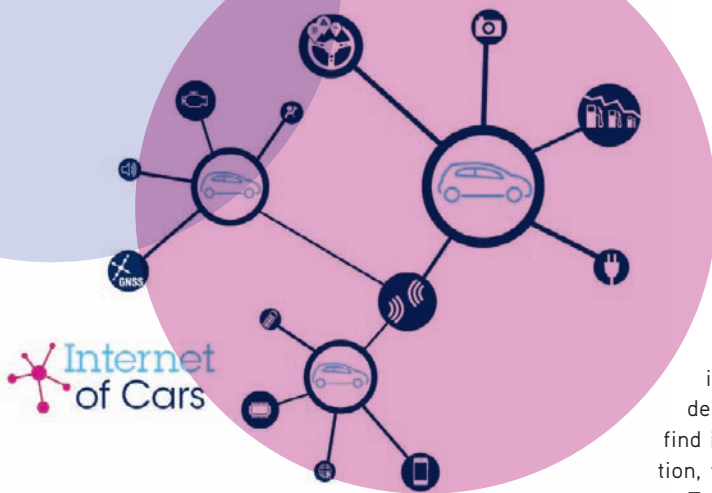
Driver behaviour and habits data can be tracked, recorded and transferred to insurance companies for analysis. Such precise data tracking can allow insurance companies to offer highly tailored policies based on the pay-as-you-drive or pay-how-you-drive models. At the expense of some personal data, this indirectly promotes more economical and safer driving practices.

### Infotainment and telematics

Getting lost is one of the most frustrating driving experiences ever and the proliferation of navigation systems has reduced the frequency of it happening. While GPS is an established technology in car navigation, the capability to receive signals from multiple satellite systems (Galileo, Glonass, Beidou), to collect information from a number of different sensors in the vehicle's network (speed, acceleration, wheel angle) and to utilise that information will improve accuracy and response time in determining vehicle position and expand the utility of this function beyond basic navigation into safety-related applications.

Most of us utilise connected technologies, enabled mostly by our smartphones or tablets, in our daily life — the information that is streamed to us, the music we listen to, the communication channels we have established or our social media networks that have become a significant part of us. We interact fluidly with

## INTERNET OF EVERYTHING



these throughout the day. When we get into our cars for an hour or two, the interaction should continue in the same fluid manner. We would not want to adjust to a whole new set of connected characteristics while we are in the car.

Hence the ability to 'hand over' the personal connectivity of a smartphone or tablet to the car to mimic the same feel and user interface is an important goal. Players who control the main operating systems for smartphones and tablets are forming alliances and shaping standards to accelerate the seamless pairing of the smartphone to the car and create a single connected experience.

While familiarity is preferred, the attention-demanding requirements of driving will require that certain user interfaces be redesigned. The driver's focus cannot be taken away from the road and too many activation controls via finger presses and swipes would be risky. Applications that demand visual attention will have to be curbed on the car platform. As a result, the ideal user interface will be both hands- and eyes-free. Voice-activated commands will play an increasingly bigger role inside the car.

Just like the smartphone platform, the car platform will also face issues related to business model ownership, even more in areas that are very car specific and not yet tested and standardised via the more mature smartphone platform. Car makers and traditional stakeholders will face new players entering the market bringing

new and disruptive models for the automotive industry of today. Content providers, service and software platform providers, consumer appliances makers and telecommunication network providers will mix together (in the car!) creating a new era for the automotive industry.

### A confluence of diverse but complementary technologies

Just like the Internet of Everything, the Internet of Cars is a huge complicated beast in need of an organisation to define its key standards and functionalities. It will eventually find its own equilibrium based on technologies that give it function, value and practicality.

Technology players like STMicroelectronics who want to make a difference in the Internet of Cars will need to offer the technology building blocks that make up the many different parts of the car as well as the expertise to make them work seamlessly together. They also need to recognise that they can't operate in a vacuum and need to build a technology ecosystem with other players.

The key technology building blocks within the Internet of Everything are positioning devices, processors as the brain, low-power connectivity for data transfer and sensors, as well as various analog and digital interfaces to complete the product design. These are technologies which ST has already built into a strong portfolio.

ST also enjoys a market-leading position in automotive-wide technologies such as powertrain, infotainment, positioning, telematics, body, safety, advanced driver assistance systems and sensors. Combined with in-house design expertise and a highly efficient automotive-grade manufacturing machine, ST is very well placed to refine and expand its technology offering to system makers, car manufacturers and other stakeholders within the ecosystem to successfully implement the Internet of Cars.

*\*Edoardo Merli is the Marketing & Application Director, Automotive Product Group, Greater China and South Asia Region for STMicroelectronics.*

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



### DC/DC CONVERTERS FOR SiC MOSFETS

One of the challenges of driving SiC MOSFETs is the high frequency and high voltage at which they are switched. High potentials between the control and power side of a SiC MOSFET application can wear down isolation barriers, eventually causing them to fail.

RECOM has introduced two 2 W DC/DC converter series especially designed to power SiC MOSFETs. The RxxP22005D and RKZ-xx2005D series come with 3, 4 and even 5.2 kVDC isolation to ensure that the isolation barrier stands up to harsh tests.

Switching SiC MOSFETs requires turn-on and turn-off voltages which are not common for other IGBT or MOSFET applications. The series are available with input voltages of 5, 12, 15 or 24 V and feature asymmetric outputs of +20 and -5 V to efficiently and effectively switch the SiC MOSFET.

The converters come fully equipped with an ultralow parasitic capacitance and power sharing capabilities. They are UL/IEC-60950-1 certified and fully compliant to RoHS2 and REACH.

**RECOM Power GmbH**  
[www.recom-power.com](http://www.recom-power.com)







## OPEN MODULAR ARCHITECTURE FOR INDUSTRIAL CLOUD COMPUTING

ADLINK Technology has introduced Modular Industrial Cloud Architecture (MICA). The industrial IoT architecture for commercial off-the-shelf (COTS) platforms features a design aimed at optimising performance, cost and space requirements for the next generation of industrial IoT solutions.

The industrial-grade platform is designed to support the native virtualisation requirements for software-defined networking (SDN) and network function virtualisation (NFV) while integrating a wide range of the latest hardware acceleration technologies to boost the processing of network packets and video streams. This functionality is offered on an open, modular computing architecture, allowing users to redefine resource allocation for cloud computing applications.

The product is an Application Ready Intelligent Platform (ARIP) for industrial cloud computing. It supports ADLINK's PacketManager, network traffic management software that accelerates and enriches packet processing capabilities on telecom, networking and security equipment. It also supports the company's MediaManager software, designed to provide fast performance for video editing and processing, media conversion, streaming, playback and videoconferencing.

**ADLINK Technology Inc**  
[www.adlinktech.com](http://www.adlinktech.com)

## Engineers Get ready to Play

**ERNTEC**

### Next Generation Control Requires ...

- Decentralised intelligence
- Real-time communication
- Higher level process control
- Multiple Motor compatibility

### **NEW** MC3 Series Controller

- Compact Modular design
- High Performance Motion Control (Velocity, Position, Torque)
- Peak current to 30 A
- Flexible, fast control loops
- Increased inputs/outputs
- Available as a plug-in card
- USB programming interface
- RS232 or CANopen as field bus
- Optional EtherCAT Interface
- Slave or stand-alone operation
- Single platform IDE with BASIC

**FAULHABER**

FAULHABER Motion Control

Contact ERNTEC  
PH: (03) 9756 4000  
TEL: [sales@erntec.net](mailto:sales@erntec.net)  
[www.erntec.net](http://www.erntec.net)

## TR ACQUIRED BY UK-BASED RENTAL COMPANY

Specialist equipment rental company TR Pty Ltd has been acquired by UK-based rental business Vp plc.

Vp announced the purchase of the entire issued share capital of TR, committing to pay \$17.4 million on completion of the acquisition, with an assumed net debt of \$6.6 million.

Founded in 1974, TR provides rental, sales, calibration and repair to a range of markets including electrical, telecommunications, manufacturing, construction, defence, oil and gas, mining and government.

The company employs more than 170 people and operates from 13 locations in Australia, New Zealand and Malaysia.

"In recent years the Vp group has made strong progress based mainly on its operations within the UK. It has been our aspiration for some time to increase the Group's overseas presence, given the right opportunity. We are therefore very pleased to have acquired the TR business and warmly welcome the whole TR team to Vp," said Jeremy Pilkington, chairman of Vp plc.

"TR is a market-leading, specialist rental provider, consistent with the key attributes of all businesses within Vp. We are excited by the quality of this business and believe that by working with and supporting the TR team going forward we will, together, be able to deliver further incremental growth and development."



Mikko Nisula holds in his hand a sample on a steel substrate. Behind the hand there is an ALD reactor.



A sample on a steel substrate. Behind the hand there is a ALD reactor.



Researchers tested the material on coin cells.

## MANUFACTURING MICROBATTERIES WITH ORGANIC ELECTRODE MATERIALS

With the rising popularity of smaller electronic devices, smaller energy storage systems are needed. Researchers from Aalto University have demonstrated the fabrication of electrochemically active organic lithium electrode thin films, which help make microbatteries more efficient than before.

When microbatteries are manufactured, the key challenge is to make them able to store large amounts of energy in a small space. One way to improve the energy density is to manufacture the batteries based on 3D microstructured architectures. This may increase the effective surface inside a battery dozens of times. However, the production of materials fit for these has proven to be difficult.

The Finnish researchers used a combined atomic/molecular layer deposition (ALD/MLD) technique to prepare lithium terephthalate, a recently found anode material for a lithium-ion battery. Their study has been published in the journal *Nano Letters*.

"ALD is a great method for making battery materials fit for 3D microstructured architectures," said Mikko Nisula, co-author of the study. "Our method shows it is possible to even produce organic electrode materials by using ALD, which increases the opportunities to manufacture efficient microbatteries."

The researchers' deposition process for Li-terephthalate is shown to comply well with the basic principles of ALD-type growth, including the sequential self-saturated surface reactions, which is a necessity when aiming at micro-lithium-ion devices with 3D architectures.

