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COVER STORY



The Keysight Streamline Series comprises compact USB instruments: vector network analysers (VNAs), oscilloscopes and an arbitrary waveform generator (AWG) that leverage Keysight technologies, measurement algorithms and application software.

Controlled via PC through a USB connection, Keysight's instruments help customers save space on the test bench and are easily shared among members of a development team. The small rack size makes them suitable for manual or semi-automated testing in design-validation and light-manufacturing applications.

Keysight Streamline Series platform is available in three models.

The P937xA models are compact two-port VNAs with frequency coverage up to 26.5 GHz. All are designed to test passive devices such as antennas, filters and duplexers. Running on a host PC, the context-sensitive user interface is identical to that of Keysight's latest benchtop VNAs.

The P924xA high-performance oscilloscopes provide full measurement functionality along with advanced triggering, rapid waveform updates and popular features such as zone triggering. With the Keysight InfiniiVision interface running on the user's PC, the look and feel is consistent with familiar benchtop oscilloscopes.

The P9336A three-channel AWG provides 16-bit resolution with maximum analysis bandwidth of 540 MHz and maximum onboard memory of 4 GB. Applications range from general-purpose testing to complex I/Q signal generation for characterisation of transceivers and modulators.

More information about Keysight Streamline Series instruments is available at www.keysight.com/find/streamline.

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PERFORMANCE UP, POWER CONSUMPTION DOWN

Zeljko Loncaric*



High-end applications can never have too much computing power, but thermal budgets are limited. With its six cores, the 8th generation of the Intel Core and Intel Xeon processors offers more performance with lower overall power consumption — ideal conditions for high-performance systems in harsh industrial environments. The processor generation makes its debut on COM Express modules.

Until multicore technology came along, performance increases were mostly achieved by speeding up the clock frequency. Today, the performance per clock rate tends to increase with the number of cores per processor, so more tasks can be performed in parallel. The 8th generation of the Intel Xeon and Intel Core Embedded processors has been modified on both counts: for the first time, a general-purpose embedded computer is powered by a six-core processor, and for the first time it can process 12 threads with up to 4.4 GHz. The larger number of cores and the higher clock frequency drives up total computing power significantly, which benefits applications such as vision control and monitoring of complex CNC machines, as well as control room and monitoring systems for smart factories with support for up to three independent displays in 4k.

More tasks? More cores!

In the automation industry, this performance increase also benefits systems that have to process and coordinate many different tasks in parallel. Examples can be found in controls for robotics, manufacturing cells, and complex packaging and machine tools. Multicore technology makes it possible to operate individual processes, such as HMI and (real-time) control, on an embedded hardware platform. This reduces the number of computer systems in a single machine, lowering costs and increasing reliability. An example from the motion control area is motion axes that are assigned to individual processor cores. In such installations, the data exchange that's necessary to coordinate the motion sequences takes place in the system itself, which is much more efficient than connecting separate drive controls — especially since latencies occur even in connected systems, which can reduce the precision of a machine.

Collaborative robotics — a boom market

Collaborative robotics is a new and immensely booming market for high-performance multicore systems. According to MarketsandMarkets, it is expected to grow by 56.94% between 2017 and 2023 to reach a total global volume of US\$4.28 trillion. Collaborative robots call for even more computing capacity as they require additional subsystems for situational awareness and adaptive control besides the actual controller. These can be systems such as LIDAR and (stereoscopic) obstacle detection cameras, or subsystems for adaptive control and route finding in mobile solutions. These systems require additional computing instances that can be implemented very efficiently into the control systems with more computing cores.

IoT and condition monitoring

Automation OEMs also want more computing cores for IoT and Industry 4.0 integration as well as condition monitoring of their machines and systems. At this point, virtualisation starts to make sense in order to separate the individual tasks from each other. Depending on the software, the real-time controls of individual components can still be executed as multithreaded software on a single operating system instance; however, the gateway functionality should be separated from the real-time controls. Similarly, smart condition monitoring can be integrated efficiently by using local rule engines to evaluate and monitor the state of the mechanical components, for example, via vibration analysis. This sometimes requires significant computing power. High-end embedded systems for machine control literally cannot have too many computing cores and processing power per core. But what are the exact increases in processor performance?

