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COVER STORY



Keysight has introduced the next generation of handheld microwave analyser, the FieldFox B-series, which combines a spectrum and vector network analyser and delivers bandwidth up to 100 MHz for wide-band, real-time spectrum analysis to enable 5G testing in the field.

Accurate microwave measurements are becoming increasingly necessary in harsh and hard-to-reach environments spanning a wide range of conditions: day or night, rain or shine, hot or cold; aboard a ship, in an aircraft or in a vehicle. In these situations, a handheld instrument must be capable of making the required measurements with high performance and accuracy.

FieldFox B handheld analysers provide the following benefits:

- 100 MHz bandwidth in real time for cellular base-station testing.
- PRF 28800F compliance to withstand explosive impact and wet weather conditions.
- 10 dB improvement in displayed average noise level (DANL) for measuring low noise signals and detecting weak interferers.
- The ability to collect, play back and analyse raw I/Q data for electronic warfare test.
- A task-driven user interface for each operation mode, helping save time and space in the field.
- Routine maintenance and in-depth troubleshooting, including multiple measurement applications to meet specific measurement needs.
- 89600 VSA software, enabling measurements to be easily transported from the field to the lab for further analysis.



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KEEP PACE WITH A STANDARDISED DEVELOPMENT PROCESS

Nicholas Butler, Head of Aerospace and Defense Marketing

Standardisation has been an aspirational objective in test organisations for decades.

In 1961, DB Dobson and LL Wolff of Radio Corporation of America (RCA) published 'Standardization of Electronic Test Equipment'. The paper presents the principles, criteria and techniques used in the investigation and prototyping of multipurpose missile system test equipment.

The goal of most early technology standardisation efforts was to limit the variety of test equipment used in test solutions across the organisation. The key objective RCA achieved was the design and deployment of a modular hardware set. Modular hardware leads to higher equipment re-use, more integrated test solutions, fewer obsolete components and an easier process for technology replacement. With a large mix of products and assets that can stay in service up to 50 years, test groups in the aerospace and defence industry stand to benefit most from test systems that are more maintainable and re-usable.

Security requirements and fast-paced changes are compelling modern test organisations to go far beyond just hardware standardisation. They're now focusing on both software layers and the practices used to develop them. Test engineering teams must begin the process of adopting and standardising on iterative software development to keep pace with product development teams and maintain project schedules in an industry that is quickly modernising.

Software as the backbone of standardisation

The RCA paper describes the process of identifying shared inputs and outputs across multiple functional components and missile programs to define the requirements of its modular hardware system. That process of identifying and separating common elements that can be addressed together is the basis of abstraction. Larger instrumentation standardisation efforts and a move towards commercial off-the-shelf technology have led to modular hardware standards like VXI, PXI, PXIe and AXIe that are used in test organisations across many industries. Standard modular hardware platforms abstract redundant elements like power supplies, cooling and user interfaces to single points within the system.

In the report 'Design and Acquisition of Software for Defense Systems', the Defense Science Board (DSB) states "many of the capabilities provided by our weapons systems are derived from the software of the system, not the hardware. This shift from hardware-enabled capabilities to software-enabled capabilities is increasing quickly." Modern instrumentation increasingly includes processors and software-defined components like FPGAs. To get the most out of these modern test solutions, defining measurement systems in software is not only beneficial but necessary.

The best test software engineering teams are building abstracted test software that delivers even more benefits than abstracted hardware provides. An abstracted software platform comprises layers that perform specific functions. This allows teams to repair and upgrade each module individually while isolating other layers by maintaining the same inputs and outputs. "With dozens of legacy business lines, software standardisation has to address the history of each group," said Mark Keith, Chief Engineer at Honeywell Aerospace. "The purpose [of abstraction] is to minimise or eliminate the need for software modifications when that obsolete hardware is replaced.

"With the rate of change in technology today, 30 years can feel like an eternity. Sometimes the best-in-class approaches of today just aren't compatible with the best-in-class approaches of the past."

Modern software development for test

At the pace new products and features are released in today's market, just organising a test software architecture properly is no longer enough. The test software organisation must implement practices that drive faster and more flexible delivery to manufacturing and the customer. To deliver all the demanded features, modern software engineering teams are moving to continuous iterative software development practices like Agile.

As stated in the DSB report, "The main benefit of iterative development is the ability to catch errors quickly and continuously, integrate new code with ease

and obtain user feedback throughout the development of the application." Iterative software development is now an industry-standard practice, and it "will help the [Department of Defense (DoD)] operate in today's dynamic security environment, where threats are changing faster than Waterfall development can handle".

Standardising on iterative development

Iterative software development requires a well-orchestrated team that works cooperatively and, much like the abstraction of hardware platforms and software architectures, includes shared and repeated concepts and tasks.

Teams that collaborate on code bases must agree and standardise on tools for source code control, unit test frameworks, code analysis, work management and deployment. A growing additional concern is cybersecurity. The DSB states, "Checking a software system's code base daily keeps manageable the number of changes required to comply with a large base of cyber rules."

In the report 'Contracting Strategy for F-22 Modernization', the Inspector General of the DoD states, "According to a Program Office official, the DoD is at risk of losing its technological edge against US adversaries and it needs to find innovative ways to bring capabilities to the warfighters faster." Aerospace and defence is not the only industry in which test teams are struggling to deliver better technology to market faster. Iterative development is a proven method for accelerating technology development across multiple industries.

While test engineering teams have been focusing on hardware standardisation and tiered software architectures, R&D organisations have moved towards iterative product development. All aspects of standardisation are important and valuable to test organisations, but standardisation must be refined to work with the engineering practices under development today. Test organisations that adopt Agile software development practices are poised to capitalise on this approaching opportunity.

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ORITECH EXTENDS PARTNERSHIP WITH NORDSON CORPORATION

Oritech, a supplier of tools and equipment to the Australian electronics industry, has announced it has extended its distribution and service support partnership with Nordson Corporation within Australia and New Zealand, providing new opportunities for electronics manufacturers looking for SMT production systems.

A leader in precision dispensing, fluid management and related technologies, Nordson manufactures and markets differentiated products used for dispensing adhesives, coatings, sealants, biomaterials and other materials; for fluid management; for test and inspection; and for UV curing and plasma surface treatment.

Oritech has been Nordson's official distribution partner for the Nordson Select range of selective soldering equipment since Nordson acquired Interselect two years ago. Following the success of this partnership and training at Nordson's headquarters in Singapore, Oritech has now taken on the entire Nordson range, including:

- Asymtek dispensing systems
- Dage Bondtester systems
- Dage X-ray systems
- Matrix AXI systems
- March Plasma systems
- Nordson Select systems
- Sonoscan Acoustic Micro Imaging Inspection Systems
- Yestech Automatic Inspection systems
- Existing service and support

"Having worked closely with the Nordson team for many years, especially over the past 24 months, we have put in place the necessary resources to deliver and support the entire Nordson range within the Australian and New Zealand market," said Oritech Sales Manager Roy Kingon. "We are excited to bring the entire Nordson range to our customers and to continue to help them on their path to continual improvement."

Oritech will be exhibiting at Electronex, to be held in Melbourne from 11–12 September, on Stand B2.



ON-TRACK TECHNOLOGY RELOCATES TO MILPERRA

Contract electronic manufacturer On-Track Technology has made the decision to relocate from its Mascot manufacturing facility, which has helped the company service the local electronic manufacturing industry for the past 19 years.

As its business continues to grow, the On-Track management team has taken into account many considerations and limitations of the current Mascot manufacturing facility. Ultimately, the company decided to relocate and build a custom, purpose-built manufacturing facility to better service its customers' electronic manufacturing requirements, both now and into the future.

From mid-July, On-Track Technology's manufacturing facility can be found at its new address of 12 Works Place, Milperra, NSW 2214. For any enquiries, call the office on (02) 9700 7000.



ELECTROLUBE TO HOST CONFORMAL COATINGS SEMINAR

Electrolube, the global electrochemicals manufacturer for electronics, automotive and industrial manufacturing, will present a technical seminar at Electronex, which takes place from 11–12 September at the Melbourne Convention and Exhibition Centre.

The seminar will be presented by Beth Turner MSc (pictured), Development Chemist for Electrolube's Conformal Coatings Division, who will provide a comprehensive overview of next-generation conformal coatings for harsh environments as well as a useful insight into coating vs encapsulation.

The seminar will focus on protecting electronics from the harshest environments with new-generation conformal coatings. Visitors will have the opportunity to learn about the different types of coatings available — for instance, how to speed up production with next-generation UV cure products — as well as explore the varying levels of protection that different coatings provide.

Turner will also highlight examples of how to select the most suitable product for your application by providing an insight into how Electrolube has provided collaborative solutions for a number of different applications with its global customers. Visitors will gain a deeper understanding of when it is better to use an encapsulation resin rather than a coating, learn the difference between these two mediums, and hear about a new-generation 2K conformal coating that encompasses the same features as a resin but in a coating format.

"Electronex Australia is a fantastic opportunity to share our expertise in conformal coatings and encapsulation resins with the electronics community, and for visitors to get an in-depth insight into the variety of coatings available that serve virtually every manufacturing need," Turner said. "The seminar will provide a greater understanding of conformal coatings for harsh environment [and] how to speed up production with UV cure coatings, and will expand on when it is best to use an encapsulation resin rather than a coating. I'm really looking forward to helping visitors find better solutions for their existing coating processes."



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EMC TECHNOLOGIES RECEIVES FURTHER NATA ACCREDITATION

Testing house EMC Technologies has advised that it can now provide NATA accredited testing to IEC 61000-4-18 or EN 61000-4-18: Electromagnetic compatibility (EMC) – Part 4-18 : Testing and measurement techniques – Oscillatory wave immunity test.

IEC 61000-4-18 relates to the immunity requirements and test methods for electrical and electronic equipment, under operational conditions, with regard to:

- repetitive damped oscillatory waves occurring mainly in power, control and signal cables installed in high-voltage and medium-voltage (HV/MV) substations;
- repetitive damped oscillatory waves occurring mainly in power, control and signal cables installed in gas insulated substations (GIS) and in some cases air-insulated substations (AIS), or in any installation due to



©iStockphoto.com/Mauro Salvaggio

high-altitude electromagnetic pulse (HEMP) phenomena.

Compliance with this standard will establish the immunity requirements, using a common reference for evaluating

in the laboratory, of electrical and electronic equipment intended for residential, commercial and industrial applications, as well as of equipment intended for power stations and substations, when subjected to damped oscillatory waves.

Test voltage, current waveforms test equipment and test procedures are defined in the standard. Test levels are given for slow damped oscillatory waves (100 kHz or 1 MHz) and for fast damped oscillatory waves (3, 10 or 30 MHz).

This testing service is claimed to be unique in Australia, and is now available to manufacturers and suppliers of equipment to be used in MV/HV power stations. The service complements EMC Technologies' NATA testing to related standards IEC/EN 61000-4-8, IEC/EN 61000-4-9, EN 61000-4-10, IEC/EN 61000-4-12 and IEC 61000-4-16, all of which are provided under the one roof.

5G COMMUNICATION ACHIEVED WITH A GLASS ANTENNA

Japanese mobile operator NTT DOCOMO, glass supplier AGC and communications provider Ericsson have achieved what they believed to be the world's first 5G mobile telecommunications using an antenna embedded in synthetic fused silica glass to transmit and receive 28 GHz 5G radio signals for stable, high-speed mobile communication in buildings, vehicles and trains.

The antenna was used to verify 28 GHz 5G mobile communication with downlink speeds averaging 1.3 Gbps within a 100 m range and reaching a maximum of 3.8 Gbps at 400 MHz. The verification tests, which used a vehicle fitted with multiple antennas and travelling about 30 km/h, were conducted in the Sumida area of Tokyo between 22 April and 28 May.

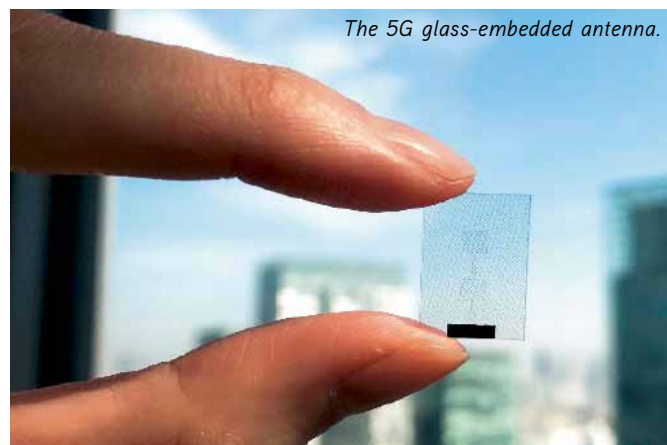
Radio signals in the 28 GHz band are more linear than 4G LTE signals, so they are not strong enough to adequately penetrate windows in buildings, vehicles and railway cars. The glass antenna can be attached to window surfaces to enable radio waves to

be received and relayed in ideal directions for stable, high-speed 5G communications under challenging indoor and in-vehicle conditions.

Antennas were used in multiple spots on the test vehicle, including the windshield, side windows and rear window, enabling data to be transmitted and received in ideal directions for maximum signal strength. As a result, stable, high-speed communication was achieved even in urban areas where signals were blocked or reflected by obstacles.

The 5G glass antenna's small size and transparent appearance allow it to be installed unobtrusively in buildings, vehicles, etc., without impairing the installation object's

appearance or design, or people's line of sight. Going forward, DOCOMO, AGC and Ericsson will continue to refine antenna technology to enable the glass antenna to function compatibly with Massive MIMO — a technology that uses multiple antennas to transmit and receive data, aiming to achieve faster 5G communication speeds and expanded 5G use under diverse conditions.



The 5G glass-embedded antenna.

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USB-TO-CAN CONVERTER

The I-7565M-HS, from ICP DAS, is a high-speed USB-to-CAN converter with two CAN channels. Providing fast CAN bus communication performance, it supports the CAN2.0A/2.0B protocol and different baud rates ranging from 5 to 1000 Kbps. The

most important feature of the device is its ability to support the user-defined baud rate functionality no matter what that baud rate is.

When the product is connected to a PC, the PC will automatically load the relevant device driver (hot plug and play). As a result, the converter makes data collection and the processing of CAN bus networks fast and simple for any user. It is suitable for a range of applications, including CAN bus monitoring, building automation, remote data acquisition, environment control and monitoring, laboratory equipment and research, and factory automation.