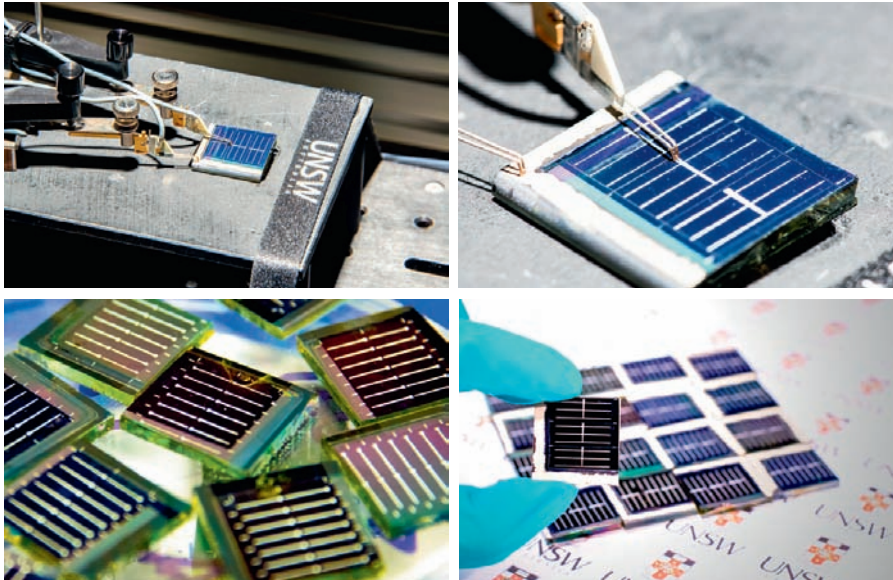
The as-deposited films are found to be crystalline across the deposition temperature range of 200-280°C, which is a trait that is highly desired for an electrode material but rather unusual for hybrid organic-inorganic thin films. A good rate capability is ascertained for the Li-terephthalate films, with no conductive additives required.

The electrode performance can be further enhanced by depositing a thin protective LiPON solid-state electrolyte layer on top of Li-terephthalate. This yields highly stable structures with a capacity retention of over 97% after 200 charge/discharge cycles at 3.2°C.





## WORLD-LEADING THIN-FILM SOLAR CELLS ARE CHEAP, EASY TO MAKE AND NON-TOXIC



A UNSW research team has achieved the world's highest efficiency for a full-sized thin-film solar cell using a competing thin-film technology known as CZTS. Led by Dr Xiaojing Hao of the Australian Centre for Advanced Photovoltaics, the researchers achieved 7.6% efficiency in a 1 cm<sup>2</sup> area CZTS cell — a world-leading result which has been confirmed by the US National Renewable Energy Laboratory.

It is believed that the milestone will make it easier to achieve the dream of 'zero energy' buildings, which have until now been held back by two hurdles: the cost of the thin-film solar cells (used in facades, roofs and windows) and the fact that these solar cells are made from scarce, and highly toxic, materials.

Thin-film technologies such as CdTe (cadmium-telluride) and CIGS (copper-indium-gallium-selenide) are attractive options for the solar industry because they are physically flexible, which increases the number of potential applications. But cadmium and selenium are toxic at even tiny doses, while tellurium and indium are extremely rare. CZTS cells, on the other hand, are made from abundant materials — copper, zinc, tin and sulfur — and are non-toxic.

"In addition to its elements being more commonplace and environmentally benign, we're interested in these higher bandgap CZTS cells for two reasons," said Professor Martin Green, a mentor of Dr Hao.

"They can be deposited directly onto materials as thin layers that are 50 times thinner than a human hair, so there's no need to manufacture silicon 'wafer' cells and interconnect them separately. They also respond better than silicon to blue wavelengths of light and can be stacked as a thin-film on top of silicon cells to ultimately improve the overall performance."

By being able to deposit CZTS solar cells on various surfaces, Dr Hao's team believe this puts them on the road to making thin-film photovoltaic cells that can be rigid or flexible, and durable and cheap enough to be widely integrated into buildings to generate electricity from the sunlight that strikes structures such as glazing, facades, roof tiles and windows. And because CZTS is cheaper — and easier to bring from lab to commercialisation — than other thin-film solar cells, applications are likely even sooner.

"This is the first step on CZTS's road to beyond 20% efficiency and marks a milestone in its journey from the lab to commercial product," said Dr Hao. In fact, UNSW is currently collaborating with a number of large companies keen to develop applications well before it reaches 20% efficiency — probably within the next few years.

"I'm quietly confident we can overcome the technical challenges to further boosting the efficiency of CZTS cells, because there are a lot of tricks we've learned over the past 30 years in boosting CdTe and CIGS and even silicon cells but which haven't been applied to CZTS," Dr Hao concluded.

## SIERRA WIRELESS AND RICHARDSON RFPD SIGN GLOBAL DISTRIBUTION AGREEMENT

Richardson RFPD has announced an expanded global franchise agreement with wireless communications equipment manufacturer Sierra Wireless. The agreement builds on the long-term collaboration between the two companies, as well as a mutual commitment to serve the emerging industrial IoT market.

Under the terms of the agreement, Richardson RFPD will sell Sierra Wireless cellular modules and modems to its global audience. With a focus on industrial connectivity, the distributor will support a comprehensive portfolio of Sierra Wireless products, including 2G, 3G and 4G embedded cellular modules and modems, for an array of IoT/M2M applications, such as telematics, transportation, energy, smart cities, networking and other vertical markets.

"We chose a global distributor like Richardson RFPD because they offer a very high level of technical field expertise and global support," said Jin Pak, vice president of worldwide M2M and automotive sales, OEM Solutions Business Unit, Sierra Wireless. "Richardson RFPD's field team has the technical knowledge and experience necessary to guide customers through the entire product selection and design process."

"Our technical sales and engineering teams that are deployed in several countries in the Americas, Europe and Asia are helping a broad range of customers get their connected products and services to market faster," said Dr Rafael R Salmi, Richardson RFPD's president. "Our team is ready to present Sierra Wireless's innovative multiregion, multicarrier IoT solutions by supporting customers through design-in to field trials and, ultimately, global deployment."



## ETHERCAT SLAVE I/O MODULES

ICP Electronics has expanded its ECAT-2000 Series of EtherCAT (Ethernet for Control Automation) slave I/O modules designed for industrial monitoring and control applications. The three latest models are: the ECAT-2052, featuring eight digital inputs and eight digital outputs; the ECAT-2053, with 16 isolated digital inputs; and the ECAT-2060, with six isolated digital inputs and six relay outputs.

The series is equipped with the EtherCAT protocol and installed by daisy-chain connection, which permits flexibility in device installations and reduces infrastructure and operational costs. All the modules can be deployed in the network topologies such as star, line or ring. The isolation input and output design protects the series against harmful interference and the environment. Users can obtain the input and output status not only via the process data but also from its LED indicators.

Other features include: on-the-fly processing (EtherCAT); a powerful MCU to handle efficient network traffic; 2 x RJ45 bus interface; distance between stations up to 100 m (100BASE-TX); removable terminal block connector; RoHS compliance; and ESD protection 4 kV contact for each channel.

**ICP Electronics Australia Pty Ltd**

[www.icp-australia.com.au](http://www.icp-australia.com.au)







## YOUR PRODUCT DEVELOPMENT AND MANUFACTURING PARTNER

25 Years  
Experience

in Electronics  
Design &  
Manufacture

- Electronics Design & Manufacture
- Turnkey Project Development
- Industrial Design
- Prototyping • Cable Looms

Gold Sponsor of








Phone 1800 054 383 or visit [www.hetech.com.au](http://www.hetech.com.au)



## POWER FACTOR CORRECTION CAPACITORS

TDK has released the EPCOS PhaseCap Energy series of high-power capacitors for power factor correction. Available with gas- or resin-filled housings, they are designed for voltages of 230 to 690 VAC and offer a reactive power of between 5 and 33 kVAR.

The life expectancy of the B25674 series of gas-impregnated capacitors is 180,000 h. The maximum permissible inrush current is 500 x IR. The maximum number of switching cycles per year is 15,000, while the maximum permissible operating temperature as per IEC 60831-1 is 60°C.

The B25675 series of resin-filled



capacitors features an even longer life expectancy of 200,000 h and is likewise designed for a maximum operating temperature of 60°C and a maximum permissible inrush current of 500 x IR. Both series have increased energy density in comparison with the existing types.

The capacitors feature a diameter of between 75 and 125 mm, depending on the type, and a height of between 164 and 224 mm. They are equipped with an overpressure disconnector that isolates all three phases from the grid in the event of damage.

**TDK Australia**  
[www.tdk.com.au](http://www.tdk.com.au)

## TWO-SIDED BOARD

The Flip & Click is a two-sided board from MikroElektronika. One side of the board contains an Arduino AT91SAM3X8E MCU, the Arduino pin-out and compatibility with Arduino IDE.

The other side of the board has four sockets for click boards. Click boards are bite-sized add-on boards with standardised mikroBUS connectors. The connector is a specifically designed pin-out standard with SPI, I<sup>2</sup>C, Analog, UART, Interrupt, PWM, Reset and Power supply pins.

Click boards can carry a single sensor, transceiver, display, encoder, connection port or any other sort of chip or module. There are hundreds of click boards available from MikroElektronika, which can be used to create any number of solutions.

**Glyn Ltd**  
[www.glyn.com.au](http://www.glyn.com.au)

## “Rigol offer Australia’s Best Value DSOs”



### RIGOL DS-1000E Series

- ▶ 50MHz & 100MHz, 2 Ch
- ▶ 1GS/s Real Time Sampling
- ▶ USB Device, USB Host & PictBridge

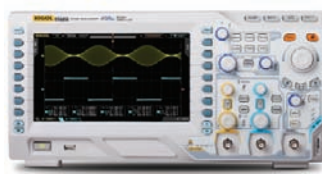
**FROM \$469** ex GST



### RIGOL DS-1000Z Series

- ▶ 50MHz, 70MHz, 100MHz, 4 Ch
- ▶ 1GS/s Real Time Sampling
- ▶ MSO & 25MHz In-Built Generator Versions

**FROM \$579** ex GST



### RIGOL DS-2000A Series

- ▶ 70MHz, 100MHz, 200MHz, 300MHz, 2 Ch
- ▶ 2GS/s & 14Mpts Standard Memory Depth
- ▶ MSO & 25MHz In-Built Generator Versions

**FROM \$1,247** ex GST



### RIGOL DS-6000 Series

- ▶ 600MHz & 1GHz, 2 & 4 Ch
- ▶ 5GS/s Real Time Sampling
- ▶ 140Mpts Memory Standard

**FROM \$8,461** ex GST

**Buy on-line at [www.emona.com.au/rigol](http://www.emona.com.au/rigol)**

#### Sydney

Tel 02 9519 3933  
Fax 02 9550 1378

email [testinst@emona.com.au](mailto:testinst@emona.com.au)

#### Melbourne

Tel 03 9889 0427  
Fax 03 9889 0715

#### Brisbane

Tel 07 3392 7170  
Fax 07 3848 9046

#### Adelaide

Tel 08 8363 5733  
Fax 08 8363 5799

#### Perth

Tel 08 9361 4200  
Fax 08 9361 4300

web [www.emona.com.au](http://www.emona.com.au)

**EMONA**

## On closer inspection: PCBA inspection aided by stereo inspection microscope

When it comes to circuit board assembly and design, success comes with quick turnaround times without incident.

Laritech is a Californian corporation specialising in engineering design services and quick-turn printed circuit board assemblies. With more than 15 years' experience designing and manufacturing embedded hardware and firmware and nearly 500 completed designs to date, Laritech is nationally recognised as one of the fastest growing private companies in North America.