Powerful six-packs

First tests by congatec show that the new six-core processors offer between 45 and 50% more multithread and 15 to 25% more single-thread performance compared to 7th generation Intel Core processor variants. At a given TPD, system designers can now achieve higher bandwidth with lower overall power consumption. This allows them to install high-end computing power and features even deeper in the field and to significantly increase the functionality of their applications. Incidentally, the microarchitecture of the 8th generation processors remains unchanged from the 7th generation, but the 14 nm manufacturing technology was optimised again, resulting in lower leakage currents, which in turn allows higher clock rates. In all other respects, the processor core is almost identical, so there is no need for any customisation on the software side, allowing truly seamless migration to this latest processor generation.

Fast upgrades with COM Express Type 6

If OEMs have designed their systems using computer-on-modules, they can integrate the new processor technology very quickly because all that's needed to upgrade to the next performance levels at a given TDP is a simple module swap. The COM Express Type 6 specification ensures that modules offer identical form factors, functions and cooling solutions as ready-to-buy super components that include a complete BSP with all required standard drivers. Comprehensive specifications for the construction of a carrier board also make it easier for



The COM Express cooling concept is standardised to such an extent that no design effort is required to equip system designs with new modules of comparable TDP classes.

developers of industrial-grade computers to design a system solution that's specifically tailored to their own requirements. Compared to full-custom designs, developers can expect to save around 50 to 90% of the effort required to develop a suitable solution at the board level. So, whenever standard motherboards do not meet the requirements of the specifications or if they are too large, computer-on-modules should be used — mass production excluded, of course.

Virtual machines for IoT connection

In this context, OEMs should also look out for support by real-time hypervisors for OEMs, which are often used in the industrial control and medical sector. This offers many advantages for OEMs wanting to supplement their real-time control with additional virtual machines for IoT or Industry 4.0 connection. That's because the two extra processor

cores in addition to the previously available quad-core solutions are literally predestined for supplementary functions.

Another focus for IoT designs is support for the development of SGET's Universal IoT Connector (UIC), which serves to standardise the decision-making and communication logic at the edge of the IoT. Next to pure hardware with comprehensive BSPs, embedded vendors that offer support for the UIC provide a large range of key standardised software modules that OEMs can use as application-ready glue logic for their applications. Available for purchase off-the-shelf, they have the advantage of significant engineering cost savings. As they rely on standards, OEMs also gain greater independence from the solutions of individual providers.

**Zeljko Loncaric is a Marketing Engineer at congatec.*

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www.congatec.com



Key technical data

The conga-TS370 modules with Intel Xeon and Intel Core i7 or quad-core Intel Core i5 processors have a TDP of 35 to 45 W and support up to 32 GB DDR4 2666 RAM. Even with full virtualisation and multiple virtual machines, each instance has more than enough memory as a result. For safety-critical applications, such as situational awareness for collaborative robots, optional error-correcting code (ECC) support can be provided. In addition, the modules feature an impressive choice of high-bandwidth I/Os, including 4x USB 3.1 Gen 2 (10 Gbps), 8x USB 2.0 and 1x PEG and 8x PCIe Gen 3.0 lanes for powerful system extensions. Long-term availability of at least 10 years and Intel Optane memory support plus extended security features such as Intel Software Guard Extensions, Intel Trusted Execution Engine and Intel Platform Trust Technology add to the modules' attraction. They further support all common Linux operating systems as well as the 64-bit versions of Microsoft Windows 10 and Windows 10 IoT.



STM32 Discovery Packs for Cellular-to-Cloud Connectivity

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- P-L496G-CELL01: with UG96 2G/3G modem
- P-L496G-CELL02: with BG96 LTE Cat M1 /Cat NB1 /EGPRS modem



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NEW WORLD RECORD SET IN QUANTUM COMPUTING SIMULATION

Scientists at the University of Melbourne have set a new world record in simulating quantum power on a classical computer, demonstrating more quantum data crunching than any of the existing quantum computer prototypes.