ICP Electronics Australia Pty Ltd
www.icp-australia.com.au

POWER QUALITY ANALYSER

The CHK Miro PQ45 Power Quality Analyzer is a weatherproof and compact analyser that is certified to IEC61000-4-30, Class A. It is suitable for power quality analysis, supply compliance checks and voltage investigation, power flow studies, energy audits solar and railway systems, and transformer monitoring. It is powered from Phase A to Neutral or an external PV with an internal backup battery. The product is available to rent from TechRentals.

The CHK Miro PQ45 has isolated voltage inputs to facilitate various wiring configurations while each channel has its own neutral. Its expansion port allows for system expansion to include additional sensors, input/output controls and custom interfaces, which broaden the PQ system platform. It has built in Phase A supply to cover full 600 V operating range.

Running on the CITRUS platform, this device is powerful, easy to use and supports all other CHK PQ products, making it an effective tool for device management, data analysis and reporting. It also has LCD display for clear logging status, quick verification for correct installation and graphical colour display.

Additionally, with its gapless logging, users can download data, clear log memory and configure the device with no interruption to logging. Concurrent logging is available at all Class A intervals plus a user-adjustable interval.

TechRentals
www.techrentals.com.au



INDUSTRIAL MOTHERBOARD

The AIMB-286 THIN Mini-ITX industrial motherboard, from Advantech, supports the latest 8th Generation Intel Core Processors. It features Intel's 9th generation graphics engine for the latest in video acceleration, as well as an Intel H310 chipset that provides abundant I/O in a flat, thin design of only 25 mm. This embedded motherboard comes bundled with Advantech's value-added smart software suite, WISE-PaaS/RMM, which brings the benefits of cloud computing within reach of many embedded application developers.

Designed to support space-limited applications, the AIMB-286 builds on the standard Mini-ITX form factor with only 25 mm I/O height (from PCB top side), making it suitable for integration in tight spaces. It offers high-performance computing and multiple expansion interfaces including an M.2 B key for 4G/LTE connectivity or storage and an M.2 E key for Wi-Fi connectivity. Additionally, the product supports 3x GbE LAN, 8x USB (4x USB3.0 + 4x USB2.0) and one single PCIe4 slot which allows for the installation of different modular add-on cards.

With multiple expansion capabilities, the device is suitable for factory automation, machine vision and robotics applications which typically require multiple video camera connections for video capture, object detection and examination.

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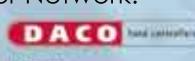
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WHERE NANOTECHNOLOGY, THE IoT AND INDUSTRY 4.0 MEET

Liam Critchley*

The Internet of Things (IoT), Industrial Internet of Things (IIoT) and Industry 4.0 are significantly growing due to advances in the ability to record more accurate data and automated data analysis methods. Recent software, algorithm and machine learning advances enabled the automation of many sensor networks to the point where an operator is not required unless notified by the system itself.

These new sensor networks and data manipulation approaches are used in applications ranging from smart buildings to industrial production processes — where each environment is readily optimised based on the trends of the recently obtained data against the historical data. In many cases, they can automatically change the internal conditions themselves and will only notify the operator if an issue occurs or the data trends show that downtime is imminent. This has provided much higher efficiencies to a range of industries.

While nanotechnology is not everybody's first thought when they think of the IoT, there are already ways in which nanotechnology is helping to propel this area of data optimisation; and there will be areas that are likely to be used commercially in the future. These areas range from the initial point of measurement to building an information exchange network using nanomaterials.

Improving the capability of sensors

At the heart of the IoT and Industry 4.0 are the sensors themselves. Perhaps the area that will benefit the most from nanotechnology is the initial data measurement. As software and data analysis approaches advance, they can work with a much greater amount of data; and the more accurate the initial data point is, the more accurate the whole IoT system is.

The incorporation of nanomaterials as the 'sensing materials' into various types of sensors is well documented, with much greater efficiencies being afforded by their use. The small size of nanomaterials — in particular, 2D materials such as graphene — often provides a high surface area that can detect changes in an environment. Now, not every sensing mechanism is the same — some are remote, some are through absorption of molecules and some are in response to a physical change (among others).

Nanomaterials have various properties that enable these mechanisms to work efficiently — whether it is through measurable optical changes in the distance, adsorbing atoms at its surface or the ability to be flexed, stretched or compressed. Some nanomaterials can perform at least one, if not all, of these mechanisms. The high sensitivity, and therefore more accurate data points, is often due to the high electrical conductivity and charge carrier mobility of nanomaterials. When something is sensed (through adsorption, physical change, etc), the sensing mechanism invokes a change in the electrical conductivity of the nanomaterial, which is then detected as a measurable response. Because the conductivity and charge carrier mobility within a nanomaterial are often high (ie, high-conductivity nanomaterials are usually used), the sensitivity is high, as very slight changes to the conductivity will provide a detectable response.

The Internet of Nano Things (IoNT)

The second area where nanotechnology can be combined with the IoT is in the creation of a physical network composed of nanomaterials that facilitate the exchange of data through different components communicating with each other at the nano level. This is known as the Internet of Nano Things (IoNT). In terms of development, it is not yet at the level of other IoT systems, but it is attracting interest from the communication and medical sectors. One such example is in field-based applications, where remote sensing is required, or for measuring different points within a human body.

How the system works

As with any system, there are multiple components, and the IoNT is no different. There are also two common ways that these components communicate with each other, and these are through electromagnetic nanocommunication (transmission and receiving of electromagnetic waves) and molecular communication (information encoded in molecules). As for the components themselves, there are four main areas of the IoNT that help to facilitate the transfer of information — these are nano nodes, nano-routers, nano-micro interface devices and gateways.

Nano nodes are the simplest and smallest component within the IoNT set-up and are seen as a basic nanomachine. These small nanomachines are used to transmit data and perform basic computations. However, their small size (and energy) limits the distance that they can transmit data, and they possess a very small internal memory. Nevertheless, they can be placed in a specific location and transmit data to a larger nano-router, which then transmits the data over longer distances. Therefore, the nano nodes can often be the actual sensor component of the system.

The nano nodes pass the data on to the nano-router, which is a nanomachine with a much larger computational power. Because they possess a much higher computational power, they act as an aggregator for all the surrounding nano nodes that obtain the initial data. They can then control the exchange commands between the nano nodes and send the information to the nano-micro interface device. These interface devices aggregate all the data from the nano-routers and transmit the data to the microscale (and vice versa) using a combination of nano-communication techniques and classical network protocols. The gateway then acts as the controller of the whole system and enables the data to be accessed anywhere via the internet.

Conclusion

Industry 4.0 is only just emerging and will continue to advance in the coming years. That is a given. However, even though conventional data transferring, cloud computing and data manipulation approaches are used across many industries now, there may come a point — just like computing — where the transfer of data needs to occur through much smaller architectures. When the immediate need is there commercially, the groundwork being put into the IoNT will enable it to be used when Industry 4.0 really takes a hold across all industry sectors.



**Liam Critchley is a writer, journalist and communicator who specialises in chemistry and nanotechnology and how the fundamental principles at the molecular level can be applied to many different application areas. Liam is perhaps best known for his informative approach and explaining complex scientific topics to both scientists and non-scientists. Liam currently has over 350 articles published across various scientific areas and industries that cross over with both chemistry and nanotechnology.*

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SHIELDING QUBITS FROM ENVIRONMENTAL NOISE

Image courtesy of UNSW Media.

A team of scientists and engineers from UNSW Sydney, Griffith University and the University of Technology Sydney (UTS), in partnership with seven leading US institutions, have launched a new project to develop a 'noise-cancelling headphone' for quantum computers, set to increase the stability of fragile quantum building blocks.

Unlike classical computers, where digital data is stored in bits whose '0' or '1' value can be stored and manipulated very robustly, quantum computers encode information in delicate superposition states of quantum bits, or 'qubits'. There, the information can be processed with exponentially more computational power than in a classical computer, but it is also highly susceptible to any kind of environmental noise.

"To build a reliable quantum computer, we must shield the quantum bits from that noise in the environment," said Professor Howard Wiseman, Director of the Centre for Quantum Dynamics at Griffith University.

That's the problem that Prof Wiseman and his colleagues are trying to solve. Specifically, the team is building the capacity to cancel noise around a 'data qubit' by detecting the noise on a 'spectator qubit' in its vicinity, and using advanced machine learning algorithms to adapt the controls that encode information in the data qubit.

"Our expertise is in building single-atom quantum bits in silicon," said Andrea Morello, Scientia Professor of Quantum Engineering at UNSW Sydney and one of the leaders of the project. Prof Morello's team was the first in the world to encode quantum information in a silicon chip.

"Until now we have used phosphorus as the data qubit, since it is the simplest atom to use in silicon. But our technology, based on ion implantation, allows us to choose from many other types of atoms, some of which are more sensitive to noise. The

other atom will act like a 'spectator in the theatre', or like the microphone in a noise-cancelling headphone."

The information about the noise, picked up by the 'spectator qubit', needs to be processed in real time in order to feed the 'data qubit' with a signal that cancels out the effect of the noise. Griffith University's Dr Gerardo Paz-Silva, leader of the overall project, said, "We will develop theoretical methods to analyse and process the noise around the quantum bits.

"This needs to be done very efficiently, because extracting information out of quantum systems is itself a delicate process."

To 'close the loop' in the system, the consortium includes leading researchers in quantum machine learning, based at UTS. Dr Chris Ferrie, the group leader at UTS, says machine learning is ideally suited to make on-the-flight decisions on how best to counteract the noise that risks destroying the information on the data qubit.

"The data-spectator qubit system is a very challenging testbed for our algorithms," Dr Ferrie said. "What we will develop for this application is likely to have broad impact even outside of quantum computing, for instance for advanced tasks in defence and data analytics."

The project was set up by the Department of Defence's Next Generation Technologies Fund, in scientific coordination with the US Army Research Office. According to Chief Defence Scientist Professor Tanya Monro, "This is a great example of how Defence can facilitate international research projects that harness excellence in research in Australia and create a pathway to impact from new discoveries."



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SiC FET SWITCHING TRANSISTORS

UnitedSiC has released a family of high-performance FET transistors based on a cascode configuration, made with the use of SiC technology. A JFET (SiC) transistor and Si-MOSFET transistor are optimally connected in one housing, which results in

an easy-to-apply switching cascode. The product can be successfully used in applications with high operating frequency and demanding thermal conditions, in which it can replace MOSFET or IGBT transistors.

Features include low resistance in switch-on state; operating temperature of up to 175°C; short switch-off time; low gate capacity; reverse voltage of up to 650 V; low internal thermal resistance; and internal ESD protection.

Typical applications include motor drivers; impulse power supplies; power factor correction systems; inductive loads; inverters; and converters for solar panels.

Transfer Multisort Elektronik

www.tme.eu

DUAL- AND SINGLE-CORE DIGITAL SIGNAL CONTROLLERS

System developers designing high-end embedded control applications need flexible options to provide scalability as projects increase in complexity. To meet these needs, Microchip Technology has announced dual- and single-core dsPIC33C digital signal controllers (DSCs) with more options to meet changing application requirements across memory, temperature and functional safety.

Microchip's dsPIC33CH512MP508 dual-core DSC enables support for applications with larger program memory requirements. The dsPIC33CK64MP105 single-core DSC is suitable for applications that require smaller memory and footprint. Developers can easily scale across product lines using the devices, which are pin-to-pin compatible within the dsPIC33CH and dsPIC33CK families.

The dsPIC33CH512MP508 (MP5) family expands the dsPIC33CH with Flash memory growing from 128 to 512 KB and triples the program RAM from 24 to 72 KB. This enables support for larger applications with multiple software stacks or larger program memory, such as automotive and wireless charging applications. More memory is needed to accommodate AUTOSAR software, MCAL drivers and CAN FD peripherals in automotive applications.

In the dual-core devices, one core can function as a master while the other is designed as a slave. The slave core is useful for executing dedicated, time-critical control code while the master core is busy running the user interface, system monitoring and communications functions; for example, having two cores facilitates partitioning of the software stacks for parallel execution of the Qi protocol and other functions such as NFC to optimise performance in automotive wireless charging applications.

The dsPIC33CK64MP105 (MP1) family extends the dsPIC33CK family with a version for smaller memory and footprint applications, offering up to 64 KB Flash memory and 28- to 48-pin packages. Package sizes are available as small as 4 x 4 mm. This compact device offers a good combination of features for automotive sensors, motor control, high-density DC-DC applications or standalone Qi transmitters. Both single- and dual-core dsPIC33C devices enable fast deterministic performance for time-critical control applications, providing expanded context selected registers to reduce interrupt latency and bringing fast instruction execution of math-intensive algorithms.

Functional safety features include multiple redundant clock sources, fail safe clock monitor (FSCM), IO ports read-back, flash error correction code (ECC), RAM built-in self-test (BIST), write protection, analog peripheral redundancies and more. A robust set of CAN-FD peripherals, along with support for 150°C operation, make the devices suitable for use in extreme operating conditions such as under-the-hood automotive applications.

Microchip Technology Australia

www.microchip.com



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WEATHERPROOF WIRE CONNECTORS

The IP68 rated IDEAL TWISTER WeatherProof Wire Connectors range is designed for interior/exterior cable connections when exposed to damp/wet and corrosive environments. In many cases, traditional screw or tunnel type connectors are not suitable for these applications and require additional materials like heat shrink, resin packs or tape to ensure a safe connection.

IDEAL TWISTER WeatherProof Wire Connectors are 100% silicon filled, eliminate the need for additional materials and provide a safe, durable and long-lasting connection in harsh environments in one easy step. The twist is

savings in time, money and energy.

Applications include but are not limited to: outdoor lighting and signage, outdoor power outlets, deck and patio lighting, pool filters and pumps, parking lot and street lighting, sump and well pump installations, security systems, bathroom/spa vent fans and irrigation systems.

For the user's peace of mind, the connectors comply to AS/NZS IEC 60998.1 and AS/NZS IEC 60998.2.4 standards, are rated and tested to IP68, suit various cable types with voltages up to 32 A 450 V and have a temperature rating of 105°C.

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AUTOMOTIVE POWER-MANAGEMENT IC

The STMicroelectronics L5965 seven-output automotive power-management IC (PMIC) enables compact electronic control units for automotive-vision systems and other in-vehicle applications, leveraging direct operation from battery voltage with register-programmable output voltages and sequencing and integrated functional-safety mechanisms.