Part of Laritech's success is the keen ability to take customer ideas and partially completed projects and see them through to fruition. At the core of this competency is the underlying corporate framework specifically designed by founder and design engineer Bill Larrick. From the inside out, Laritech is designed to allow the customer a faster, easier and more cost-effective path to market.

Recognising the importance of local investment in technology, Laritech also boasts comprehensive PCB manufacturing capabilities. They include placements from 0201 up to 2" BGAs with pick-and-place accuracies to 38 micrometres in an ISO-9000 controlled environment.

In addition, Laritech has invested in a Lynx EVO stereo inspection microscope from Vision Engineering to inspect PCBAs throughout the manufacturing process.

Every PCBA that Laritech makes is 100% inspected by an IPC certified final inspector prior to leaving the facility using a Lynx Dynascope. These final inspectors are tasked with ensuring each board has been aligned and soldered perfectly. Any modifications required such as reworking are completed using the stereo microscope because of the ergonomics and the long working distances.

The Lynx EVO is a stereo inspection microscope that looks completely different from a traditional microscope. It is still 100% optical, but the viewing area is eyepiece-less. Instead it has what looks like a viewer but remains optical with a brilliant 3D image, providing greater comfort and leading to greater productivity. As well as benefiting productivity, the Lynx EVO provides greater peripheral vision — a great advantage during reworking because it enhances hand-to-eye coordination, increasing accuracy and minimising waste.

With strict guidelines on IPC directives for acceptability standards within the electronics industry, such as guidelines on design material, Laritech strictly builds assemblies to IPC-A-610 Class 3 (or higher in certain military applications). While manufacturing to these exacting standards, every opportunity to invest in tools and equipment like the Lynx EVO is a welcomed increase in accuracy and productivity.

Bill Larrick explains how the Lynx EVO has aided the inspection process for rigid/flex PCBAs used in medical devices:

"Lynx EVO has allowed us to inspect medical device PCBAs with more clarity than ever before and has proven to be crucial in providing a consistent, high-quality product that the medical device industry demands," he said.

Rigid/flex PCBAs for medical devices are just one type of PCBA Laritech manufactures. In particular, it is critical they are manufactured to exacting standards which are consistent and reliable for medical device utilisation.

"Laritech inspectors and engineers are spoiled by the ergonomics of the Lynx EVO. When they tried using a more traditional stereo trinocular microscope, they didn't like it," Larrick said.

*Hawker Richardson*  
[www.hawkerrichardson.com.au](http://www.hawkerrichardson.com.au)





## 200 GB MEMORY CARD

The 200 GB Lexar High-Performance microSDXC UHS-I memory card is designed for sports camcorders, tablets and smartphones. The card has read transfer speeds up to 95 MBps (633x) and can capture up to 17 h of 4K and full HD video, 33,000 photos or 28,000 songs.

The card comes with a USB 3.0 reader, which allows for high-speed file transfer of photos and videos from the card to a PC or Mac. It includes a lifetime copy of Image Rescue software. The reader is backwards compatible with USB 2.0 ports.

All Lexar product designs undergo extensive testing in the Lexar Quality Labs to validate performance, quality and compatibility with more than 1100 digital devices.

**Lexar Australia**  
[www.lexar.com](http://www.lexar.com)

## AMBIENT LIGHT SENSOR

The Texas Instruments OPT3001 Ambient Light Sensor (ALS) is a sensor that measures the intensity of visible light. The spectral response of the sensor tightly matches the photopic response of the human eye and includes significant infrared rejection.

The sensor is a single-chip lux meter, measuring the intensity of light as visible to the human eye. The precision spectral response and strong IR rejection of the device enables it to meter the intensity of light as seen by the human eye regardless of light source. The strong IR rejection also aids in maintaining accuracy when industrial design calls for mounting the sensor under dark glass for aesthetics.

The product is designed for systems that create light-based experiences for humans. It is a suitable replacement for photodiodes, photoresistors or other ambient light sensors with less human eye matching and IR rejection.

**Texas Instruments Australia Ltd**  
[www.ti.com](http://www.ti.com)

# XCalibur1931

by X-ES

# X-ES

Has Your Solution  
to the

# EOL Tsi148 VME Bridge

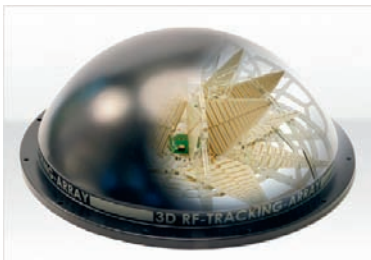
View

XCalibur1931

**Metromatics**

Brisbane: (07) 3868 4255   Sydney: (02) 9460 4355  
 Melbourne: (03) 9872 4592   Adelaide: (08) 8343 8516   New Zealand: +64 9 620-6573  
 email: [sales@metromatics.com.au](mailto:sales@metromatics.com.au)   internet: [www.metromatics.com.au](http://www.metromatics.com.au)

Brisbane
Sydney
Adelaide
Melbourne
Perth
New Zealand



## RF TRACKING ANTENNA

Aaronia has introduced an isotropic RF 3D tracking antenna that operates from 9 kHz to 35 GHz.

The IsoLOG 3D includes a high-density, customisable sector array with 8–36 antennas, for horizontal and for vertical polarisation. In addition, eight or 16 specialised low-frequency antennas can be added to extend the frequency range down to 9 kHz, giving a total of up to 52 independent antennas.

A watertight, shock-resistant and heat-proofed radom protects the antennas and electronics against the harshest conditions (-40 to 60°C). The radom is available in any colour with optional prints.

The product is suitable for counter-surveillance measurements or drone-detection systems. The wide frequency range eliminates the need for various antenna set-ups and makes it usable for mounting on vehicles (eg, drive test cars, etc) and for hidden operations.

The antenna is sensitive to most incoming signal polarisations allowing detection of signals including those invisible to DF systems that use only vertically polarised antennas. A Power over Ethernet connection allows for easy integration and control over any existing network and a powerful control software is included for operation on Windows systems.

**Clarke & Severn Electronics**

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

## Low Pressure Moulding

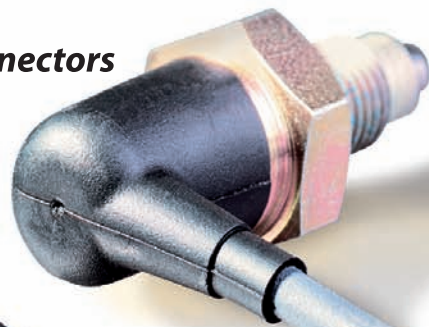
*There is*  
**A Better Solution!**

*Seal your connections, protect from environment and moisture, and finish your product professionally.*

**Cable Splices**



**R/A connectors**



**Straight connectors**



*Products can be  
branded with your logo,  
even custom colours  
can be produced.*

**Tarapath**

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

Ph: 03 9269 6200

E: [karl.b@tarapath.com.au](mailto:karl.b@tarapath.com.au)



## TANTALUM CAPACITOR

AVX has extended its F98 Series resin-moulded, undertab termination-style tantalum chip capacitors with the addition of a small, high CV 0603 tantalum capacitor rated at 100  $\mu\text{F}$ /6.3 V. The F98 Series 0603 capacitor is claimed to deliver twice the capacitance of competitors' 0603 tantalum capacitors and half the footprint of the 0805 component that had previously been the industry's smallest tantalum capacitor with equivalent ratings.

The capacitor is free from the DC capacitance/voltage dependency that MLCCs experience and features SMD facedown, undertab terminations (which enable high volumetric efficiency), low ESL and high PCB assembly density. It is suitable for use in the powerline circuits of a wide range of mobile and wearable electronics, including smartphones, wireless modules, hearing aids, fitness trackers and smartwatches.

F98 Series capacitors are currently available in three case sizes (0603, 0805 and 0402) with ultralow maximum profiles of 0.90 and 0.60 mm, rated voltages spanning 4 to 25 V and capacitance values spanning 1 to 220  $\mu\text{F}$  with a  $\pm 20\%$  tolerance at 120 Hz. Lead-free compatible and RoHS compliant, the capacitors are rated at 85°C and designed for use in operating temperatures spanning -55 to +125°C.

**Mouser Electronics**

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



## 48 V DIRECT-TO-POL POWER MODULES

Optimised for system loads (CPUs, GPUs, ASICs and DDR memory) requiring operating voltages below 1.25 V at load currents up to hundreds of amperes, Vicor's 48 V direct-to-PoL (point-of-load) power modules enable power systems with high density and conversion efficiency.

Combining good power density, efficiency and thermal and electrical performance in a rugged, thin 13 x 23 mm ChiP, the modules are suitable for use in a broad range of 48 V power systems applications. By providing efficiencies from a 48 V bus that are better than 12 V legacy solutions, in a fraction of the space, the product families eliminate the trade-off between bus voltage and system efficiency and density, enabling system designers to implement distributed system solutions featuring high conversion efficiency, high power density and low distribution loss.

The product family comprises non-isolated buck-boost pre-regulator modules (PRMs) and voltage transformation modules (VTMs). When configured in a 'factorised power architecture', a PRM receives its input from a 48 V distributed bus and delivers a controlled, factorised voltage to the input of a VTM. The output voltage of the VTM is the factorised voltage multiplied by a fixed conversion ratio (K) and the output current of the VTM is 1/K times the VTM input current. Current multiplication at the point of load delivers high efficiency, density and bandwidth.

**Vicor Corporation**

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



**HAMMOND**  
MANUFACTURING®

Standard and modified  
diecast aluminium, metal  
and plastic enclosures

tel: 08 8240 2244





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



# WEARABLES MANUFACTURERS

## ARE FEELING THE PRESSURE

Jeff Elliott\*

Consumers are demanding more and more of their clothing, not just in terms of fit — which they expect to be precisely right — but in terms of functionality. Comfort, after all, plays a role in determining whether someone will like a product or not.

**N**ow the issue of form and fit is extending well beyond traditional apparel to more specialised items such as bras, gloves, shapewear, compression stockings, diapers and eyeglasses for the burgeoning wearable technology market with its fitness bands, smart watches and headphones that collect biometric information or interact with mobile devices.

With so much at stake, wearable manufacturers are increasingly investing in sophisticated pressure mapping research to optimise product design and create the comfort and fit that will garner the most market share.

### Measuring pressure

For wearables in prolonged contact with the body, or that come into contact with particularly sensitive areas, the amount of pressure applied at specific points is the primary consideration.

However, gauging the amount of pressure can be difficult because most people have a hard time determining static pres-

ures in general. That is to say, the human body tends to be more sensitive to pressures that change than to constant loads.

Instead, by integrating capacitive sensor technology in testing and development, wearable manufacturers can capture and quantify the amount of pressure users feel when wearing the design to optimise fit and function.

### Capacitive tactile sensor technology

Capacitive tactile sensors involve two electrodes separated by a compressible dielectric structure. When pressure is applied, the gap decreases and capacitance rises. Unlike resistive technology, the two electrodes never touch. Consequently, capacitive sensors are less susceptible to wear or failure even if subjected to multiple, repeat loads.