The team, led by Deputy Director of the Centre for Quantum Computation and Communication Technology Lloyd Hollenberg, has simulated the output of a 60-qubit quantum computer, which in general would require up to 18,000 petabytes, or more than a billion laptops, to describe — capabilities well beyond the largest supercomputer.

A quantum computer uses quantum physics to rapidly uncover an answer to a problem by adjusting probabilities simultaneously, while a classical computer uses more time and memory by looking at each potential answer in turn. A full-scale quantum computer in the future will be able to solve problems that range from complicated modelling for use in drug development and weather forecasting to optimising large systems such as transport systems, and may even extend the bounds of machine learning.

University of Melbourne student Aidan Dang developed and ran the university's record-breaking simulation by asking it to use Shor's quantum factoring algorithm to find the two prime numbers that when multiplied together equal the semi-prime 961,307. While this factoring calculation can be done on a laptop, the Melbourne team's simulation was able to solve it as a quantum computer comprising 60 qubits would.

By giving the quantum computer simulation a highly structured mathematical question to solve, rather than something more random, the team did not need to simulate the entire quantum state in order to witness larger-scale quantum computing in action. This enabled the simulation to solve the equation using just 13.8 terabytes of memory at the Pawsey classical supercomputer in Western Australia.

"The simulation used up almost all our allocated computing time at the Pawsey Supercomputing Centre, but we just made it," Dang said. "We can now use the results to identify clues as to how the first full-scale quantum computers will work."

Although current quantum computer prototypes are too small to do anything more useful than a classical computer, Professor Hollenberg said this record simulation is an important step in helping researchers get 'quantum-ready'.

"The capability to simulate quantum algorithms at this level is critical for learning how a quantum computer in the future will physically operate, how the software can work and what sort of problems it can solve," he said.

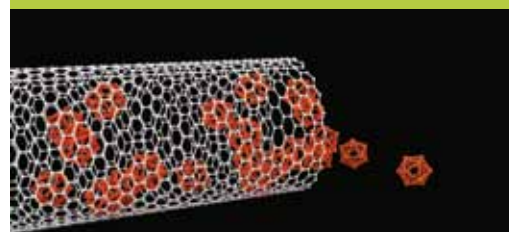
"Essentially, academia, government and industry alike need to be quantum-ready as the hardware development occurring globally accelerates. Large-scale quantum computer simulation is an important ingredient in this process."

ATOM-THIN NANOWIRES EFFICIENTLY CONVERT HEAT TO ELECTRICITY

Waste heat can now be converted to electricity more efficiently using one-dimensional nanoscale materials as thin as an atom, thanks to new research led by the University of Warwick and published in the journal *ACS Nano*.

Collaborating with the Universities of Cambridge and Birmingham, researchers from Warwick's Department of Physics found that the most effective thermoelectric materials can be realised by shaping them into the thinnest possible nanowires. Thermoelectric materials harvest waste heat and convert it into electricity — and are much sought after as renewable and environmentally friendly sources of energy.

"In contrast to three-dimensional material, isolated nanowires conduct less heat and more electricity at the same time," said Dr Andriy Vasylenko, first author on the paper from the University of Warwick. "These unique properties yield unprecedented efficiency of heat-to-electricity conversion in one-dimensional materials."



The researchers were investigating the crystallisation of tin telluride in extremely narrow carbon nanotubes used as templates for the formation of these materials in their lowest dimensional form. In a combined theoretical-experimental research, they were able not only to establish a direct dependence between the size of a template and a resulting structure of a nanowire, but also to demonstrate how this technique can be used for regulation of the thermoelectric efficiency of tin telluride formed into nanowires 1–2 atoms in diameter.