With seven regulated outputs, a single PMIC can power an entire camera- or radar-based driver-assistance system including the sensors, memory ICs, processor and CAN interface circuitry. One-time programmable (OTP) cells for setting the output voltages and sequencing give flexibility to configure the PMIC for a wide variety of advanced driver assistance systems and other in-car applications.

The product's ability to operate directly from the vehicle battery allows its use without a pre-regulator. Its register-programmable outputs also eliminate voltage-setting resistors, and the on-chip regulators can be used without external compensation circuitry. These savings in external components also eliminate fluctuation due to environmental effects on external components.

The integrated functional-safety features are designed in compliance with ISO 26262 and enable systems to fulfil Automotive Safety Integrity Level (ASIL) requirements up to ASIL-D. The mechanisms include a failure status pin, voltage monitors, ground-loss comparators, analog and digital built-in self-test (BIST) and temperature monitors.

STMicroelectronics Pty Ltd

www.st.com



ANALOG-TO-DIGITAL CONVERTERS

Analog Devices has released the AD7380 and AD7381 successive-approximation register (SAR) analog-to-digital converters (ADCs). The pin-compatible, 16-bit AD7380 and 14-bit AD7381 ADCs feature throughput rates of 4 MSa/s and a tiny 3 x 3 mm LFCSP package.

The ADCs have a serial interface with two separate data output pins. Engineers can access data on the devices via the serial interface, which can operate with one or two serial outputs.

The ADCs feature fully differential analog inputs that accept a wide common-mode input voltage, sampling and converting on the falling edge of CS. The conversion process and data acquisition use standard control inputs allowing easy interfacing to microprocessors or digital signal processors (DSPs). Integrated on-chip oversampling blocks improve dynamic range and reduce noise at low bandwidths.

The dual simultaneous-sampling, high-speed ADCs operate from a 3 to 3.6 V power supply, with a buffered internal 2.5 V reference (optional external reference up to 3.3 V) and typical drift of just ± 1 ppm/°C. They are suitable for motor control, sonar, power quality and data acquisition applications.

Mouser Electronics

au.mouser.com



INDUSTRIAL MOTHERBOARD

The AIMB-U117 UTX industrial motherboard is equipped with Intel Atom E39XX processors and features three independent displays, onboard eMMC storage and good I/O capabilities. It supports a wide range of DC power inputs

from 12–24 V and has a lockable DC jack to ensure power cables remain securely connected in high-vibration environments.

The device integrates an Intel Gen 9 graphics engine for high throughput, media acceleration and 4K2K display resolution. It offers substantial display interfaces, including DisplayPort1.2, HDMI1.4 and eDP (or LVDS). The 4096 x 2160 high-resolution output meets the requirements of high-quality display applications, making it suitable for digital signage applications requiring a slim-sized solution with high-resolution graphics and up to three independent display outputs.

The AIMB-U117 offers an I/O interface that includes dual GbE LAN ports, 4 x USB 3.0, 1 x SATAIII and 2 x COM (RS232, RS422 or 485). For expansion, it supports 1 x M.2 (E key) and 1 x full-sized MiniPCIe (colay mSATA) for flexible modular add-on card installation.

Compliant with flexible thermal solutions designed by Advantech engineers, the product supports extended operating temperatures from -20 to 70°C for rigorous performance under intense conditions. It is therefore suitable for use in automation applications and/or semi-outdoor public environments where passenger information systems, signage walls and vending machines are located, such as airports or train stations.

Advantech Australia Pty Ltd

www.advantech.net.au





MORE POWER ON YOUR PCB

PCB TERMINAL BLOCKS FOR POWER ELECTRONICS

WAGO's line of PCB terminal blocks gives a comprehensive product portfolio that perfectly meets the needs of today's power electronics. Combining compact design and a high current-carrying capacity with all the advantages of WAGO's Push-in CAGE CLAMP® connection technology, WAGO's new terminal blocks simplify wiring and maximize PCB design flexibility.

WAGO's power electronics portfolio includes six terminal block families. The PCB terminal blocks accommodate 4 mm², 6 mm² and 16 mm² conductors, are rated up to 1000 V/76 A and can be operated via operating tool or lever. They are equipped with Push-in CAGE CLAMP® technology for all conductor types, allowing solid and ferruled conductors to be simply pushed into the unit. The new terminal blocks terminate conductors both horizontally and vertically to the PCB. Furthermore, they can be tested both parallel and perpendicular to conductor entry.

SAVE SPACE ON THE PCB

Beyond their nominal cross-section, the PCB terminal blocks may connect solid and fine-stranded conductors up to the next larger cross-section size. This advantage saves space on the PCB and reduces device connection costs. WAGO's 2624, 2626 and 2636 Series PCB Terminal Blocks are ideal for space-restricted applications. Tool operation is performed parallel to conductor entry so that the clamping points can be easily reached – even if individual components are tightly packaged on the PCB. This makes these new 2624, 2626 and 2636 Series PCB Terminal Blocks ideal for compact device connections and panel feedthrough applications.

EASY-TO-USE LEVER

WAGO has developed the 2604, 2606 and 2616 Series PCB Terminal Blocks that enable intuitive and tool-free operation via lever. The blocks' lever is incredibly user-friendly because the respective latch positions (open/closed) can be clearly identified. When the clamping point is closed, the ease of movement becomes a tremendous advantage: the force of the open spring ensures that the lever closes – even at low force. This intelligent design always ensures a secure connection of the clamping point for all types of conductors, and virtually eliminates errors due to misuse.

Advantages:

- Comprehensive product range: 0.2 ... 25 mm² (24–4 AWG)
- Push-in CAGE CLAMP® termination of both solid and ferruled conductors
- Wider conductor range and higher current carrying capacity
- Conductor connection and mating direction both horizontal and vertical to the PCB
- Testing both parallel and perpendicular to conductor entry



For more information visit:

www.wago.com/au/electrical-interconnections/discover-pcb-connection

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THE KEY TO SUCCESS IN TEST AND MEASUREMENT

Lauren Davis



In an era of 5G, IoT, wearables, smart devices and more, how do you ensure your electronics company stands out from the crowd? According to test and measurement business Keysight Technologies, the secret is to take a customer-focused, R&D-centric approach.

Keynsight recently celebrated the opening of its new site in Mulgrave, Victoria — relocating and merging its pre-existing calibration labs with those of Thales Calibrations Services, which the company acquired in late 2018. The move to the custom-built, combined site largely occurred due to the high level of growth Keysight has experienced since branching off from life sciences company Agilent Technologies back in 2014, enabling it to concentrate on test and measurement applications for the electronics industry.

"When we launched we had a market capitalisation of \$5 billion, and now we're about \$15 billion — so we've tripled the size of the company," John Page, Keysight's Senior Vice President and President of Global Services, told *What's New in Electronics*. "We were about \$2 billion in revenue, now we're about \$4 billion in revenue — but it's been a lot of hard work to do that."

According to Page, the hard work in question involved totally reorganising the company so that it could double its spending on R&D, having always had to share such investment with Agilent in the past. It's just as well, then, that there's "a huge amount of R&D work" that goes on in the Australian electronics industry, Page said.

"[R&D is] where a lot of the problems get solved, it's where a lot of the sophisticated analysis has to work, and it's the step before you get to the manufacturing. So we still do a lot of work with manufacturing, but we do a lot of work with R&D facilities in the US, Western Europe and Australia."

The importance of R&D was reiterated by Steve Karandais, General Manager and Director at Keysight Technologies Australia. He said the company is very much looking to the future, and at being at the forefront of technologies such as 5G, IoT, connected cars and mmWave.

Page recalled: "There were people, when we broke off from Agilent, who said, 'You should cut your R&D'. We said, 'No, we're going to double our R&D and we're going to be first in these markets'. Because somebody needs to lead this stuff, and there's this huge opportunity there that's a much higher ROI for us."

In the case of 5G, for example, the company has spent the past five years working with universities, standards bodies and chipset providers to help define exactly how 5G could be achieved — and providing the equipment and software for these organisations to conduct their own tests along the way. And with Karandais claiming that 25% of all traffic will be carried by 5G by 2024, it's a move that looks set to pay off.

"Back when people didn't even know what 5G was yet — it wasn't defined, it wasn't anything — we put a very concerted effort, and real dollars and investment, behind understanding 5G, driving 5G, pushing it forward, helping standards bodies, and all those things," said Page. "So we invested very early on in that. And now 5G is everywhere."

"We're always going to be first in the markets that we're focused on. We're going to invest early and we're going to be first. And 5G is one of those examples; IoT is another one, automotive is another one."

Page added that Keysight is driven by the success of its customers, whose test and measurement needs are now higher than ever before — particularly in manufacturing environments, where software and analytics are required to decipher millions of measurements every second. As a result, the company has been reorganised to focus on customer applications; so rather than having different divisions for each product, products are brought together to create customised solutions. In addition, the company now offers a variety of services supporting customers throughout the life cycle of their entire project.

"Rather than being hardware focused and just maintaining equipment, it really became, 'Okay, we're trying to deliver a solution to the customer. How do we do that?' And so you can't really have a solution if services isn't part of it," Page said.

One such service surrounds asset utilisation and optimisation, with the company analysing whether customers are utilising their existing instruments efficiently. For example, Page said Keysight recently signed a deal with a group that was getting about 75% utilisation from its test equipment — and set out to increase this to over 90%.

"That's like having whole new sets of equipment for free that they never had before," he

said. "Now it's all up and running all the time; before they'd have to have an extra third of equipment, basically, because things would be out of service at times."

It's all a part of the newly launched KeysightCare service model, Page said, which offers support for instruments, software and solutions in the form of a dedicated online portal, scheduled calibration of test equipment, notifications of software and firmware updates, and access to experts who possess knowledge and understanding of current and changing technologies — all in an effort to reduce downtime, which is typically one of the biggest drains on any company's time and money.

"There's this MIT study that talks about how one of the biggest delays in projects is caused by downtime; so having engineers who are stumped by something," said Page. "Their equipment isn't working right, or they don't understand something. So KeysightCare really is about uptime, and keeping them going."

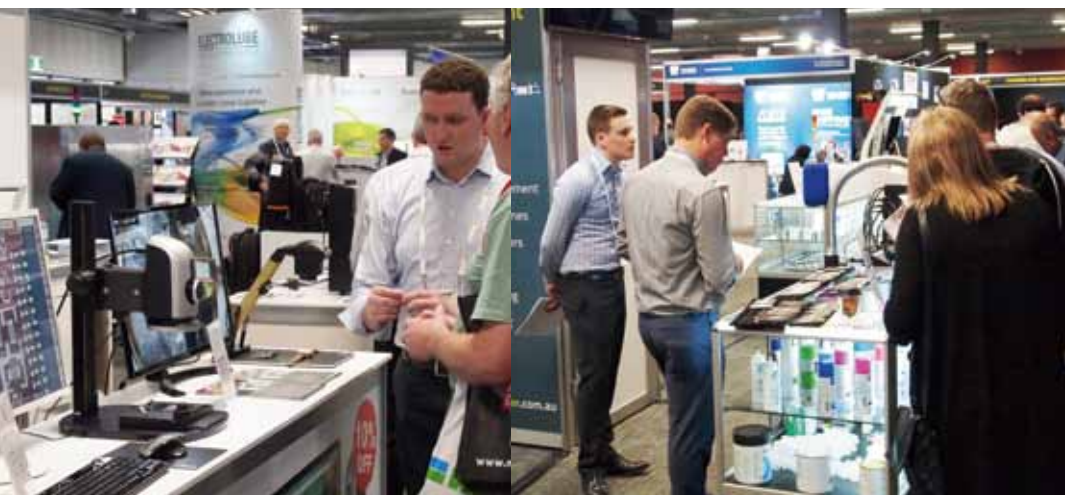
So what's next on the horizon for a company that has committed to being a market leader in new technologies? According to Page, there's still "a lot of runway left" in 5G, with Keysight aiming to remain at the leading edge. The company is also embracing the IoT — which is expected to connect around 22 billion devices by 2025, according to Karandais — and is excited to be implementing the technology in its own devices, with Page noting how advantageous it is for test and measurement applications.

"They [the devices] are all connected to the network, they all bring back data, they all carry out analytics," he said. "We have lots of data, so there's lots of opportunities to tie that all together."

Finally, Page revealed that Keysight is "investing heavily" in quantum computing, working with leading researchers around the world to help drive the technology forward. He admitted, "It's really early days, but you can't wait till everything's figured out if you really want to contribute to it."

"How big is it going to be? How quickly is it gonna come? Nobody knows exactly, but it goes back to the philosophy of: invest in those areas and be first."

Keysight Technologies Australia Pty Ltd
www.keysight.com



ElectroneX
electronics design & assembly expo

ELECTRONEX MOVES TO MCEC

ElectroneX – The Electronics Design and Assembly Expo, Australia's dedicated trade event for the electronics industry, will be staged in Melbourne this year from 11–12 September.

Now in its 10th year and alternating annually between Sydney and Melbourne, the expo has outgrown its previous venue at Melbourne Park Function Centre and relocated to the Melbourne Convention and Exhibition Centre — a move which has seen a record number of companies participating in this year's event. With more than 100 companies now represented at the expo, a technical conference plus free seminars featuring leading international and local industry experts, this is a must-see event for decision-makers, managers and engineers designing or manufacturing products that utilise electronics.

This year's event will feature a host of new product releases as well as advanced manufacturing solutions as Australian companies move towards hi-tech specialised manufacturing applications. Companies are sourcing more products and solutions from Australian-based suppliers as local manufacturers seek out specialist applications and recognise the expertise and quality control that is available from local suppliers.

In addition to featuring a wide range of electronic components, surface mount and inspection equipment together with the latest test and measurement products and other ancillary products and services, companies can also discuss their specific requirements with contract manufacturers that can design and produce turnkey solutions for specific applications.

The last expo in Melbourne in 2017 attracted over 1000 electronics design professionals, including electronic and electrical engineers, technicians and management, along with OEM, scientific, medical, IT and communications professionals, defence, government and service technicians. A series of free seminars on the latest hot topics will also be held on the show floor. Trade visitors can register for free online.

SMCBA conference

Since 1988 the Surface Mount & Circuit Board Association (SMCBA) has conducted Australia's only conference dedicated

to electronics design and manufacture, bringing together local and international speakers to share information critical to the successful design and development of leading-edge electronic products and systems engineering solutions. The 2019 conference will once again be held in conjunction with ElectroneX, featuring a comprehensive two-day workshop program presented by Martin O'Hara from the UK, Jasbir Bath from the USA and Andy Kowalewski.