Capacitive sensor technology has several additional advantages over resistive, including greater stability in terms of repeatability and durability and the ability to measure extremely low levels of pressure with accuracy. This can be an important consideration when clothing fit can involve subtle, low levels of pressure.





© stock.adobe.com/au/Stephen VanHorn

Using capacitive sensors, pressure can be measured using sophisticated arrays that measure thousands of points of force to create a high-resolution map as well as using miniature force sensors that measure pressure at discrete points.

One of the main challenges when developing wearables is that the human body is not, of course, flat. It has contours and curves and any sensor used for such a purpose must conform to the curved surfaces while providing accurate pressure measurements.

Fortunately, the tactile array options from leading sensor manufacturers can be integrated with a variety of soft, flexible and conformable materials. For research purposes, the sensors can be embedded in mannequins or sewn into straps that go between the clothing and a mannequin or human tester.

Consider, for example, bras — an area in which proper fit is crucial. A tactile pressure sensor-equipped mannequin could be a solution for companies aiming to improve bra design.

Another logical use for tactile pressure sensing technology would be for shapewear — garments that are designed to hold various parts

of the body in such a way as to modify and ostensibly improve the wearer's appearance. Quantifying pressures would be a crucial element of creating shapewear that is just tight enough in the right places to create the desired effect without being excessively constrictive.

Tactile pressure sensor technology could also assist in the development of garments that have medical applications, like compression stockings meant to treat and prevent deep-vein thrombosis, a complication that often involves the formation of potentially serious blood clots in the lower leg and calf.

Headphones and other headgear are other potential applications that can benefit from pressure mapping. For headgear, comfort is often as important as functionality. Because it can be difficult to discern the difference in noise attenuation from one brand of noise-cancelling headphones to the next, comfort and fit can play an important role in determining what will be purchased.

### Professional sports

In professional sports, wearable technology has applications in monitoring and real-time performance feedback for athletes as well.

At Red Bull, the energy drink company, the limits of sports research are being pushed through the Red Bull High Performance group. The group works with Red Bull's community of sponsored athletes and a community of scientists to conduct research designed to explore the characteristics and traits of elite performance to broaden the collective understanding of the true capacity of human potential.

"One approach is to utilise cutting-edge technologies to collect information from the greatest athletes on the planet to not only shed insight into their performance, but also to adapt any kernels of knowledge to the broader community to make everyone's lives better," said Brandon Larson, technologist with the Red Bull High Performance group. Larson is a mechanical engineer with previous experience in R&D at NASA and the Boeing Company.

Larson led the Surf Science project, which is designed to advance technologies to collect data while surfing to provide insights and explore performance improvement.

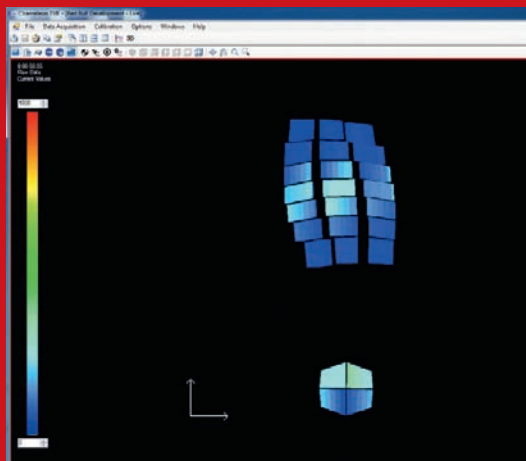
The initial research was focused on determining how the pressure of a surfer's feet is transferred into a surfboard to control it. To accomplish this goal, high-resolution pressure mapping utilising sensors in the insoles of surf booties would be required.

However, capturing foot pressure information is a challenging task even for casual footwear due to the constant pounding and stress on an insole in addition to the wide range of forces being applied.

Adding to the demanding requirements, the surfing application meant designing pressure mapping sensors and electronics that could withstand the wet, corrosive, high humidity environment and a range of temperatures. Onboard wireless data acquisition was also out of the question, due to interference of the signal caused by the water.

After carefully vetting the available options on the market, Larson approached Pressure Profile Systems (PPS), a world leader in providing capacitive tactile sensing solutions.

PPS sensors differ from traditional capacitive designs that require a finger or stylus to interact with a single electrode. Instead, the sensors



*The foot-pressure sensor for surfboards.*



*Foot-pressure data acquisition software.*



*Red Bull's surf sensor in action.*

are designed with two built-in electrodes separated by a proprietary compressible dielectric matrix, which acts like a spring.

To build its tactile array sensors, PPS arranges the electrodes as orthogonal, overlapping strips. A distinct capacitor is formed at each point where the electrodes overlap. By selectively scanning a single row and column, the capacitance at that location, and thus the local pressure, is measured.

The TactArray sensors feature up to 8192 integrated sensing elements while measuring pressures from 0.01 to 700 psi.

For applications that do not require an array, PPS has just developed new single-element, Wearable SingleTact force sensors that can reliably quantify force at levels as low as 1 gram. Constructed from stretchable conductive cloth materials for conformability, the 20 mm Wearable SingleTact force sensor can be used on humans since it is soft, stretches and conforms to multicurved surfaces without compromising data quality.

Wearable SingleTact sensors come as a complete turnkey solution with interface board with analog output. OpenSource Arduino and DAQ Software are also available for designers wishing to develop or integrate the sensors into their product or project.

To meet the demanding requirements of surfing while maintaining quality pressure data, PPS worked with Red Bull engineers and went through multiple design iterations.

Unlike the majority of capacitive touch sensors, PPS sensors are not influenced by humidity. However, they are not waterproof, so the company provided sheaths to protect the tactile array.

Engineers on both sides also collaborated to create a small, 3D-printed waterproof housing for the data acquisition computer. To facilitate the placement of the housing, the Red Bull High Performance group worked directly with Rip Curl, a major surf boot manufacturer, to create a custom pocket just below the flexing point of the ankle so as not to interfere with the surfer's technique.

Throughout the process, Larson was particularly impressed by the testing procedures employed by Pressure Profile Systems as well as its manufacturing capabilities.

"Pressure Profile has one of the more rigorous testing procedures I have experienced, which is saying a lot coming from places like NASA and Boeing," said Larson. "To see that level of precision and workmanship put into a sensor to measure the pressure from a surfer's foot was impressive."

The PPS sensors have already been put into action by Red Bull sponsored surfers at their Surf Science technology camp in Mexico and by World Champion Mick Fanning in a session at Lower Trestles. The system successfully captured and stored hours of surfing data that provided a unique view into how world-class elite surfers use their feet to control the board.

Larson envisions the next step in the evolution of the project as working with PPS to embed tactile array sensors into the deck of a surfboard to not only collect pressure distribution of the feet, but also position. To date, surfer foot placement has only been evaluated through less precise watching of video.

Other applications the Red Bull High Performance team has considered for Tactile Array technology include incorporating it into wingsuits to better understand airflow and air pressure distribution across the aerodynamic skin; mountain bike racer gloves or handgrips to determine grip and braking timing and firmness; and in the decks of skateboards to determine the pressure profile of skaters as they perform specific tricks and manoeuvres.

"Being able to see the pressure signature in some of these applications is a game-changing educational tool," said Larson. "With the capabilities of the sensor array, your mind can wander and you start to realise that there are very few things it can't measure when it comes to pressure."

To learn more about the Red Bull project, visit <http://www.redbull.com/us/en/surfing/stories/1331686821979/this-is-what-happens-when-scientist-go-surfing> or <http://www.pressureprofile.com/press/2014/12/8/fv3w35of29ic6c55antm9a0giz9gbb>.

Pressure Profile Systems  
[www.pressureprofile.com](http://www.pressureprofile.com)

*\*Jeff Elliott is a Torrance, California-based technical writer. He has researched and written about industrial technologies and issues for the past 20 years.*







## OPTICAL SENSORS

Vishay Intertechnology has introduced two AEC-Q101-qualified surface-mount transmissive optical sensors for automotive and industrial applications.

Offered in a 5.5 x 4 x 5.7 mm package, the Vishay Semiconductors single-channel TCPT1600X01 and

dual-channel TCUT1600X01 feature an increased dome height compared with previous devices. Due to their tall dome design, the devices offer vertical headroom for the code wheel in turn-and-push applications.

The devices can be used as position sensors for encoders in high-temperature environments close to motors, in addition to turn knobs, ignition locks and adaptive headlights. Both sensors can detect motion and speed. With dual channels, the TCUT1600X01 can also be used to detect direction in applications such as electronic power steering (ESP) systems.

The single-channel TCPT1600X01 includes an infrared emitter and phototransistor detector located face to face in a surface-mount package, while the dual-channel TCUT1600X01 includes an infrared emitter and two phototransistor detectors. Both sensors deliver a typical output current of 1.6 mA and operate at a wavelength of 950 nm. They feature a 3 mm gap width and apertures of 0.3 mm, and they operate over a wide temperature range of -40 to +105°C.

With a moisture sensitivity level rating of 1, the sensors have an unlimited floor life. Compatible with reflow solder processes according to JEDEC-STD-020D, the devices are halogen-free, RoHS compliant and Vishay Green.

**Mouser Electronics**

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

**SEMİKRON**  
innovation + service

### Current / Voltage:

**100A up to 400A / 650V, 1200V, 1700V**

Up to 10% system cost savings

One MiniSKiiP platform 4A up to 400A

Scalable inverter design 40kW up to 90kW

Standard MiniSKiiP package sizes

**SPRING Technology**



Phone +61 3 85 61 56 00

[sales.skaus@semikron.com](mailto:sales.skaus@semikron.com) [www.semikron.com](http://www.semikron.com)



MiniSKiiP® Dual

**Now up to 90kW**





## DIGITAL MULTIMETER AND THERMAL IMAGER

The Fluke 279 FC TRMS Thermal Multimeter is an integrated digital multimeter (DMM) and thermal camera test tool for electricians and maintenance technicians.

The device lets users quickly and safely check for hot spots in fuses, wires, insulators, connectors, splices and switches with the imager and then troubleshoot and analyse issues with the DMM. It features 15 electrical measurement functions, including AC/DC voltage, resistance, continuity, capacitance, diode test, min/max and frequency. The optional iFlex clamp can wrap around conductors and wires in tight, hard-to-reach spaces and expands the device's measurement capabilities to include AC current up to 2500 A.

The product features a 3.5" full-colour LCD screen and comes with a rechargeable lithium-ion battery that lasts up to 10 h under normal conditions. It also has CAT III 1000 V and CAT IV 600 V safety ratings.

**Fluke Australia Pty Ltd**  
[www.fluke.com.au](http://www.fluke.com.au)



## PORTABLE WORKSTATION

Graphics- or processing-intensive applications, like geospatial imagery analysis, UAV ground control or HD digital video processing, require powerful computer hardware. However, for mobile deployments where size, weight, power and cooling (SWaP-C) are a concern, typical rackmount servers are just too large, heavy and power-consuming.

The Vigor ED portable workstation series, from NextComputing, is said to overcome these problems. Compact and rugged for mission-critical applications in tough environments, the systems are designed to handle the same demanding tasks normally assigned to full-sized systems. The user can replace larger rackmount hardware with an all-in-one workstation that is easy to transport and set up.

The modular, scalable device can be outfitted with the latest Intel multicore processors, high-capacity/performance memory, full-size PCI Express 3.0 cards and up to 16 removable enterprise-class SSD, SAS or SATA drives.

**Metromatics Pty Ltd**  
[www.metromatics.com.au](http://www.metromatics.com.au)

## POWER ENTRY MODULE FOR PROTECTION CLASS II EQUIPMENT

SCHURTER has expanded its range of power entry modules to include versions without ground pin for use in protection class II double-insulated applications. Its protection class II version is suitable for use in medical equipment according to the IEC standard 60601-1-11, which outlines safety measures specific to medical equipment intended for use in the home.

Protection class II equipment generally has no metal case. It is double insulated and requires higher safety levels for energised components relative to exposed surfaces. The KMF class II power entry module provides double insulation between energised components and exposed parts. This reinforced insulation is tested with a voltage of 4000 VDC between the energised conductor and the neutral conductor relative to the mounting panel.

The product is available with a 2-pole line switch and a 1- or 2-pole fuse holder. For medical applications, an extra-safe fuse holder is available that can only be opened with the aid of a tool. An EMC filter is available in medical and low-leakage versions. The integrated filter at the power input provides effective interference suppression, which results in optimised electromagnetic compatibility.

Current ratings range from 1–10 A at 250 VAC and connections take place with quick-connect terminals 4.8 x 0.8 mm. The product is rated according to IEC 60320-1, style C18 and is ENEC, cURus and CCC approved.

**SCHURTER (S) PTE LTD**  
[www.schurter.com](http://www.schurter.com)





## 4-PORT CAN BUS SWITCHES

The I-2534 and I-5534-M, from ICP DAS, are CAN switches used to establish a connection among four CAN bus subnetworks. The switches are specially designed for integrating four CAN networks and solving problems when using star topology.

In addition to their use as CAN bridges, the switches also have more powerful features. They can extend CAN bus working distance, connect to four CAN subnetworks with different baud rates and support star or tree topology. The I-5534-M provides particularly high stability, especially in harsh environments.

The upgraded firmware has features like user-defined CAN baud rate, CAN bus message acceptance filter and routing path configuration. In addition, the firmware features the CAN-ID mapping mechanism in order to modify the received CAN-ID before process forwarding. Users can configure the CAN-ID mapping table.

When the switch receives the specific CAN-ID, the CAN-ID will change to the corresponding CAN-ID by the mapping table before it is transmitted to another CAN port. When CAN devices transmit the same CAN messages, the I-2534 or I-5534-M could change to another CAN-ID by the CAN-ID mapping mechanism.

**ICP Electronics Australia Pty Ltd**  
[www.icp-australia.com.au](http://www.icp-australia.com.au)





# Explore the limits

## — EUREKA FAST SUPER DRYER —

**Replaces**

- N<sub>2</sub> Cabinet
- Baking Oven
- Vacuum Dry
- Dry Air
- Purge





**FAST SUPER DRYER**

**R&D / LAB Essential**

**Professional Series**

Newly designed, large size dehumidifying core units for specialized materials. Can effectively solve all moisture damage problems.

Providing Protection For All Types Of Material / Equipment / Files / Cultural Relics. **Customized**

- **Equipment / machine.**
- **Priceless cultural relic and collectible items.**

**Embedded Logic Solutions Pty Ltd.**

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

TEL +61 2 9687 1880  
FAX +61 2 9687 1881  
ADD Suite 2, Level 3 144 Marsden Street Parramatta, NSW 2150 Australia



## TAPE EXTENSION SENSOR WITH INTEGRATED PULLEY

ASM has added an extra feature to its POSITAPE tape extension sensor product line. The WBR models are now equipped with an integrated pulley mounted directly onto the sensor, which enables a flexible pullout angle of the measuring tape.

The WBR sensor has been specifically designed for machines with limited space where the tape needs to be deflected. With the integrated pulley the starting angle of the measuring tape is adjustable to a broad range of measurement applications, even in areas that were previously not accessible.

The linear cable extension position sensors of the series employ a robust stainless steel measuring tape that is coiled onto a precision manufactured drum. The ultrathin, flexible, stainless steel tape can be guided even on small pulleys and also in the opposite direction without impairing the service life of the measuring tape. With the pulley mounted directly onto the sensor the pullout angle can be rotated through 90°, which allows for an installation that can be flexibly adapted to the available mounting set-up.

The tape extension sensors utilise a linear and absolute measurement principle without reference operation. Depending on the model, measurement ranges can reach from 1500 up to 20,000 mm. With a linearity tolerance of  $\pm 0.10\%$ , the sensors can be equipped with analog and digital outputs achieving a resolution of  $< 0.05$  mm.

**Automated Control Pty Ltd**

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



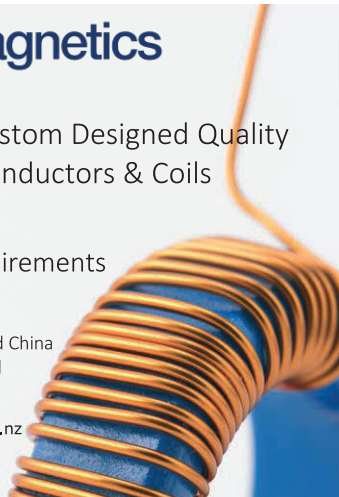
## Marque Magnetics

Global Supplier of Custom Designed Quality  
Transformers, Inductors & Coils

Talk to us about your requirements

Full Engineering Design Service  
Manufacturing in New Zealand and China  
ISO 9001 and ISO Medical Certified

Email: [contact@marque-magnetics.co.nz](mailto:contact@marque-magnetics.co.nz)  
Web: [www.marque-magnetics.co.nz](http://www.marque-magnetics.co.nz)



## SCADA SYSTEMS PC & PLC PROGRAMMING



We offer cost effective solutions for your automation technology needs Australia wide.

At IS&E we specialise in systems integration and automation projects, big and small.

**For more information phone us on 07 3856 2232.**

### INDUSTRIAL SOFTWARE & ELECTRONICS

Tel: (07) 3856 2232 Fax: (07) 3355 1012  
E-mail: [info@industrialsoftware.com.au](mailto:info@industrialsoftware.com.au)  
Web: [www.industrialsoftware.com.au](http://www.industrialsoftware.com.au)



Industrial Software & Electronics

## EMC EMR SAR SAFETY

Accredited testing and global product approvals  
**EMC Technologies Pty Ltd**

**Melbourne** Telephone: +61 3 9365 1000 **Bayswater** Telephone: +61 3 9761 5888  
**Sydney** Telephone: +61 2 9624 2777 **Auckland (NZ)** Telephone: +64 9 360 0862



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



HVAC

Dynapar Veeder-Root Eagle Signal Line Seiki Keyence Maple Greystone Novotechnik TWK AECO

PLCS

Time Count Rate Flow

ph: 1 300 553 500 enhance your sensors VEEDERLINE [www.veederline.com.au](http://www.veederline.com.au)

Encoders HMIs Controllers



THE RISE OF

# TEST MANAGEMENT SOFTWARE

Matej Krajnc\*

Most organisations that have been conducting automated test for a while would probably notice an increase in languages. This can be attributed to more specialised forms of abstraction in today's higher level programming languages.

**T**his evolution is rooted deeply in the history of programming languages and the thirst for higher levels of abstraction, and it starts with the first high-level programming language, FORTRAN. Developed in 1953 by John Backus, FORTRAN addressed the need for a greater level of abstraction for machine processes built around the way that humans naturally communicate their ideas — through language.

"We approach unique test challenges with the best language for each task at hand. By using commercial off-the-shelf test management software to act as a grand unifier during the whole product life cycle, we greatly increase our engineering productivity and minimise the time to market," Festo AG & Co. KG Head of Automated Testing Architecture Simon Wiedemer said.

After the success of FORTRAN, more languages like C, Pascal, ATLAS and PAWS were developed, each bringing new

constructs and models of computation. And with each new language came more powerful levels of abstraction, such as object-oriented programming, which is now one of the most widely used programming constructs. In addition, these newer models of computation often are developed to solve common problems. Some of these newer models of computation are developed for general-purpose programming tasks, but some are developed for a particular application. For example, LabVIEW was developed for test, measurement and control applications and Python was developed for quick code-scripting tasks.

These increasing levels of abstraction result in languages better suited to specific tasks. The best test managers now design test systems that leverage the power of multiple languages and save development time by using test management software.



USING A SINGLE LANGUAGE CAN LIMIT NEW HIRES TO A CERTAIN SKILLSET OR FORCE NEW EMPLOYEES INTO LEARNING NEW TOOLS.

### Traditional test system development

Considering that software is the backbone of automation when building a test system, many organisations prefer to standardise on a single, fairly general language used for all aspects of test system design from individual component tests to test management across the board. The end result is the development of a homogenous test software approach. The main advantage is all members of a team can work in a single, standardised environment, which allows easier sharing of libraries and code modules across the team. The training for this approach is also greatly simplified since the team learns and works in a single environment.

However, standardising on one language does present some disadvantages. Using a single language can limit new hires to a certain skillset or force new employees into learning new tools. As students graduate, they often have a preference for and experience in one or more specific languages. Also, as new managers take over, they commonly opt to implement a language of their choice, which causes organisational whiplash. This can be a costly exercise that often requires code migration, revalidation of the codebase and additional training in the new language.

The best test managers must look towards a newer approach to test-system development that builds a heterogeneous system out of multiple languages. This kind of approach allows a team to use multiple languages, each for its own advantages, to build more powerful test systems. For instance, Python could be used for scripting validation and verification tests based on code developed by R&D engineers. In the same system, C# could be used to develop an object-oriented interface for custom hardware or to existing .NET libraries while LabVIEW communicates with and gathers data from hardware. Since all languages are designed to tackle specific applications, using each to its strength would ultimately save time and money.

Though beneficial, this approach can present a new challenge to test system development: different languages now need to work and communicate together to form a single system.

To resolve this, all test engineers need to understand not just the one environment they specialise in but also the others to adequately interface with them.

### The software solution

Test departments are now turning to commercial off-the-shelf test management software to act as a Rosetta Stone of sorts between different languages. This software not only offers users a common environment in which they can work with any type of test code but also completes executive tasks, such as sequencing and calling each test, handling data logging and generating reports. Each engineer can then focus on writing the best test for each component of the DUT without needing to worry about how to communicate with the other portions of code. And since engineers can use the environments they are most comfortable with, an organisation can focus on hiring engineers with skills unique to its applications, even if they don't have prior knowledge of, or training in, the company's required language.