O'Hara is conducting the two-day workshop 'New Product Development and Introduction', which will cover from start to finish the processes and procedures for new product development and introduction. O'Hara is a successful engineering manager with a strategic mindset and drive to improve quality and environmental issues within development and manufacturing.

Bath is conducting the two-day workshop 'Improving Manufacturing Yield and Reliability', which will be presented in six parts. He has over 25 years of experience in research, design, development and implementation in the areas of soldering, surface mount and packaging technologies, and extensive knowledge of soldering technologies.

Finally, Kowalewski is conducting the two-day workshop 'PCB Design' — a comprehensive course covering many of the trade-offs and design that make PCB design ever more difficult. Kowalewski has been a board designer for 39 years, and so will be a useful source for PCB designers and engineers looking to stay in tune with the industry in order to be successful in bringing products to the market on time, on budget and with a minimum of development cost.

What: ElectroneX expo and SMCBA conference

When: 11–12 September

Where: Melbourne Convention and Exhibition Centre

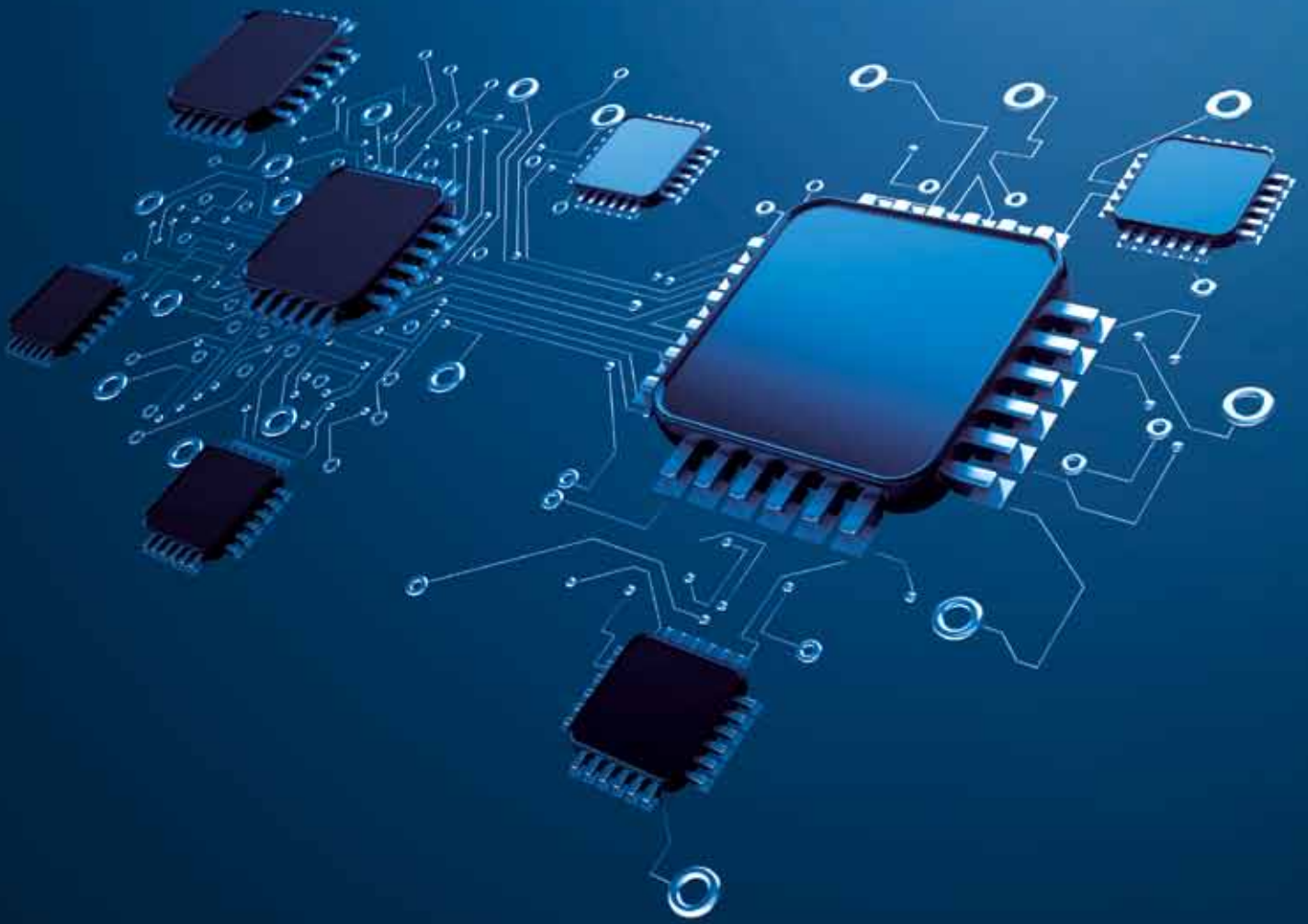
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STAND D33 SIGNAL AND SPECTRUM ANALYSER

The R&S FSV3000 is designed to help users set up complex measurements in the simplest and fastest way possible. With its easy usability and high measurement speed, it is a suitable instrument for labs and production lines. It provides up to 200 MHz analysis bandwidth — enough to capture and analyse, for example, two 5G NR carriers at once.

The R&S FSV3000 features functions that make complex measurements fast and easy. Setting up RF parameters with touchscreen gestures is as easy as using a smartphone. The auto set feature automatically sets the most important parameters such as frequency, level and gating. The SCPI recorder, which translates manual operation into remote control command scripts, will be appreciated by test system software engineers. Event-based actions support the user when debugging the DUT by capturing and documenting rare events.

The R&S FSV3000 is now available from Rohde & Schwarz.

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STAND C28 ENCRYPTION FRAMEWORK

Kontron APPROTECT encrypts an application's source code in a way that makes reverse engineering impossible, featuring copy protection, IP protection and protection from reverse engineering and tampering.

It is a combined hardware and software solution that includes an embedded hardware security chip on all new Kontron products and the software framework to provide full application protection. It is available either integrated in products starting with the 6th generation Intel Core and Intel Xeon processors and latest-generation Intel Atom, Intel Celeron and Intel Pentium processors, or by using an upgrade kit.

At application level, the Kontron Secure System concept relies on the APPROTECT hardware and software solution. It combines the software framework with an integrated security chip in addition to the TPM 2.0 (Trusted Platform Module) chip to provide comprehensive protection for the application software. Additionally, APPROTECT Licensing enables business models such as pay per use, time-based trial versions or enable/disable features, and adds a software management framework.

Kontron Australia Pty Ltd
www.kontron.com.au

STAND D9 UV CURE CONFORMAL COATINGS

Electrolube, the global manufacturer of electrochemicals, developed the UVCL range of UV cure conformal coatings to meet the various requirements of electronics, LED and automotive manufacturers, with the additional benefit of increasing production time and offering higher levels of performance.

The range features UVCL — a single-component, medium-low viscosity dual-cure coating with secondary moisture cure — for complete cure in shadow areas. Available in 5 L packaging, UVCL is VOC-free and non-flammable, and demonstrates good electrical properties.

The coating provides a wide operating temperature range and is ready to use for selective spray application. The range is solvent- and VOC-free and provides good performance in harsh environments, including resistance to cracking during thermal shock cycling.

Key properties include: single-component conformal coating, which cures upon exposure to UV light; a high level of protection for electronic circuitry; high speeds of application and cure; low viscosity; dual cure, with a secondary moisture cure mechanism for complete cure even in shadow areas; long shelf life; a wide operating temperature range of -65 to +135°C; RoHS compliance; IPC-CC-830; IEC-61086; UL746-QMJU2. The product fluoresces under UV light for ease of inspection.

Electrolube
www.electrolube.com.au





STAND C19 IP68 INDUSTRY 4.0 SEALED ENCLOSURES

Hammond Electronics has added 36 configurations to its Industry 4.0 1554 and 1555 sealed enclosure families. Available in ABS or polycarbonate with styled, opaque, clear or

smoked lids, the six latest sizes are 105 x 105 x 60 and 90, 140 x 140 x 60 and 90 and 180 x 180 x 60 and 90, giving a grand total of 150 sizes and lid options.

The polycarbonate versions have cUL and UL 508A listing and are tested to IP68 (NEMA Type 4, 4X, 6, 6P, 12 and 13). Sealing is achieved with a tongue and groove construction and a one-piece UL listed silicone gasket.

All versions have a RAL7035 grey base. The polycarbonate range is available with a plain or styled opaque lid, a clear lid or a smoked lid; the ABS units have a plain or styled opaque grey lid. The lid is secured with self-captivated M4 stainless steel machine screws, located outside the sealed area and threaded into integral stainless-steel bushings to preserve the sealing integrity after repetitive assembly and disassembly.

The internal features vary with size. M3 threaded brass inserts and/or standoffs for PCB or inner panel mounting and vertical PCB guides are provided in all but the smallest B size. DIN rail mounting tabs are moulded into most sizes.

The polycarbonate versions are UV stabilised for outdoor use. The grey material has a UL94-5VA flammability rating; the clear and smoked lids are rated UL94V-0. The ABS versions are rated UL94-HB.

Hammond Electronics Pty Ltd

www.hammondmfg.com



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Our 32-bit microcontroller (MCU) lineup covers a broad range of motor control applications from basic Brushless DC (BLDC) 6-step scalar control to highly advanced sensorless Field Oriented Control (FOC) and sensed feedback examples for positioning applications. We provide hardware and software solutions to address many different motor types, including brushed DC, stepper, BLDC, Permanent Magnet Synchronous Motors (PMSM), AC induction and switched reluctance motors. If you can dream it, our 32-bit MCUs can spin it.

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Contact Information

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STAND A6 POWER SUPPLIES

Keysight Technologies has launched a series of single- and dual-output power supplies that deliver usable power, a bench-friendly design with low background noise, a small footprint and a large display. The E36200 series enables engineers to test their designs across multiple industries, including automotive electronics, consumer goods, medical devices, power tools and industrial applications.

The series are standard commands for programmable instrument (SCPI) power supplies with built-in USB, local area network (LAN) and optional general-purpose interface bus (GPIB). Users can easily integrate the series into their existing system using the rear output terminals, modern I/O and trigger port.

Key features of the 200 and 400 W series power supplies include: auto-series and auto-parallel to combine dual outputs into a single 400 W output; low output noise, with ripple and noise <350 μ Vrms; local 2-wire and remote 4-wire measurements, eliminating the need for an external multimeter; and overvoltage, overcurrent and overtemperature to provide layers of device protection.

Keysight Technologies Australia Pty Ltd
www.keysight.com

STAND A29 BIDIRECTIONAL PROGRAMMABLE DC POWER SUPPLY

ITECH has released a programmable DC power supply, the IT6000C series, with a bidirectional source and regenerative sink. It features standalone max output power of 144 kW, expandable up to 1.152 MW by paralleling.

The product has a voltage range of 0 to 2250 V and a current range of 0 to 2040 A. It offers high power density up to 18 kW in a compact 3U rack space and has high regenerative efficiency up to 95%. The bidirectional power transfer means there is a seamless switch between sourcing and sinking.

There is a standard built-in USB/CAN/LAN/digital IO communication interface, optional GPIB/analog and RS232. A built-in function generator supports arbitrary waveform generation.

The product features full protections, with support for OVP, \pm OC, \pm OPP, OTP, power-down protection and anti-islanding protection. It supports multiple working modes, with adjustable rising and falling time as well as adjustable output impedance.

Fuseco Power Solutions Pty Ltd
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STAND B10 POWER SUPPLIES

WAGO's Pro 2 series of power supplies includes six units ranging from 120–960 W, providing an energy conversion efficiency of up to 96%.

The power supplies feature optional fieldbus modules for constant communication via standardised protocols. They offer monitoring functions that provide continuous power supply data information and signal errors for seamless application monitoring. Users also have the option of choosing the fieldbus they want to connect.

The slimline power supplies combine high power density with efficiency, requiring little space and generating a low amount of heat in the control cabinet. They can be tailored to any application requirement, allowing parameters such as output voltage and overload behaviour to be easily configured via software.

Fieldbus connection is permitted via snap-on type communication modules and the power supplies feature WAGO's high-performance TopBoost and PowerBoost capabilities for maximum system uptime. TopBoost delivers 600% extra output current, enabling protection for up to 15 ms compared to conventional circuit breakers. PowerBoost provides an additional 150% output current for 5 s, providing good reserve power and eliminating the need for oversized power supplies and their associated costs.

WAGO Pty Ltd
www.wago.com.au

STAND B16 STEPPER MOTORS

Following the acquisition of Dimatech, a manufacturer of high-performance disc magnet stepper motors, FAULHABER has expanded its portfolio to include the DM series of stepper motors — suitable for situations where speed and direction change often and quickly. This occurs often in the semiconductor and textile industries, as well as in medical technology and robotics.

The series' disc magnet technology provides high acceleration and precise movement. The primary difference between disc magnet motors and conventional motors is the disc magnet motor's lightweight rotor.

Advantages include: high acceleration/change of direction capability; high power density; long operational lifetimes; short and light motors; high pull-in speed; and the possibility of full-step, half-step and micro-step operation.

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**STAND C6
RGB LED INDICATORS**

APEM's expanding selection of LED indicators shine brightly to provide high-quality illumination for attractive, functional and innovative designs.

The latest range of sleek-designed, panel-mounted RGB LED indicators are energy efficient, as one LED provides seven different colours. Using glare-free diffused flat and round LEDs, the Q series gives the user limitless adjustable uniformed lighting options, including combined illumination and indication with intense RGB light output.

RGB offers a bold and bright status indication, providing users and the market with a host of LED design options. Its three primary colours of red, green and blue can be mixed to provide four more colours — cyan, magenta, yellow and white — which can be mixed again to further provide a multitude of hues, finely tuned for custom options and applications.

Flush and prominent, the RGB LEDs fit Q10, Q14, Q16, Q19 and Q22 bezels. They come with a standard 200 mm wire and series wire gauge. The front panel has been sealed to IP67 and the rear is epoxy sealed. Colour animations will need to be controlled by the user.