Additionally, test managers can take advantage of the full power of a heterogeneous design while avoiding the new challenges that such a design introduces.

This includes the use of test management software for a more modular development process, which produces a system that's easier to maintain and upgrade because each component can be updated individually without affecting the rest of the test system.

Ultimately, test executives typically include the support of commercial vendors that continually patch and upgrade the test software, which further offsets the cost of maintenance and increases the sustainability of these systems. These advantages, combined with the benefits of a heterogeneous test system design, are how the best test managers are building the future of automated testing.

*\*Matej Krajnc is the Managing Director for ASEAN/ANZ for National Instruments.*

National Instruments Aust Pty Ltd  
[www.ni.com/oceania](http://www.ni.com/oceania)





## Z-AXIS NANOPOSITIONING STAGES

Aerotech has introduced a series of Z-axis piezo nanopositioning stages for extreme-precision research and industrial requirements. The QNP-Z stages provide the resolution, linearity, repeatability and high dynamics required for the most demanding applications, from microscopy to optics alignment.

Nanometre-level precision is assured by resolution to 0.15 nm, linearity to 0.007% and bidirectional repeatability to 1 nm. A variety of travels (100 to 600  $\mu\text{m}$ ), feedback options and vacuum versions add to the versatility of the stage series.

The stages are guided by precision flexures that are optimised using finite element analysis. The resulting design offers good stiffness and resonant frequency (up to 1050 Hz), enabling high process throughput and fast closed-loop response.

All QNP stages provide good geometric performance (straightness and angular errors) while minimising overall package size. Available adapter plates allow linear, XY and Z-axis stages to be mounted together for simultaneous multi-axis positioning.

Applications include test and inspection, industrial and academic laboratories, military, nanometrology, microscopy, semiconductors, microelectronics, optics, photonics, data storage, precision mechanics, metals, life sciences and medical devices.

**Coherent Scientific Pty Ltd**

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

## It's not a trick. It's engineering

 **FAULHABER**

### **NEW** MCS3 Control Systems

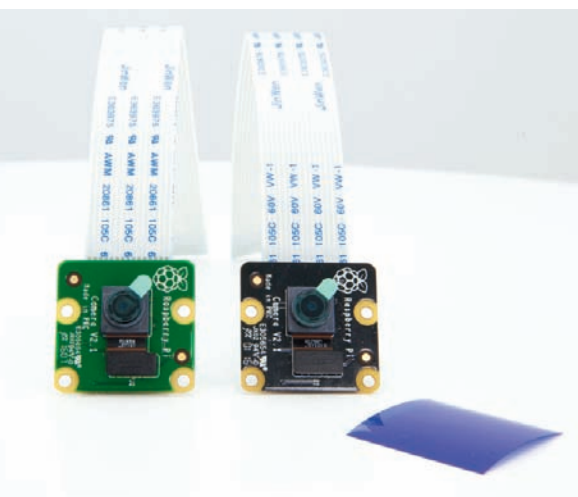
- Intelligent Servo Motors
- Modular design up to IP54
- High Performance Control (Velocity, Position, Torque)
- Multiple I/O
- Multiple variants available
  - Cable options
  - Gears
  - Ball screws
  - and many more ...

Contact ERNTEC :  
Tel: (03) 9756 4000  
Email: [sales@erntec.net](mailto:sales@erntec.net)  
[www.erntec.net](http://www.erntec.net)



**ERNTEC**

**FAULHABER Motion Control Systems**



## CAMERAS FOR RASPBERRY PI

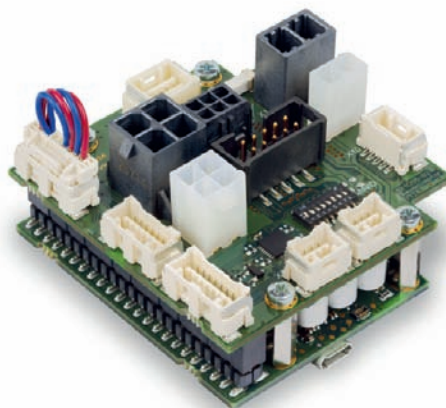
The Raspberry Pi Camera v2 and Raspberry Pi NoIR Camera v2 further enhance the application of the credit card-sized Raspberry Pi3 computer. Both cameras have been upgraded to 8 MP and feature an image sensor that enables the board to capture 3280 x 2464 pixel static images.

The cameras have the same video capability as the original cameras, supporting 1080p30, 720p60 and 640x480p90 video, and link to the Raspberry Pi board through a dedicated CSI interface. The NoIR camera v2 has a No InfraRed (NoIR) filter on the lens, which makes it suitable for infrared photography and taking pictures in low light environments. The cameras are backwards compatible with all Raspberry Pi boards and have the same footprint and weight as the previous 5 MP cameras.

The camera modules' tiny size (25 x 35 x 9 mm) enables them to feature at the centre of eye-catching projects, including sending weather balloons into the stratosphere. They are suitable for applications including low-light photography (NoIR Camera), drones, CCTV, weather stations, school projects and more.

**element14**

[au.element14.com](http://au.element14.com)



## DC MOTOR POSITION CONTROLLER

maxon motor has released the latest generation of position control units — the EPOS4. Available as a module for OEM designs and also with connectors for easy integration, there are two continuous power ratings of 8 and 15 A.

With tiny dimensions of 60 x 62 mm and able to drive both brushed and brushless DC motors up to 1500 W with 98% efficiency, the position controller has the highest power density ratio for maxon motor controllers. These attributes make it particularly suitable for space- and power-critical applications in the electronics, manufacturing, process control, robotics, communications, aerospace and oil and gas fields.

The easy-to-use motor position controller has been designed with intuitive set-up in mind via freely downloadable configuration software. A modular system allows for selection between various communication preferences, and additional functionalities like safe torque off and field-oriented control have been included.

**maxon motor Australia Pty Ltd**

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



For more than 60 years OKW has set the design standards for plastic enclosures and tuning knobs. Today we offer every conceivable technology in-house to individualize whichever product you choose from our range. We will supply your very own housing solution that will maintain its value and meet all of your customers' requirements.

**OKW**  
GEHÄUSE  
SYSTEME

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

TO EACH HIS OWN HOUSING

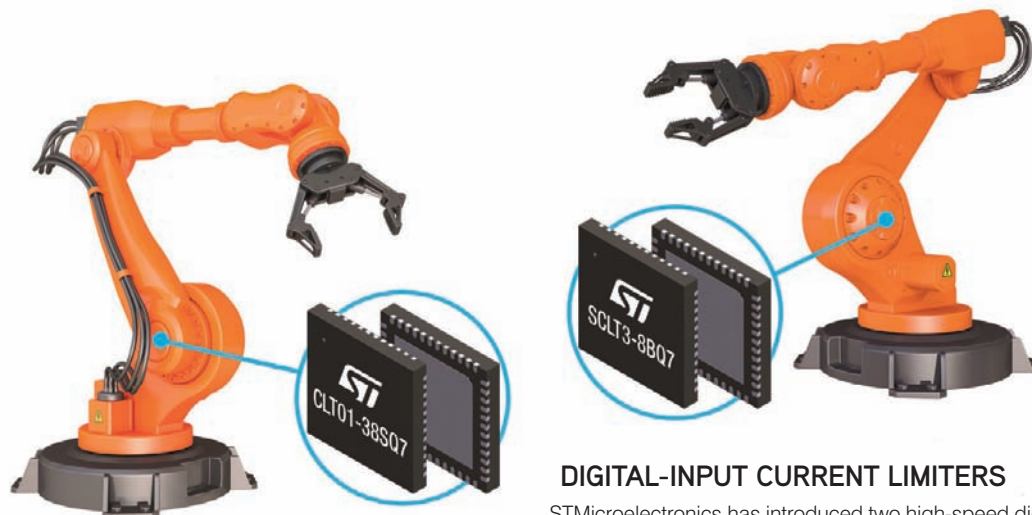


**ROLEC**

**OKW**

**ROLEC OKW**  
Australia New Zealand Pty Ltd  
Unit 6/29 Coombes Drive,  
Penrith NSW 2750  
Phone: +61 2 4722 3388  
Fax: +61 2 4722 5300  
E-Mail: [sales@rolec-okw.com.au](mailto:sales@rolec-okw.com.au)





## DIGITAL-INPUT CURRENT LIMITERS

STMicroelectronics has introduced two high-speed digital-input current limiters for circuit protection in factory automation.

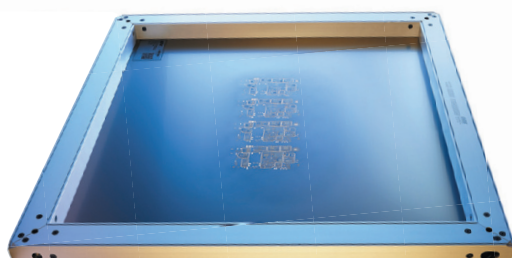
The SCLT3-8BQ7 and CLT01-38SQ7 provide industrial programmable logic controllers (PLCs) with fast, robust protection against unwanted input-signal current spikes while reducing power consumption, board space and component costs. Both devices are housed in the QFN-48L (7 x 7 mm) package with a large exposed thermal pad that optimises power dissipation at ambient temperatures greater than 100°C.

Other features include: eight high-speed SPI protected outputs; 8-/16-bit high-speed SPI output; high-side inputs with common ground; an integrated 5 V regulator; 30 V+ reverse polarity protection; an energy-free LED output signal for visual status indication; a 78 mW/channel power-dissipation capability; and temperature/voltage alarm options.

The CLT01-38SQ7 also delivers robustness compliant with stringent international EMC (electromagnetic compatibility) standards such as IEC 61000-4.2, IEC61000-4.4 and IEC6100-4.5.

**STMicroelectronics Pty Ltd**

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



**DEK**<sup>®</sup>  
+ - x y z



**LPKF**<sup>®</sup>  
Laser & Electronics

## Australian Made DEK and LPKF Solder Paste Stencils



*DEK VectorGuard stencils, now  
manufactured in Australia by Mastercut.*

**DEK VectorGuard | LPKF Zelflex | Standard Mesh Mounted**

*Reduce the overall cost of your stencils and simplify  
your stencil storage with a proven, reusable framing system.  
Frames for almost any stencil can be provided.*

### Benefits ...

- > Superior tensioning
- > Reduces storage
- > Reduces shipping
- > Environmentally friendly
- > Over 20 years experience
- > Super LPKF accuracy
- > Fast turnaround
- > Australian made stencils



(07) 5576 1900  
[info@mastercut.com.au](mailto:info@mastercut.com.au)

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

**Mastercut**  
Technologies

Your thin metal experts

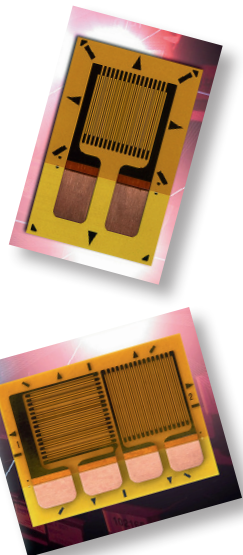


## FOIL STRAIN SENSORS

Micro-Measurements has doubled its Super Stock program offerings, with the off-the-shelf delivery program offering users an even broader range of general-purpose foil strain sensors. Super Stock general-purpose patterns are available in linear, tee rosette, stacked rosette, rectangular rosette and shear/torque configurations. The strain sensors are offered in a wide variety of sizes with resistance values of 120, 350 and 1000Ω.