Control Devices Australia
www.controldevices.com.au

**STAND A17
AUTOMOTIVE ELECTRONICS REMANUFACTURING SERVICE**

For over 30 years, Injectronics, a division of the Innovative Mechatronics Group, has been providing supply solutions for automotive electronics to the aftermarket and the OEM. During this time the company has developed a reputation as a leading supplier of quality remanufactured automotive electronic and mechatronic components in Australasia, with customers in the automotive, heavy-duty, marine, mining, fleet management and construction industries relying on Injectronics to provide quality remanufactured spare parts in a timely manner.

The company's products are all tested on its custom-built automated testing systems and are ensured to meet, or in some cases exceed, the OE quality. Remanufacturing also reduces environmental impacts with savings of on average 80% on water, energy and raw materials, and reduction of landfill waste.

Some of the customised remanufacturing and testing services Injectronics can provide include: sourcing and providing new or remanufactured electronic parts; obsolete parts remanufacturing; continual supply solutions; complete warranty management, including warranty testing, validation, repairs, remanufacturing and logistics management; root cause analysis; warranty and extended warrant replacement services; software and hardware reworks and upgrades; part number conversions through software or hardware modifications; and complete core and logistics management.

Innovative Mechatronics Group
www.im-group.com.au/

**STAND B32
PICK-AND-PLACE MACHINE**

The NeoDen7 features six simultaneous pick-up heads and has been designed for ease of use, efficiency and increased expandability and compatibility. Its feature set makes it suitable for low-volume assembly.

Using efficient linear servomotors, as well as lightening and stiffening the head unit, leads to a placement speed of 14,000 CPH. The product also features an integrated flying vision system and GUI (graphical user interface), with Windows-based software that allows programming in minutes.

Users can place, manage and track components with smart feeders with up to 64 (all 8 mm) tape feeders. The machine places a wide range of components, including 0402, LED, BGA, 0.4 mm pitch QFP, SMT connectors and many others. In addition, it supports cut tape, loose, tube or tray feeders.

Embedded Logic Solutions Pty Ltd
www.emlogic.com.au

STAND D2 UPS POWER SUPPLIES

The ADEL System range of DIN rail mount DC UPS power supplies incorporate a DIN rail mounting switchmode power supply and UPS controller into a single unit. Users can also buy a maintenance-free battery pack and holder to create a fully integrated UPS solution.

Some models can be networked via the ADELBus network using the robust DPY351 controller, which is equipped with a high-brightness and wide viewing-angle 3.5" TFT screen. The user interface is clear and intuitive.

Using the onboard Ethernet interface, it is possible to remotely manage the ADELBus network via the internet with a PC or a mobile device. The controller can also act as a gateway using standard protocols. The ADELBus network allows users to manage all connected power supplies, with functionality including system monitoring and event logging; system configuration; alarms and recorder management; and event programming.

Available with 12, 24 or 48 V outputs, the power supplies combine the functions of a power supply with those of a backup module and battery charger. They optimise the loading and unloading times of the battery without a deep discharge, and the switch from the battery to the charger without any interruption. They provide automatic protection without a fuse against reserve polarity, short circuit, overload and overvoltage.

They carry out diagnostic checks on the battery through the Life Test function, enabling the user to select the most appropriate charging curve to maximise the efficiency of their system. The supply of power is automatically allocated between the load and the battery being charged, with the charging rate being up to twice the rate of the rated output current.

Visual indications and a self-diagnostic function make it easy to anticipate any potential issues. The power supplies are also equipped with relays to warn of power outage and defective battery. Three charging levels are utilised: boost, trickle and recovery. It is possible to set boost and trickle remotely on some units.

The power supplies are compact, allowing users to fit more devices onto a single DIN rail. They will operate in ambient temperatures ranging from -10 to 70°C.

ADM Instrument Engineering Group

www.admtech.com.au



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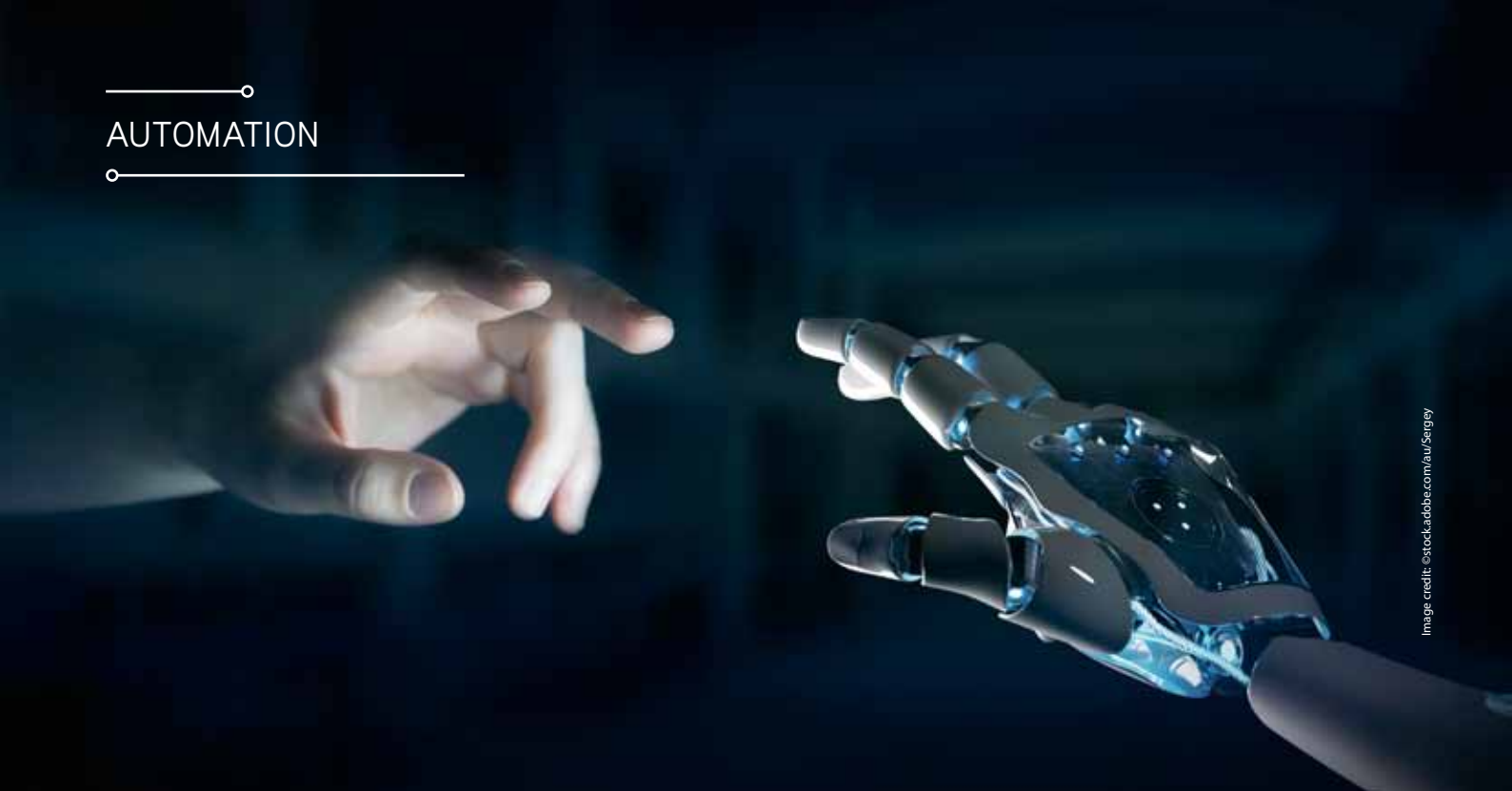


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AUTOMATION WILL ASSIST LABOUR, NOT REPLACE IT

While manufacturing companies globally are changing the production game by adding more automation to the line, some are wondering if this is meant to replace the manufacturing employees. Rest assured that this assumption, though based on some merit, is to the best of our knowledge completely untrue.

Electronics design and manufacturing companies, like Hetech, are set to update, improve and increase productivity through the use of automation. This automation is intended to assist, not replace.

While Australian SME companies are integrating into Industry 4.0, the development, addition and use of new technologies is unavoidable. In a sense, the introduction of automation into SME manufacturing companies helps to level the playing field a bit... but how?

Automation in manufacturing is simply this: the use of automatic equipment, that requires little human intervention and interaction, in a system of production processes. It has the potential to improve business for SMEs, along with making improvements in the labour force along the way.

The time and attention that is freed up due to automation will help businesses achieve a better level of productivity and labour force effectiveness. Automation is meant to enhance, not take over.

To put it bluntly, automation in Australian electronics manufacturing is becoming essential for the local companies to compete in the world manufacturing platform. Integration into Industry 4.0 is essential.

Manufacturing companies of all sizes are investing in and working towards Industry 4.0. Industry 4.0 encompasses the current automation trend and method of data exchange within manufacturing technologies and companies. Often referred to as the Fourth

Industrial Revolution, Industry 4.0 includes cognitive computing, the Internet of Things, cloud computing and cyber-physical systems.

For manufacturing companies to succeed, it is imperative that they keep up with the integration rate. Manufacturing companies, like Hetech, are investing in a variety of automated machines. These include, but are not limited to, new SMT machines, conformal coating machines, inventory and asset tracking systems and optical inspection machines. These automated machines are fully intended to help our labour force operate at a smarter and faster level.

Automated machines can propel SMEs towards Industry 4.0 by reducing the risk, and encouraging existing labour to work faster, not harder.

For many SME companies, it's imperative to receive automation funding. Thankfully, SME manufacturers can look to local governments for grants to invest in automation. These grants are meant to assist SMEs with becoming more competitive, allowing them to grow in the international market. With funding comes relevance.

Automation in manufacturing is giving SME companies the ability to succeed on a level of companies that exist on a much larger scale. The possibilities here are incredible, and paired with current labour, endless. These two components will work seamlessly together to push many SMEs closer and closer to Industry 4.0.

Hetech
www.hetech.com.au



STAND A1 MIXED SIGNAL OSCILLOSCOPES

The Rigol MSO8000 series is a high-performance digital oscilloscope range based on Rigol UltraVision II technology and Rigol's in-house designed PHOENIX chipset. The series offer bandwidth up

to 2 GHz, four channels with 16 digital channels, up to 10 GSps sampling rate, 500 Mpts memory depth and a high waveform capture rate of 600,000 waveforms per second.

With a 10.1" capacitive multi-touch screen, the series integrates seven independent instruments into one, including a digital oscilloscope, 16-channel logic analyser, spectrum analyser, arbitrary waveform generator (option), digital voltmeter, 6-digit frequency counter and totaliser, and protocol analyser (option). The series also support real-time eye diagram measurement and jitter analysis, making the unit suitable for a wide variety of R&D applications.

Emona Instruments Pty Ltd

www.emona.com.au

STAND B7 LOW-PRESSURE MOULDING EQUIPMENT WITH SAFETY FEATURES

LPMS low-pressure moulding production equipment has had a design upgrade, meaning improved safety logic and features. The safety additions come from trusted brands such as Sick, Keyence, Allen Bradley and SMC Pneumatics to provide protection for operators.

Other features include improved machine logic, which includes a sliding front door to isolate the operator from the injection process, a safe material purge function with three levels of protection and air evacuation of a machine when protocols are broken.

Tarapath Pty Ltd

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STAND D32 IGBTs FOR MOTOR DRIVES

The Generation 7 IGBTs, from Semikron, are said to represent the latest in IGBT chip technology. They are specifically designed to match the requirements of motor drive applications.

The IGBTs come with a lower forward voltage drop than previous generations and deliver optimised switching performance. Due to roughly 25% smaller chips, higher nominal currents can fit into existing power module packages.

In application, the IGBT 7 provides reduced power losses or increased maximum output power and power density. This translates into lower system costs.

Semikron will initially release the Generation 7 IGBTs with conventional motor drive topologies: CIB (converter-inverter-brake), six-pack and half-bridge configurations. For low and medium power drives, MiniSKiiP and SEMITOP E1/E2 are the first available choice. For higher power classes, IGBT 7 is available in SEMiX 3 press-fit and SEMiX 6 press-fit. More power modules are to follow.

Semikron Pty Ltd
www.semikron.com.au

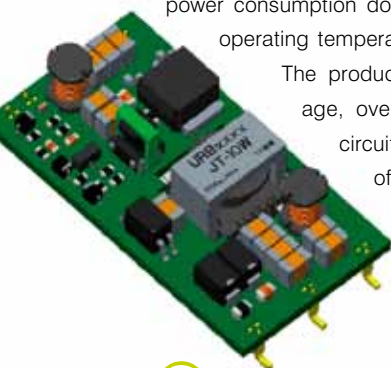
STAND C20 ULTRATHIN DC/DC CONVERTERS

Distributed in Australia and New Zealand by DLPC, the MORN SUN 3 W ultrathin DC/DC series URB/VRB-J(M)D/T-3W is an extension of the company's 6, 10 and 15 W ultrathin isolated and regulated family of DC converters — the thinnest of which is 6.2 mm.

The 3 W series offers both 4:1 and 2:1 ultrawide input voltage ranges, in surface mount and DIP mounting, with 1500 VDC isolation voltage and efficiencies up to 83%. The converters have no load power consumption down to 0.1 W and a wide -40 to +85°C operating temperature, which meets EN62368 standards.

The products offer protection for input undervoltage, overvoltage, overcurrent and output short circuit. They are applicable to a wide range of applications in industrial control, power grid, instrumentation and communication fields.

Fairmont Marketing
www.fairmontmarketing.com.au



STAND C38 ELECTRONICS DEVELOPMENT SERVICE

Successful Endeavours develops smart electronics-based products that are intended for profitable manufacture in Australia. These are typically higher value products performing sophisticated monitoring, communications or control functions or where special features, size, power consumption, performance, battery life or cost-effectiveness are the primary commercial drivers.

The company's market is Australian-based electronics manufacturers and entrepreneurial small businesses that want to make a high-quality product in Australia. It specialises in custom IoT devices and supporting technical web services.

The company brings consulting class product development services to the SME sector. Over the past 22 years this has seen more than 2000 projects completed with the vast majority of the products developed being manufactured in Australia.

As an extension to the high-technology R&D product development services, Successful Endeavours also offers turnkey manufacturing for the product developed where the end customer is not a local manufacturer or does not want to manage the manufacturing logistics chain. This allows products to be brought to market that would otherwise have gone to overseas manufacture or not been made at all.

Successful Endeavours
www.successful.com.au

STAND A10 MIXED SIGNAL OSCILLOSCOPE



The Tektronix 6 series mixed signal oscilloscope extends the performance threshold of mid-range oscilloscopes to 8 GHz and delivers a 25 GS/s sample rate simultaneously on all four channels, to accommodate the needs

of designers working on fast, complex embedded systems designs.

With a 25 GS/s sample rate on all channels, designers can view up to four high-speed signals at one time. For example, a DDR3 clock and three DDR3 data channels can be viewed and analysed simultaneously, decreasing the time it takes to fully characterise a design with an instrument that shares sampling systems between channels.

The MSO also boosts measurement confidence with its low-noise inputs, especially at high-sensitivity settings where it matters most. For example, modern embedded designs require clean, precisely controlled DC power supplies to feed ASIC and FPGA devices. For such applications, the MSO enables designers to measure DC power rails with more resolution, reducing the time it takes to understand high-frequency influencers on power rails in a design.

Based on the same platform as the 5 Series MSO, the 6 Series provides easy upgradeability for long-term investment protection.

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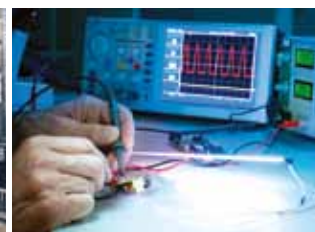
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STAND A21 SINGLE-BOARD COMPUTER

The Raspberry Pi 4 Model B Computer is three times faster compared to its predecessor, the Raspberry Pi 3 B+. It offers enhancements in processor speed, multimedia performance, memory and connectivity that will powerfully help general desktop computer users, hobbyist and makers, and professional

developers working with compute-intensive embedded applications such as computer vision and artificial intelligence (AI).

The computer also features a 64-bit quad-core processor running at 1.5 GHz, dual-display support at resolutions up to 4K at 60 fps, up to 4 GB of RAM, dual-band 2.4/5.0 GHz wireless LAN, Bluetooth

5.0/BLE, True Gigabit Ethernet, USB 3.0 and PoE capability (via a separate PoE HAT add-on). Available in three memory variants — 1, 2 and 4 GB — it is said to be a faster, more powerful and more feature-rich single-board computer than ever before.

element14
au.element14.com



STAND A13 INVENTORY MANAGEMENT SYSTEM

Cluso's InvMan-S1 transforms the customer's warehouse into a smart inventory management system that is designed to improve productivity and efficiency.

The system is easy to use but also powerful in its function. It allows for quick and easy storage and retrieval of components, so multiple users can simultaneously have access to stock or remove components. Using BOMs, jobs can be loaded directly onto feeders/machines from the storage system, eliminating kitting in advance and in turn untying the stock. The system automatically sends alert emails when stock levels are low.

The product reduces storeroom floor space, with traceability tied to the operator, machine, job, feeder, etc. With the oldest reel out first, users can track parts in their dry cabinets and flag reels as empty so that they're not looking for something that does not exist.

SC Manufacturing Solutions Pty Ltd
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STAND B23 ACOUSTIC CAMERA

The Mikado is the latest addition to gfaitech's Acoustic Camera family and features an easy-to-use and efficient handheld device, usable 100% autonomously. The system is suitable for troubleshooting sound and vibration problems. The mobile, wireless device enables flexible measuring positions and angles, allowing the quick and efficient identification of noise sources using acoustic signals.

The innovative handheld device comes outfitted with all components for acoustic measurements, data acquisition and data analysis; thus, sound sources can be localised and analysed on the spot. The exchangeable Li-ion battery and Surface Pro tablet make it a completely autonomous device. The Microsoft Surface Pro 4 tablet running Noiselmage Core — the mobile version of the company's recording and post processing software — ensures ease of use while in the field. Data can be analysed on the tablet directly or transferred onto a workstation running Noiselmage4.

HW Technologies
www.hwtechnologies.com.au



STAND A12 PROCESSOR EVALUATION KIT

The SMARC 2.0 Quick Starter Kit for the NXP i.MX 8 QuadMax processor family, from congatec, is said to offer everything developers need for the immediate evaluation of the NXP i.MX 8 processor.

Developers of highly integrated IIoT, industrial and embedded vision applications can reach the next technology level quickly and easily with the NXP i.MX 8 based SMARC 2.0 modules, because they can immediately integrate a credit card-sized off-the-shelf module into their applications with minimum space requirements.

The Quick Starter Kit integrates conga-SMX8 computer modules with either the low-power NXP i.MX 8X or the high-end NXP i.MX 8 (QuadMax) series, as well as a conga-SEVAL evaluation carrier board, which offers access to all interfaces and functions for SMARC 2.0 based NXP i.MX 8 designs.

The evaluation carrier supports a comprehensive set of interfaces, including 4x PCIe x1, 1x mini PCIe, 2x USB 3.0 and 4x USB 2.0 for generic extensions. 2x RJ45 for Gigabit Ethernet, 4x COM, 1x CAN bus and 12 GPIOs are also available. Displays can be connected via dual channel LVDS, eDP, DP and 2x MIPI-DSI, and additional storage media via an SD/MMC socket and 1x SATA 6G. Digital and analog audio I/Os for I2S and HDA complete the interface offer.

Congatec Australia Pty Ltd

www.congatec.com



STAND C16 LAN TRANSFORMER

The WE-LAN AQ is a LAN transformer manufactured by a fully automated production process. Its innovative coil winding technique reduces the electrical variation while improving performance over a wide frequency range.

Features include: >1.5 kV isolation voltage; IEEE compliance; tight tolerance; compact design (max 4.5 mm height); and 10/100 and 10/100/1000 Base-T.

LAN transformers and RJ45 connectors suitable for different speeds and PoE current ratings can be found in further LAN product families.

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STAND D26 ELECTRONICS MANUFACTURING SERVICES

Precision Electronic Technologies is a specialist electronic solutions organisation. The Australian-owned company provides an extensive range of manufacturing services, including printed circuit boards and assemblies, cables, wiring harnesses, stencils, plastic and metal enclosures, decals, membranes and full turnkey solutions. It services a broad range of industries, including defence, transportation and mining.

The company provides a one-stop solution for all electronic manufacturing services requirements, ranging from fast-turnaround prototyping to high-volume manufacturing. It has the capability to identify design and/or production issues during the prototype stage and solve these (in consultation with the customer) before moving to production.

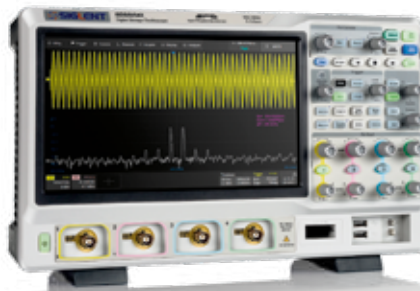
Precision Electronic Technologies
www.precisionet.com.au

STAND D7 OSCILLOSCOPES

Siglent's SDS5000X family of oscilloscopes, useful for helping electronics engineers uncover, identify and resolve potential issues, come in bandwidths of 1 GHz, 500 MHz and 350 MHz. They are available in two- and four-channel versions, plus optional MSO for measurements across 16 digital channels.

The high-performance digital storage oscilloscopes build on advancements from Siglent's SDS2000X scopes. These advancements include fast architecture; a 10.1" touch screen; mouse and keyboard support; and a snappy user interface. Powerful features include a 256-level intensity graded display as well as colour-temperature display modes; Search and Navigate; and Siglent's most powerful maths capabilities to date.

IPD Group Limited
www.ipd.com.au



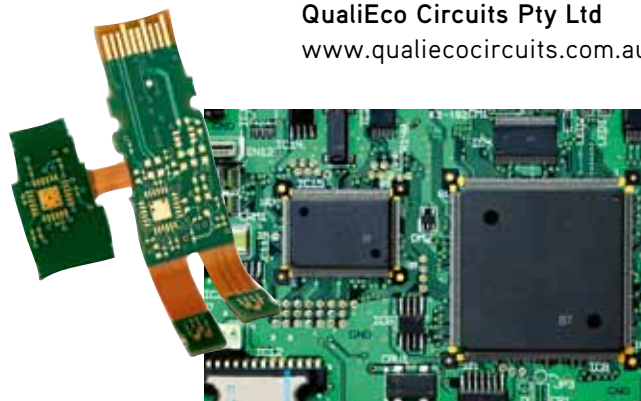
STAND A20 PCB MANUFACTURING AND ASSEMBLY SERVICES

QualiEco Circuits has been offering standard and fast-turnaround PCB manufacturing and assembly services to its customers in Australia and New Zealand for many years. Prototypes can be assembled overnight and shipped once the PCB, components and stencil are ready for assembly. The company also offers express-turnaround PCB manufacturing from its offshore plant.

The company provides high-quality electronic manufacturing services and solutions, with customised delivery solutions for all customers. Customers can choose from fast to semifast and normal delivery options based on their budget and urgency.

Services cover rigid PCBs (up to 32 layers), flexible PCBs (single- and multilayer), rigid-flexible PCBs (single- and multilayer) and metal core PCBs (single- and multilayer). The technical team at QualiEco Circuits also prepares bimonthly guides on various technical aspects of PCB manufacturing and assembly, which are available on the company's website.

QualiEco Circuits Pty Ltd
www.qualiecocircuits.com.au



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STAND B34 LASER MARKING TECHNOLOGY

Fibre laser markers are said to be the fastest laser marking technology at their wavelength, making them suitable for customers looking to increase efficiency. They are also energy efficient compared to the alternatives; fibre laser technology uses basic air cooling rather than an additional chiller unit, which would be cumbersome.

Fibre lasers typically last three times longer than other technologies, exceeding the life expectancy of other laser solutions. Because of the duration of power delivery by the technology, fibre laser marking solutions are suitable for deep marking.

Suba Engineering's 20 W fibre laser marker is made to fit onto a conveyor, and is a smart way to process parts that need identification. It has a large processing range, with a faster marking process speed than a CO₂ laser. Its integrated system means everything is included in the package, with an ergonomic design and a simple interface that means it is easy to learn how to use. It is also low maintenance.

Suba Engineering
www.suba.com.au



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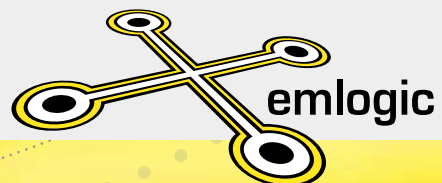


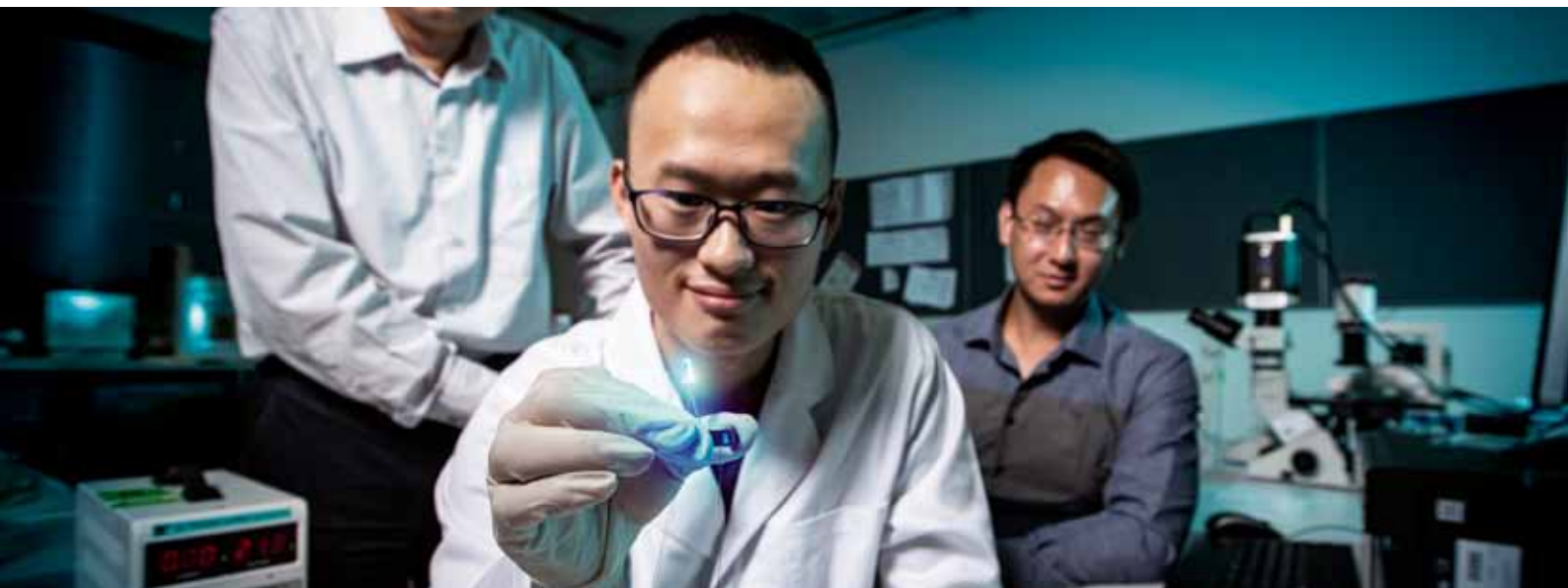
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Embedded Logic Solutions Pty Ltd

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NEW COMPOSITE MATERIAL

IS SMART, STRETCHABLE AND CONDUCTIVE

Next-generation wearable devices with sophisticated sensing capabilities could soon be possible, following the development of a rubber that combines flexibility with high electrical conductivity.

The new smart composite material, developed by researchers at the University of Wollongong's (UOW) Faculty of Engineering and Information Sciences, shows properties that have not previously been observed: it increases in electrical conductivity as it is deformed, especially when elongated. It has been described in the journal *Nature Communications*.

Elastic materials, such as rubbers, are sought after in robotics and wearable technology because they are inherently flexible, and can be easily modified to suit a particular need. To make them electrically conductive, a conductive filler, such as iron particles, is added to form a composite material.

The challenge for researchers has been finding a combination of materials to produce a composite that overcomes the competing functions of flexibility and conductivity. Typically, as a composite material is stretched, its ability to conduct electricity decreases as the conductive filler particles separate — and for the emerging sphere of robotics and wearable devices, being able to be bent, compressed, stretched or twisted while retaining conductivity is a vital requirement.

"When using conventional conductive composites in flexible electronics, the decrease in conductivity upon stretching is undesirable because it can significantly affect the performance of these devices and compromise battery life," said Senior Professor Weihua Li.

Now, Prof Li and his team have developed a material that throws out the rule book on the relationship between mechanical strain and electrical conductivity. Using liquid metal and metallic microparticles as a conductive filler, they discovered a composite that increases its conductivity the more strain placed on it — a discovery that came about in an unexpected way.