The program is designed to reduce lead times, helping to keep design engineers on schedule and able to meet their customers' tight deadlines. Eliminating the need to compromise in testing applications, the program's line-up includes a variety of stress analysis patterns, ensuring that the right sensor for the best result is always available. The patterns include precision stress analysis strain sensors that are used to meet demanding testing requirements in the transportation, infrastructure and consumer markets.

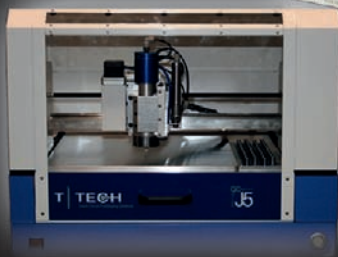
**Thermo Fisher Scientific**  
[www.thermofisher.com.au](http://www.thermofisher.com.au)



## CIRCUIT BOARDS?

For all your prototyping requirements

from  
budget ...



... to fully-  
featured

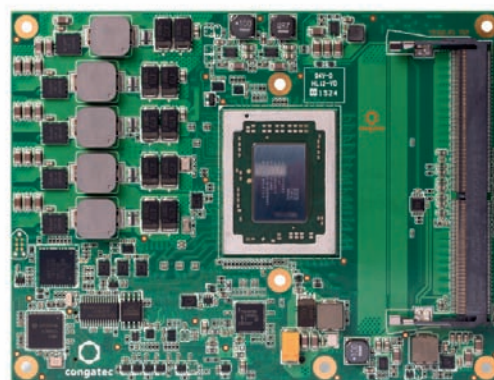
**Quick Circuit** allows you to make your own prototype circuit boards and perfectly machined panels in next to no time.

**Shouldn't there be one on your bench?**



Distributed throughout Australasia by  
**SATCAM**

Tel +61 2 9807 7081  
[satcam@satcam.com.au](mailto:satcam@satcam.com.au)  
[www.satcam.com.au](http://www.satcam.com.au)



## COM EXPRESS MODULE

congatec has expanded its COM Express portfolio with the AMD G-Series SOC. Compared to modules based on the previous generation of AMD Embedded G-Series SOC's, the conga-TR3 with dual-core AMD GX-217GI processor provides up to 30% more graphics performance and 15% more overall system performance.

The SOC supports fast and power-efficient DDR4 memory, PCI Express Gen 3.0 for demanding user-specific extensions and powerful DirectX 12 graphics acceleration. This makes the module suitable for many mainstream embedded applications as well as for fanless designs.

Since the AMD G-Series processors are pin-compatible with the AMD Embedded R-Series SOC's and based on the same processor microarchitecture, OEMs benefit from high scalability that enables them to quickly and efficiently implement solutions from entry level to high end with just one module design. In the performance intensive graphics segment, the module is suitable for high-volume applications. Such workloads can be distributed to the CPU and the parallel graphics cores, offering an energy-efficient environment.

**congatec Australia Pty Ltd**  
[www.congatec.com](http://www.congatec.com)





## ETHERNET-CONNECTED DATA ACQUISITION SYSTEMS

Designed to reduce installation and test set-up costs while improving signal quality, the 16-channel PI 7200 and PI 7300 data acquisition systems (DAS) function as ethernet-connected appliances that condition, amplify and digitise outputs from strain gauges, bridges, IEPE or voltage transducers.

Features include real-time correction/compensation of gain offset and excitation voltage from -20 to +50°C, quality signal conditioning with high gain and a 24-bit high-speed A/D converter per channel to provide high resolution and high sample rate across a wide operating range. Multiple units can be combined or distributed in larger installations.

The self-contained units provide transducer excitation, bridge completion and balance. The transducer output is amplified and filtered to remove signal components that could produce alias errors and digitised to 24-bit resolution. The digitised transducer output is digitally processed providing multiple sample rates, an 80 dB/octave FIR filter and a 32-bit floating point output format in millivolts referred to input, millivolts referred to output or user-defined engineering units.

The systems are suitable for rugged applications such as wind tunnels, engine test stands or wherever the DAS needs to be located on or near the test article. Additional model options are available for applications requiring voltage inputs; programmable voltage excitation, bridge completion for 120Ω and 350Ω strain gauges, shunt calibration and automatic balance; or regulated power for transducers with internal electronics.

**Metromatics Pty Ltd**  
[www.metromatics.com.au](http://www.metromatics.com.au)

## IGBTS

Renesas Electronics has announced six products in the 8th-generation G8H Series of insulated gate bipolar transistors (IGBTs) that minimise conversion losses in power conditioners for solar power generation systems and reduce inverter applications in uninterruptible power supply (UPS) systems.

The six products are rated at 650 V/40, 50 and 75 A and at 1250 V/25, 40 and 75 A. The company has also achieved a TO-247 plus package for a 1250 V IGBT with built-in diode, which offers system manufacturers good circuit configuration flexibility.



The IGBTs have adopted an exclusive trench gate configuration in the process structure. Compared to previous IGBT generations, the devices are said to provide faster switching performance while also reducing conduction loss by lowering the saturation voltage.

The performance index for the 8th-generation devices has been improved by up to 30% compared to previous 7th-generation IGBTs, contributing to lower power loss and better overall performance for user systems. These updates are important for key markets in the power industry focusing on photovoltaic inverters, UPSs, industrial motor drives and power factor correction.

**Braemac Pty Ltd**  
[www.braemacenergy.com.au](http://www.braemacenergy.com.au)

# MORNSUN®

## The Future of Power Supplies

Green energy, miniaturization and digitization are the future of power sources. Development of components (power device, chip, transformer) influences the future of technology.

### Australia & NZ



DLPC Pty Ltd  
07 3823 4844  
[keith@dlpc.com.au](mailto:keith@dlpc.com.au)  
[dlpc.com.au](http://dlpc.com.au)

### Victoria (Australia)



Fairmont Marketing  
03 9878 3077  
[nick@fairmontmarketing.com.au](mailto:nick@fairmontmarketing.com.au)  
[fairmontmarketing.com.au](http://fairmontmarketing.com.au)

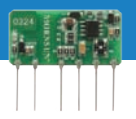
3-50W 4:1/2:1 Wide  
Input R3 DC/DC Converter



### Energy Saving

Efficiency exceeds 90% at 30%-100% load &  
78% at 5%-30% load  
No-load power consumption as low as 0.12W

LS03-15BxxSR2S(-F)  
AC/DC Converter



### Space Saving & Lower Cost

Compact size: 35 x 18 x 11mm  
Height as low as 13mm (Right-angled version)  
Input voltage range: 85~264VAC

LN Series  
(AC/DC Converter)



### No Electrolytic Capacitor

Input voltage - 165~264VAC / 233~370VDC  
No derating from -40° ~ 70°  
EMI meets CLASS B, anti-surge capacity ±2KV

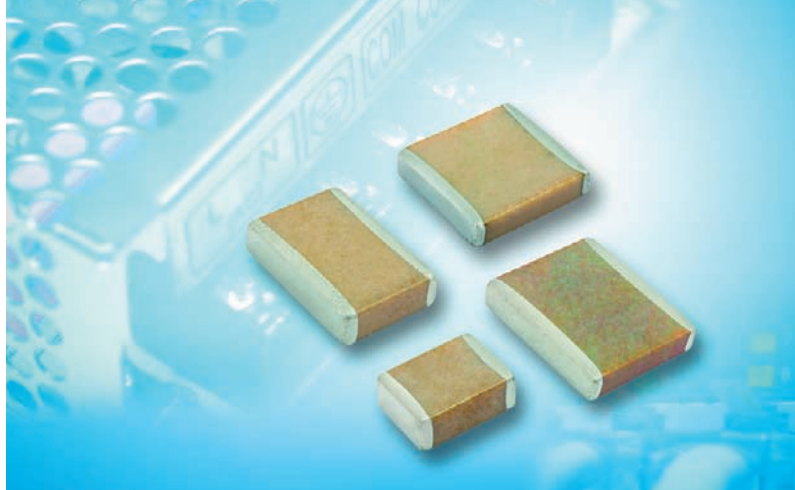
Power Module for IGBT  
Driver/MOSFET Driver QAO1C



### Specialized for SiC MOSFET Driver

Isolation voltage - 3.5KVAC/6KVDC  
Max. capacitive load - 220pF  
Ultra low Isolation capacitance of 3.5pF  
Operating temperature range -40° ~ 105°

**5YR**  
Warranty



### LORA SURVEY BOX

The MultiConnect mDot Box helps to determine if LoRa is the right technology to solve key industrial IoT issues. Easy to use, customise and manage, it makes evaluating LoRa technology for IoT applications as easy as clicking a button.

The unit can measure LoRa distance and building penetration performance for line-of-sight or urban/obstructed use cases. LoRa site survey data can be viewed in the cloud, on the gateway or on the user's laptop. The product has several built-in sensors, including temperature, ambient light, pressure, electrical current and a 3-axis accelerometer.

The product includes a MultiConnect mDot LoRa module and features an LCD display menu, device navigation information and network, test mode, GPS and sensor status data. Two push-button controls provide menu navigation functions and LEDs for displaying network and GPS status.

LoRa Demo Mode is suitable for testing IoT application prototypes and proof of concepts. Sensor data is transmitted to the LoRa gateway at user-defined intervals or triggered with the push of a button. Survey Single Mode tests connectivity with the LoRa gateway at different data rate and power level combinations. Site Survey Sweep Mode tests connectivity with the LoRa gateway over a wide range of data rates and power levels automatically.

**Elecom Electronics Supply**  
[www.elecomes.com](http://www.elecomes.com)

### SURFACE-MOUNT MULTILAYER CERAMIC CHIP CAPACITORS

Vishay Intertechnology has introduced a series of surface-mount multilayer ceramic chip capacitors (MLCCs) optimised for high-voltage industrial and telecom applications. The Vishay Vitramon HV High Voltage Series features a robust serial electrode design and an extended voltage range up to 5 kV in four EIA sizes from 1812 to 2225.

The high breakdown voltage of the MLCCs is said to increase reliability against voltage spikes, while their serial electrode design reduces the risk of short circuits due to mechanical cracks. Manufactured in noble metal electrode (NME) technology with a wet build process, the devices are suitable for input and output filtering in power supplies and analog and digital modems, snubbing in power converters and buffering in voltage multipliers.

Featuring an X7R dielectric, the devices offer a voltage range from 3000 to 5000 VDC, capacitance from 180 pF to 15 nF, a temperature coefficient of capacitance (TCC) of  $\pm 15\%$  from  $-55$  to  $+125^\circ\text{C}$  and an ageing rate of 1% maximum per decade. RoHS compliant, halogen-free and Vishay Green, the MLCCs offer 100% matte tin plate terminations.

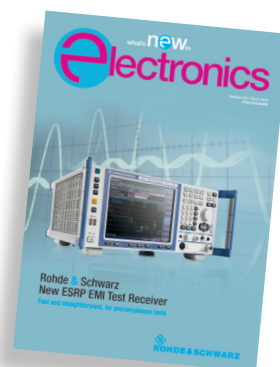
**Mouser Electronics**  
[www.mouser.com](http://www.mouser.com)

# FREE SUBSCRIPTION

*What's New in Electronics* is **FREE** to industry professionals in Australia\*.

To **continue** receiving your free copy you will be asked to register every three years.

\* For qualified industry professionals outside Australia, the digital magazine and eNewsletters are available FREE of charge. If you would like the print magazine, contact [circulation@wfmmedia.com.au](mailto:circulation@wfmmedia.com.au) for subscription prices in your region.



QUICK REGISTRATION @ [www.electronicsonline.net.au/subscribe](http://www.electronicsonline.net.au/subscribe)





## STAINLESS STEEL KEYBOARDS

InduKey has released the TKV-084-FIT-Touch-IP65-MGEH series of stainless steel keyboards with integrated touchpads. Available in three compact versions, the keyboards are suitable for use in tough industrial applications due to their robust design and high-quality workmanship.

The silicone seal between the top and bottom parts of the keys protects against any ingress by dust or splashing water. By integrating the keys in an additional membrane (consisting of silicone or PORON), it is possible to create a LABS-free version designed for medical and laboratory applications.

The flat key caps and the arrangement of the keys enable noise-free typing strokes and support fast touch typing. The capacitive keypad also allows precise operations for users, even if they are wearing silicone gloves. Customised modifications are available to meet the requirements of specific applications.

**Backplane Systems Technology Pty Ltd**  
[www.backplane.com.au](http://www.backplane.com.au)

## POWER INDUCTORS

Vishay Intertechnology has extended its IHHP series of low-profile, high-current power inductors with two devices in the compact 3 x 3 mm 1212 case size. Offering a wide range of inductance values from 0.33 to 10  $\mu$ H and low profiles of 0.8 and 1 mm, respectively, the Vishay Dale IHHP-1212ZH-01 and IHHP-1212AZ-01 are designed to save space and increase efficiency in portable electronics.

The devices are optimised for DC/DC converters and power supply modules for notebook PCs, tablets and other handheld, battery-powered electronics. The magnetic-alloy power inductors offer low acoustic noise and provide magnetic shielding to prevent interference with nearby components.

The units feature maximum DCR down to 23 m $\Omega$ , high saturation current to 6.5 A and a heat rating current up to 6 A. The devices operate over a temperature range from -55 to +125°C and are packaged in an RoHS-compliant, lead-free shielded construction.

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



# ElectroneX

**electronics design & assembly expo**

**Design, Develop, Manufacture with the latest Solutions!**  
Showcasing new innovations and technology in electronics

In the fast paced world of electronics you need to see, test and compare the latest equipment, products and solutions in manufacture and systems development.

**Technology Park Sydney**  
**14 -15 September 2016**

**Free Registration online!**  
**[www.electronex.com.au](http://www.electronex.com.au)**



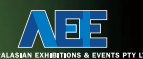
In Association with



Supporting Publication



Organised by



# CNT SLICING DEVICE

## TO REVOLUTIONISE ELECTRONICS

An Australian invention, the Vortex Fluidic Device (VFD), is being adapted to precisely cut through carbon nanotubes (CNTs) used in solar panel manufacturing and cancer treatment.

Scientists from Flinders University in South Australia have proven the Vortex Fluidic Device's ability to slice through CNTs with great precision. The scientists last year received an Ig Nobel Prize for creating the VFD and using it to unboil an egg.

Device creator and Flinders University Professor Colin Raston said the CNTs could be commercialised within 12 months.

CNTs are minute cylinders of carbon atoms with mechanical, electrical, thermal, optical and chemical properties. They have applications in many industries, including automotive, energy storage and electronics. CNTs are lighter, more flexible and cheaper than solar cell materials.

"Importantly for this technology is that we have uniformity in products," Professor Raston said.

"Uniformity in products also means that you can improve the solar cell efficiency in solar cell devices."

The VFD can be used to slice CNTs accurately to an average length of 170 nm using only water, a solvent and a laser. It is also claimed to be a simpler and cheaper process than previous methods, which resulted in random lengths that made it difficult to deliver drugs to patients and transfer electrons for solar panel manufacturing.



Flinders University Professor Colin Raston and PhD student Kasturi Vimalanathan.

Flinders University PhD student Kasturi Vimalanathan, who played a key role in discovering new applications for the device, said the machine's ability to cut CNTs to a similar length significantly increased the efficiency of solar cells.

"They shorten the carbon nanotubes to fit in all the chemicals so it can withstand high temperatures," she said.

"It increases the efficiency and enhances the photoelectric conversion because they can provide a shorter transportation pathway for these electrons.

"It's a one-step method we can scale up. We can see cheaper solar panels on the back of this development."

**Westwick-Farrow Media**

**A.B.N. 22 152 305 336**

**www.wfmedia.com.au**

### 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

Alice Richard  
wnie@wfmedia.com.au

### Editorial Assistant

Lauren Davis

**Chief Editor** Janette Woodhouse

**Publisher** Geoff Hird

**Art Director/Production Manager**

Julie Wright

### Art/Production

Tanya Barac, Colleen Sam

**Circulation Manager** Lora Tomova

circulation@wfmedia.com.au

**Copy Control** Mitchie Mullins

copy@wfmedia.com.au

**Group Brand Manager**

Nicola Fender-Fox

### Advertising Sales

#### NSW

Courtney Van Den Berg - 0424 417 329  
cvandenber@wfmedia.com.au

#### VIC/SA/WA

Sandra Romanin - 0414 558 464  
sromanin@wfmedia.com.au

#### QLD

Nicola Fender-Fox - 0414 703 780  
nfender-fox@wfmedia.com.au

#### Asia

Lachlan Rainey - 0402 157 167  
lrainey@wfmedia.com.au



Contact the editor

If you have any queries regarding our privacy policy  
please email [privacy@westwick-farrow.com.au](mailto:privacy@westwick-farrow.com.au)

**Subscriptions:** For unregistered readers price  
on application



**September 2015 Total CAB**

**Audited Circulation**

**4,737 (84% personally requested)**

Printed and bound by Dynamite Printing

Print Post Approved PP100007394

ISSN No. 0728-3873

All material published in this magazine is published in good faith and every care is taken to accurately relay information provided to us. Readers are advised by the publishers to ensure that all necessary safety devices and precautions are installed and safe working procedures adopted before the use of any equipment found or purchased through the information we provide. Further, all performance criteria was provided by the representative company concerned and any dispute should be referred to them. Information indicating that products are made in Australia or New Zealand is supplied by the source company. Westwick-Farrow Pty Ltd does not quantify the amount of local content or the accuracy of the statement made by the source.





# COMMS 2016 CONNECT

## Sydney

22-23 June 2016

Sydney Showground

**FREE**  
exhibition  
entry

**Events for critical  
communications  
users and  
industry**

Utilities

| Government

| Enterprise

| Transportation

| Resources

| Public Safety

### Speakers include:



**STATION OFFICER  
GRAHAM TAIT**

Operational  
Communications  
Systems Officer  
FIRE & RESCUE NSW



**ROSS SPEARMAN**

CTO  
TAIT  
COMMUNICATIONS



**CHARLES EMER**

Chief Information  
Officer/Director  
Information and  
Communications  
Technology  
NSW STATE  
EMERGENCY SERVICE



**BIDAR HOMSEY**

Principal Consultant,  
Public Safety &  
Security, Global  
Industry & Society  
ERICSSON



**PHILLIP KING**

Acting Managing  
Director  
NSW TELCO  
AUTHORITY

**PLUS**

An exhibition with dozens of local and international manufacturers and distributors will have their experts on hand to help you find the solutions you're looking for.

**FOUR  
Training  
Workshops  
included**

#### Platinum Sponsors

**seapura**

#### Gold Sponsors

**rftechnology**

**taii**  
communications



**ZETRON**

#### Silver Sponsors

**ICOM**

**visionstream**

**KENWOOD**  
Listen to the Future

#### Supporting associations & media organisations

**DMR**

**LTE**  
APPLICATIONS

**IWCE**

**TCCA**

**DMR**  
APPLICATIONS

**TETRA**  
APPLICATIONS

**RFUENZ**

**PMR**  
DIGITAL

**RadioResource**  
INTERNATIONAL

#### Digital Partner

IT'S HOW  
WE CONNECT **T**

#### Delegate Bag Sponsor

**MINGARA**

#### Magazine Partner

**critical**  
communications  
www.CriticalComms.com.au

#### Association Partner

**ARCIA**

In conjunction with  
**THE ARCIA INDUSTRY GALA DINNER**  
**22 June 2016**  
Novotel, Sydney Olympic Park

Visit [www.arcia.org.au](http://www.arcia.org.au) to book your tickets

[www.comms-connect.com.au](http://www.comms-connect.com.au)

follow us on



# Value and performance at your fingertips.

Solve your toughest measurement challenges with the Keysight InfiniiVision X-Series family of oscilloscopes. Scopes come standard with high-end features such as large touch displays and industry-leading waveform update rates. Plus, Keysight offers a wealth of application-specific software for these fully upgradable scopes. With Keysight, not only can you do more, you get more.



	Keysight 2000 X-Series	Keysight 3000T X-Series	Keysight 4000 X-Series	Keysight 6000 X-Series
Bandwidth	70 MHz–200 MHz	100 MHz–1 GHz	200 MHz–1.5 GHz	1 GHz–6 GHz
Sample Rate	2 GSa/s	5 GSa/s	5 GSa/s	20 GSa/s
Waveform Update Rate	>100,000 wfms/s	>1,000,000 wfms/s	>1,000,000 wfms/s	>450,000 wfms/s
Display	8.5"	8.5" touch	12.1" touch	12.1" multi-touch
Zone Touch Triggering	N/A	YES	YES	YES
Instrument Integration	Arbitrary waveform generator, digital voltmeter, protocol analyzer, counter, MSO			

**Knowledge at your fingertips:**  
get app notes, videos, webcasts and more:  
[www.keysight.com/find/infiniivision-knowledge](http://www.keysight.com/find/infiniivision-knowledge)

AUS:1800 629 485 NZ: 0800 738 378

© Keysight Technologies, Inc. 2016



Unlocking Measurement Insights

Agilent's Electronic Measurement Group is now **Keysight Technologies.**