As explained by Postdoctoral Fellow Dr Shiyang Tang, the breakthrough began when a mixture of liquid metal, iron microparticles and elastomer, by a fortuitous accident, had been cured in an oven for much longer than normal. The over-cured material had reduced electrical resistance when subjected to a magnetic field, but it took dozens more samples to find that the reason for the phenomenon was an extended curing time of several hours longer than it would normally take.

"When we accidentally stretched a sample while we were measuring its resistance, we surprisingly found that the resistance reduced dramatically," Dr Tang said.

"Our thorough testing showed the resistivity of this new composite could drop by seven orders of magnitude when stretched or compressed, even by a small amount.

"The increase in conductivity when the material is deformed or a magnetic field is applied are properties we believe are unprecedented."

Lead author and PhD student Guolin Yun said the researchers demonstrated several interesting applications, such as exploiting the composite's superior thermal conductivity to build a portable heater that warms where pressure is applied.

"The heat increases to the area where pressure is applied and reduces when it's removed," he said. "This feature could be used for flexible or wearable heating devices, such as heated insoles."

Prof Li said the unprecedented electrical properties of the team's composite material could lead to innovative applications, such as stretchable sensors or flexible wearable devices that can recognise human motion.

University of Wollongong
www.uow.edu.au



STAND D28 BOARD-TO-BOARD CONNECTORS

Phoenix Contact presents a series of robust board-to-board connectors. The FINEPITCH series includes shielded connectors with a pitch of 0.8 mm and unshielded versions with a pitch of 1.27 mm.

The product series offers versatile solutions for the connection of several PCBs within the device. Horizontal and vertical female and male connectors enable the user to arrange PCBs in the device in a mezzanine, coplanar or orthogonal layout. Both product ranges include 12- to 80-position versions for currents up to 1.4 A and voltages up to 500 VAC. With its EMC shielding, the FINEPITCH 0.8 product range is suitable for interference-free high-speed data transmission at rates of up to 16 Gbps.

The contacts on both sides of the ScaleX contact system ensure a long-term-stable electromechanical connection, even in the event of stress caused by shock or vibration. At the same time, the principle allows for

a high level of tolerance for connectors that are positioned differently due to assembly. In addition, the insulating housing geometry prevents the connectors being interconnected incorrectly.

Pre-assembled IDC female connectors of the FINEPITCH 1.27 product range are available with flat ribbon cables in customised lengths on request, so they can be inserted into the device immediately.

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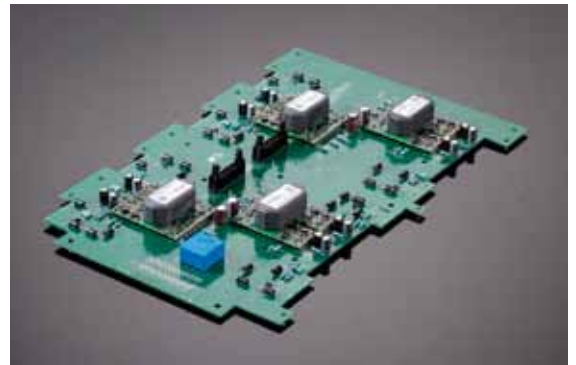
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With more than 20 years' experience of serving PCB R&D clients in China, GreenPCB's PCB manufacturing and assembly services are now available to Australia's engineers. The company manufactures high-quality products and aims to provide a safe and prosperous workplace for its employees.

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STAND D16 ELECTRONIC CONTRACT MANUFACTURING

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STAND D37 X-RAY COMPONENT COUNTER

optical control's OC-SCAN CCX.3 — an intelligent, simple and fast component counter — is designed to improve the user's SMT process when it comes the organisation of their components.

Maintaining correct materials and quantities is a critical part of the SMT process. The plug-and-play system can X-ray any size reel in the same cycle time, no matter how full or empty the reel is.

The standalone machine is fully automated when it comes to programming. It is also easy to use, as it requires no libraries or need for user input. The machine also can be configured for complete automation, including integration into other systems such as automated storage units.

By offering fast component counting, the SMD reel counting machine simplifies the electronic manufacturing process.

Hawker Richardson

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STAND D23 PCB FABRICATION AND ASSEMBLY

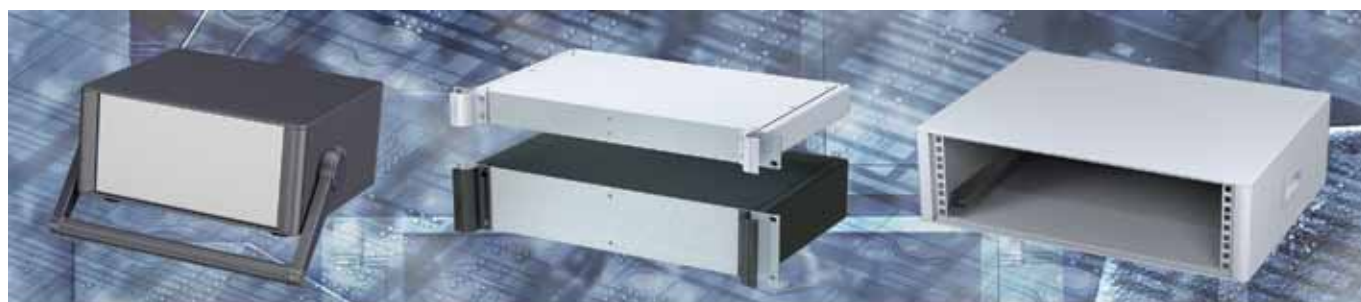
General Circuits Co is an electronics manufacturing service provider covering full PCB production runs — from PCB fabrication, to components sourcing to assembly — in multiple areas. Owing to its stringent manufacturing regulations, up-to-date equipment and professional engineering staff, the company has been selected as a contract manufacturer by businesses around the globe.

The company offers PCB fabrication to IPC Class 2 conformity, with quick-turnaround prototyping to mass production, including FR4 PCBs, metal core PCBs, flex/flex-rigid PCBs, Rogers PCBs, etc. Other services include a free file check; custom layer stack-up; and electrical tests.

The company also offers PCB assembly to IPC Class 3 conformity, from prototyping and low volume to mass assembly. Other services include SMT and THT; a free DFM check; first article inspection; and AOI, X-ray inspection and SPI.

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EMI/RFI SHIELD CLIPS

Covering a surface area of 2.3 x 1.2 mm with 2 mm height, Harwin's S0911-46R shield can clip is designed to address the demands being set by the latest generation of high-density electronic systems.

The surface mount EMI/RFI shield clip, which has a beryllium copper construction with tin over nickel plating, enables shielding cans with sides of 1 mm in length to be fitted, so that minimal board real estate is taken up. Designed for 0.2 mm can thicknesses, it is suitable for cans that have complex shapes.

The device is accompanied by the S0921-46R corner shield can clip, which provides additional shielding at the corner gaps of cans. This clip component is able to accommodate Harwin's larger thickness shield cans (0.3 mm thick), with each corner clip only taking up 6 mm² of PCB surface area.

By using the clip-based approach propounded by these products, engineers are able to avoid needing to solder the required shield can to the PCB. This not only simplifies the production process, but offers flexibility too. Attaching the shield can to the board is a straightforward procedure that may be carried out rapidly. Since solder is no longer needed, environmental impact is much less of a concern. It also eliminates the heat sink effect that is associated with direct soldering of the can to the PCB. Furthermore, the shield can be easily removed after deployment for inspection or maintenance purposes.

The shield clips are targeted for use in electronics designs where space is seriously restricted, such as wearable devices (smart watches, fitness trackers), IoT equipment (sensor nodes, data acquisition modules) and portable consumer products (smartphones, MP3 players, action cameras).

Their compact design means that they are suitable for a broad array of different applications and an operational temperature range covering -55 to +105°C is supported. Shipped in a tape-and-reel format, they are optimised for automated production lines.

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UNIVERSAL FEET KITS FOR ENCLOSURES

METCASE has added TECHNOFEET universal case feet to its wide range of accessories for electronic enclosures. The stylish and modern feet can be specified with or without tilt legs, making them suitable for laboratory equipment or other desktop instrument enclosures that require a choice of viewing angles.

TECHNOFEET can be fitted to any type of plastic or metal enclosure with a wall thickness of up to 3 mm with the standard screws supplied. Longer screws can be supplied for larger wall thicknesses on demand.

The feet are easy to install, requiring just three holes in the enclosure panel. METCASE supplies drilling details with each kit.

Two standard kits are available, each with four feet. Kit 1 includes four foot bodies, push-in anti-skid pads and self-tapping screws. Kit 2 also includes two tilt legs with 120° rotation.

Each foot is sized 30 x 12 mm high. The foot bodies are moulded in ABS (UL 94 HB) while the anti-skid pads are soft-touch TPE for maximum grip. Three colours are offered: anthracite, light grey and black.

TECHNOFEET are available in a range of six kits: M6420104, feet kit in anthracite; M6420204, feet kit with tilt legs in anthracite; M6420105, feet kit in light grey; M6420205, feet kit with tilt legs in light grey; M6420109, feet kit in black; and M6420209, feet kit with tilt legs in black. Free samples are available for evaluation.

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The 800 V BCM4414, from Vicor, is a 1.6 kW, isolated, 1/16 fixed-ratio, bus converter module (BCM) that can operate from a 500 to 800 V input voltage, to deliver SELV output voltages with 97% peak efficiency.

The 800 V module complements the existing Vicor 700 V BCM4414, to create a family of products with reinforced isolation (4242 VDC) and bidirectional voltage conversion capability. The BCM can be easily paralleled into higher power arrays and the SELV outputs can be stacked (connected in series) for higher output voltages.

Both BCMs are available in a 111 x 36 x 9.3 mm VIA (Vicor Integrated Adapter) package, which has integrated PMBus communication, EMI filtering and voltage-transient protection. The VIA's planar form factor package simplifies heat management and ease of interface to a wide variety of cooling technologies.

The high-voltage BCM family addresses the need for increased density and performance in industrial and military three-phase AC power supplies and in high-voltage DC transmission systems for tethered unmanned vehicles. The BCMs are available in either M-Grade (-55 to 100°C) or T-Grade (-40 to 100°C).

Vicor Corporation

www.vicorpower.com



CONNECTORS

The HARTING Han-Eco B Series of hoods and housing connectors expands the Han-Eco portfolio. It is suitable for applications including automation, machinery, robotics and energy.

The Han-Eco B Series, a rear-mounted connector, is capable of mating high-performance plastic connectors to metal hoods and housings for backward compatibility ensuring quick and easy assembly. The series is completely compatible with the Han B industrial standard, and standard inserts and modules in conjunction with the hinged frames from the Han-Modular portfolio.

The high-performance plastic connectors are available in a full range offering, including bulkhead, surface mount, cable-to-cable, side entry and top entry, with covers. Low in weight, they offer high mechanical robustness. They are available in sizes 6B to 24B and cable gland sizes ranging from M20-M40.

Other features include: backward compatibility with Han B metal hoods and housings; outdoor variants for enhanced environmental requirements; a click and mate principle ensuring a secure assembly process; rear mounting to speed up installation; corrosion-resistant hoods and housings made of plastic; and fire resistance according to UL94 V0.

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IN-MOULD ELECTRONICS

DESIGN, MATERIAL AND PROCESS INNOVATION OPPORTUNITIES

Dr Khasha Ghaffarzadeh, Research Director

In-mould electronics (IME) promises to enable high-volume production of structural electronics where the electronic circuitry and functionality are part of the 3D-shaped structure itself. This will save weight and space and will enable new elegant designs.

IME is not exactly a new process or technology. In fact, in many ways, it is an evolution of the well-established IMD, or in-mould decoration, in which moulding (or other ways of 3D forming) are combined with graphic printing. The transition from IMD to IME however is not straightforward, especially on a commercial scale. Indeed, this partially explains why it has taken this long for IME to establish lasting commercial success despite all the efforts and false starts.

However, this is changing. Indeed, there are already low-volume IME products on the market and the transition towards higher volume application is not far off. Our report, 'In-Mold Electronics 2019-2029: Technology, Market Forecasts, Players', finds that the market will exceed \$250 million by 2024.

This article draws from the above-mentioned report to outline key innovation trends underpinning the commercialisation of IME. Here, we will consider trends in materials, processes, as well as design. This will give the reader a better insight into this promising technology.

Everything must change to enable the commercialisation of IME. New materials must be developed that can survive new requirements such as stretching and 3D forming; new processes must be developed to combine 2D printing, 3D forming and rigid component

placement; and new design procedures and product concepts must be developed based on material and process characteristics as well as market needs. This extensive change at many levels has prolonged the go-to-market timelines.

Material trends

Functional materials in IME must withstand new requirements. They must survive a one-off significant stretching event as the 2D printed sheet is formed into a 3D object. This is much more challenging to achieve for functional (vs mere graphical) inks since elongation can disrupt the function, eg, break the conduction path in conductive inks.

There is no single required degree of stretching; however, in general higher levels of stretchability are desired. As a crude rule of thumb, 20% elongation is the minimum whereas 60% or higher is in many cases preferred. Suppliers already seek to differentiate by the stretchability of the material since it eases process development and gives more design freedom.

Functional materials must also be reliable under harsh field conditions. This is critical particularly in automotive and similar applications. This aspect, surprisingly, was often neglected in the early days. Indeed, famous IME product failures and recalls have been caused by unreliability. The properties of utilised materials can often change significantly during high-humidity and high-temperature tests. This change should be factored into the design of the product.

IME is not composed of a single layer of materials. In fact, a stack of materials will need to be printed to achieve the required effect. This stack can include graphic inks, conductive inks, dielectrics, transparent conductive inks, carbon overcoats, and so on.

Thus far, the most studied functional material has been the conductive ink. Today, there are multiple suppliers across the world offering conductive inks for IME. This attention is justified because metal-filled (almost always silver) conductive inks represent the most expensive and high-value material in the stack and because they are the most sensitive to changes in the conduction, eg, elongation.



IME IS NOT COMPOSED OF A SINGLE LAYER OF MATERIALS. IN FACT, A STACK OF MATERIALS WILL NEED TO BE PRINTED TO ACHIEVE THE REQUIRED EFFECT.

Other materials are also critical in the process. In particular, low-temperature printable conductive adhesives that also exhibit some stretchability are these days the subject of increased product offerings. In general, all functional materials must also be compatible with one another. This compatibility is critical especially during the forming process and significantly impacts final properties. Indeed, even the sequences in which the materials are deposited can have an impact. This is a development challenge but also an opportunity to develop and sell complete IME material portfolios.

The substrate also represents a development and supply opportunity. Most have thus far utilised a polycarbonate substrate due to its good formability; however, many are now developing alternative such as special PETs. This is a space to watch closely. The moulding material will also be important, especially if new material can be developed to relax the moulding conditions. This would ease performance requirements for all the other materials in the process.

Process trends and challenges

The process is critical. It is not straightforward. It involves printing and drying/curing multiple functional and graphical materials on a 2D formable substrate such as PC. It then involves converting the 2D sheet into the 3D shape via thermo or vacuum moulding under elevated temperatures. The overmoulding must then take place at high temperatures too. In many cases, it might be tempting to cut corners to streamline the process for mass production, but past experience suggests that this comes with significant perils.

The question of pick-and-placing rigid components is also challenging. If the pick-and-place occurs after forming, then the pick-and-place machine must be able to handle placement in a 3D space. This will require specialised pick-and-place as well as adhesive dispensing tools, and will almost certainly slow down

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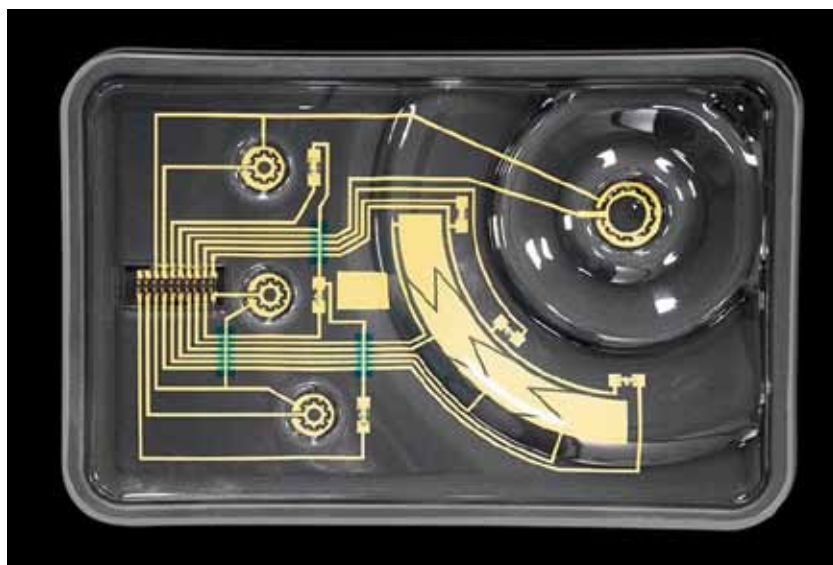
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the process. The pick-and-place could also occur on a 2D sheet prior to forming. This would however require special adhesives as well as careful product and process design to ensure that the rigid components will remain attached after all the forming steps.

In general, the process development is complex. It requires deep knowledge of the materials as well as all the process steps. The question of yield is a persistent and particular challenge. This is because defects cannot be repaired since electronics are embedded or structurally integrated. As such, defects are expensive since they waste the fully formed devices. In general, there is a steep learning curve to be travelled. This has created the need for centres or entities with accumulated know-how and expertise to cut down development time and technical barriers to entry. It has also meant that many traditional membrane switch or other functional printers with low-risk appetites and/or tight cash flows have had to wait for the industry to mature further before investing to evolve their business towards IME. This evolution will increasingly become inevitable and will accelerate as IME achieves a higher level of technical maturity and perhaps modularity.

Design trends and challenges

The design of IME products is also not straightforward. This is because it requires deep knowledge of material and process characteristics. It is not a streamlined process yet, lacking established software packages with drop-and-place component/functional libraries. This is in stark contrast to design processes found, say, in standard PCBs. The market requirements are also not clear-cut, well-established or convergent yet. This is because, despite years of development, the



industry is still in an exploratory phase where it is developing numerous prototypes and running qualification processes. The products and prototypes are still mainly custom made without standard design.

These all complicate the product development process, prolong the time-to-market, and form barriers to entry for users as well as potential producers. However, the industry is responding now and some firms are positioning to fill exactly this need, thus helping accelerate overall commercialisation.

The themes briefly discussed in this article have certainly prolonged the time-to-market. Indeed, IME, despite its semblance of simplicity on paper, is a complex endeavour, requiring drastic changes in materials, processes, designs and product concepts. The industry however has come a long way in terms of its accumulated learning as well as product offering. Low-volume products are already on the market and multiple high-volume applications are not too far from final qualification. Indeed, we forecast this market to exceed \$1 billion within the next decade.

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Screen Process Circuits is well equipped to handle prototype runs through to large production with a high degree of consistency and quality. It has extensive experience screen printing onto a wide range of materials, including acrylics, polycarbonates, polyester, PVC, metals (powder-coated and anodised), etc.

The company uses high-quality two-part epoxy inks when printing to metallic surfaces, which offers good adhesion. Once printed, the ink is oven baked for maximum durability and is scratch resistant.

The company supplies industries including mining, manufacturing, medical, telecommunications, electrical and more. It seeks to meet the exact specifications of every customer's product, while providing quick turnaround time and high quality.

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Schmidt Electronics Ethernet Media Converters are designed for operation in harsh industrial or outdoor environments. Housed in small rugged multipurpose enclosures that can be DIN-rail or wall-mounted, the converters are suitable for IP surveillance, traffic monitoring and security

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The media converters can be powered from an AC or DC power source. Screw terminals are provided, allowing 18 V-36 VAC or 12 V-60 VDC to be connected directly to the unit.

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X-RAY INSPECTION SYSTEM

The Nordson DAGE Explorer one is a compact X-ray inspection system that has been designed specifically for the electronics industry. Featuring Nordson DAGE's integrated imaging technology, the product's high image quality allows features as small as 2 μ m to be seen. Typical applications include BGA reflow inspection, PTH solder fill inspection, counterfeit component screening, cable quality inspection, and QFN and QFP solder quality.

The system leverages Nordson's powerful and easy-to-use Gensys inspection software, so operators and occasional users can perform quality inspection quickly, easily and with minimal training. The device gives real-time feedback so users can navigate around products and find defects fast. Automated inspection routines help ensure fast throughput when inspecting batches of boards.

Fast to install, the small and light X-ray system features a compact footprint that does not compromise board size. The double oblique angle detector geometry inspects 300 x 300 mm boards from every side, making it quick and easy to check BGAs and PTHs. The product also features Nordson DAGE EnviroShield Technology, a lead-free X-ray shielding technology which is non-toxic and easy to dispose of at end of life.

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Featuring high power density, maxon motor's 60 mm diameter, 400 W, 48 V brushless DC motor and right-angle helical bevel gear combination can deliver 25 Nm of torque. Loads can be mounted traditionally via keyway or coupling and through-shaft clamp collar fittings can also be used. The brushless DC motor's rear cable entry housing contains a 5000 CPT, three-channel encoder and a DC holding brake for safety-critical power failure load holding.

Two different 48 V windings allow for high speed and low current preferences, making control selection easy. All surfaces are gasketed, all bearings are rubber sealed and cables are grommated for industrial operation in harsh environments, making the drive particularly suitable for oil and gas, mining and agriculture applications.

**maxon motor
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www.maxonmotor.com.au





SOLAR SILICONES

DuPont Photovoltaic Solutions has announced DuPont Fortasun solar silicones — a product line that features sealants, adhesives, potting agents, encapsulants and electrically conductive adhesives. Used in photovoltaic (PV) applications for over 30 years, the products are designed to increase durability, stability, productivity and overall performance of solar panels.

The product range offers durability in the form of delamination and corrosion protection. It has lasting UV stability, high thermal conductivity formulations and strong adhesive bonds that help reduce failures due to moisture. It is also electrically insulating.

The range's silicone sealants and adhesives are said to outperform other technologies in frame sealing and junction box adhesion applications by providing protection from moisture, harsh temperatures and

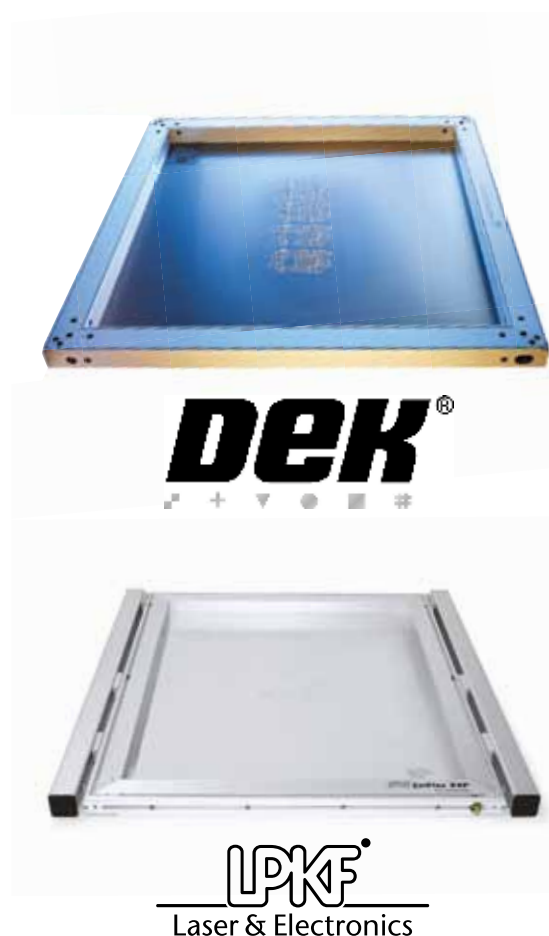
vibrations, as well as mechanical and thermal shock. They are designed to endure in the face of extreme climates, helping to reduce the risk of performance deterioration due to environmental elements.

Silicone adhesives are said to outperform typical PV tapes in rail bonding applications, offering adhesion to glass and PV substrates. This added structural strength and durability results in good overall protection and weatherability.

Silicone encapsulants meanwhile protect solar components against corrosion and delamination, prolonging the life of a module while ensuring better power output and improved performance results in terms of increased power generation. Finally, silicone potting agents are suitable for solar industry applications, offering a combination of high performance and durability for photovoltaic junction box applications and beyond.

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SOLAR CELLS



Image credit: Marc Roseboro/CNSI.

A coffee mug and a perovskite solar cell that was enhanced with caffeine.

SOLAR CELLS PERFORM BETTER WITH CAFFEINE

Researchers from the University of California, Los Angeles (UCLA), collaborating with China's Solargiga Energy, have discovered that caffeine can increase the efficiency of perovskite solar cells, enhancing their thermal stability and ability to convert light to electricity.

The research, published in the journal *Joule*, may enable the cost-effective renewable energy technology to compete on the market with silicon solar cells.

The idea began as a joke over morning coffee, with PhD candidates Jingjing Xue and Rui Wang from the Department of Materials Science and Engineering at UCLA discussing perovskite solar cells. They wondered if coffee would boost solar cell energy and improve performance as it did for them.

The team was keen to discover if caffeine, an alkaloid compound containing molecular structures, would interact with the precursors of perovskite materials — compounds with a particular crystal structure that form the light-harvesting layer in a class of solar cells. Previous attempts to improve the thermal stability of these solar cells have included enhancing the perovskite layer by introducing compounds such as dimethyl sulfoxide, but researchers have struggled to boost the cells' efficiency and long-term stability.

The UCLA researchers added caffeine to the perovskite layer of 40 solar cells, using infrared spectroscopy to determine if the caffeine had successfully bonded with the material. Further infrared spectroscopy tests revealed that the carbonyl groups in caffeine interacted with lead ions in the layer to create a 'molecular lock', which increased the minimum amount of energy required for the perovskite film to react and boosted the solar cell efficiency from 17% to over 20%. The molecular lock continued to occur when the material was heated, which could help prevent heat from breaking down the layer.

"We were surprised by the results," Wang said. "During our first try incorporating caffeine, our perovskite solar cells already reached almost the highest efficiency we achieved in the paper."

But while caffeine appears to significantly improve the performance of cells that utilise perovskite to absorb sunlight, the researchers do not think it will be useful for other types of solar cells. The unique molecular structure of caffeine only allows it to interact with perovskite precursors, which may give this solar cell variety an edge on the market.

Perovskite solar cells already have the advantage of being cheaper and more flexible than their silicon counterparts. They are also easier to manufacture — perovskite cells can be fabricated from solution-based precursors as opposed to solid crystal ingots. With further research, Wang believes caffeine may facilitate large-scale production of perovskite solar cells.

"Caffeine can help the perovskite achieve high crystallinity, low defects and good stability," he explained. "This means it can potentially play a role in the scalable production of perovskite solar cells."

To continue enhancing the efficiency and stability of the solar cells, the team plans to further investigate the chemical structure of the caffeine-incorporated perovskite material and to identify the best protective materials for perovskites.



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
Lauren Davis
wnie@wfmedia.com.au

Publishing Director/MD Geoff Hird

Art Director/Production Manager
Julie Wright

Art/Production
Veronica King, Colleen Sam

Circulation Dianna Alberry, Sue Lavery
circulation@wfmedia.com.au

Copy Control Mitchie Mullins
copy@wfmedia.com.au

Advertising Sales

Industrial Group Sales Manager
Nicola Fender-Fox – 0414 703 780
nfender-fox@wfmedia.com.au

Account Manager
Sandra Romanin – 0414 558 464
sromanin@wfmedia.com.au

Asia
Tim Thompson - 0421 623 958
tthompson@wfmedia.com.au



Contact the editor

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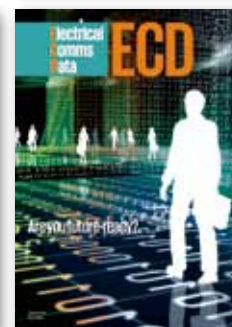
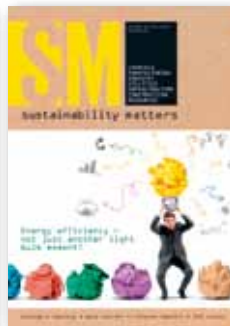
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Global Mark.com.au®

12 Works Place
Milperra NSW 2214 Australia
Tel: +61 (2) 9700 7000
Fax: +61 (2) 9700 7100

Raymond Pang | Sales Manager
Email: raymond@on-track.com.au
Mobile: +61 416 116 256
Website: www.on-track.com.au