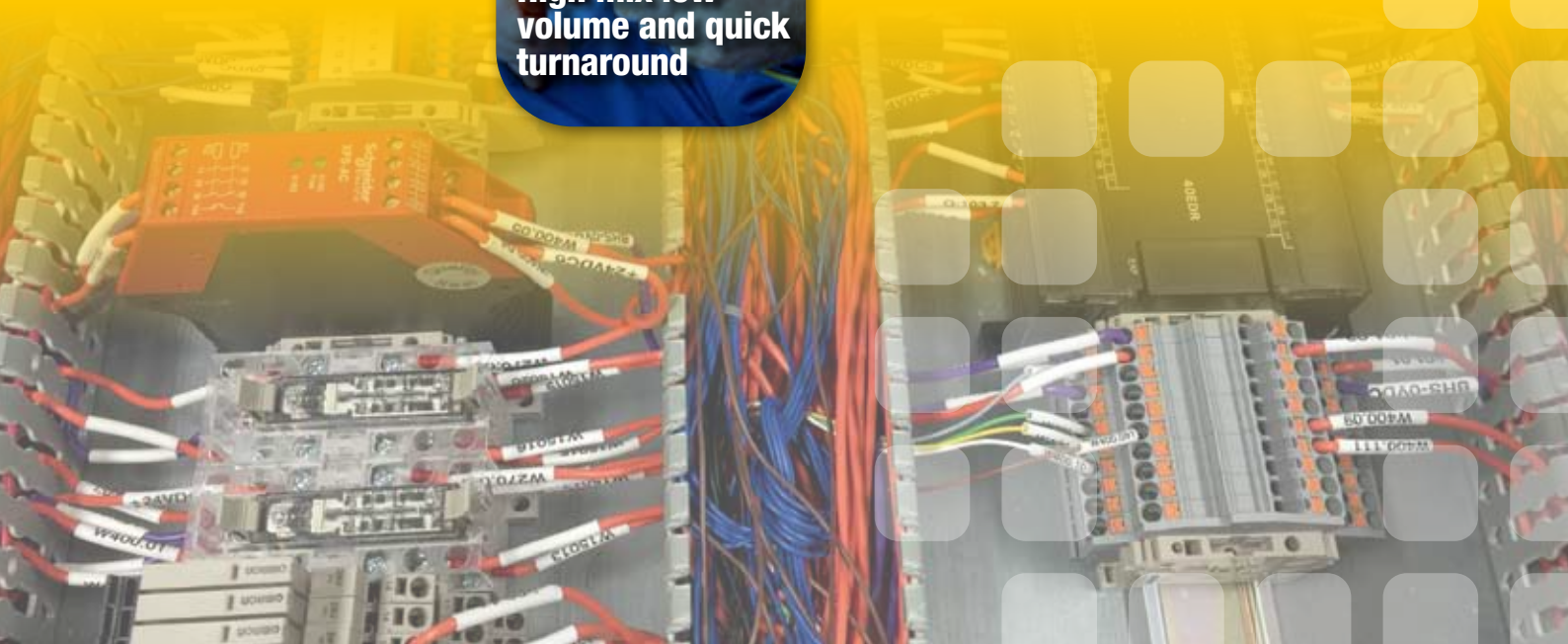
"This opens up an opportunity for creation of a new generation of thermoelectric generators, but also for exploration of alternative candidate materials for thermoelectrics among abundant and non-toxic chemical elements," said Dr Vasylenko. And with a growing demand for both miniaturisation and enhanced efficiency of thermoelectrics, nanostructuring offers a viable route for targeting both objectives.

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'HONEYCOMB' LATTICE COULD INCREASE BATTERY LIFE 100-FOLD



US scientists have invented a magnetic material that addresses two of the chief complaints surrounding battery-operated electronics: short battery life and too much heat generation.

Led by Deepak K Singh, associate professor of physics and astronomy at the University of Missouri, a group of physicists developed a lattice material in a honeycomb pattern that exhibits distinctive electronic properties. Their two-dimensional, nanostructured material was created by depositing a magnetic alloy, or permalloy, on the honeycomb-structured template of a silicon surface.

The material conducts unidirectional current, or currents that only flow one way. It also has significantly less dissipative power compared to a semiconducting diode, which is normally included in electronic devices. Its properties have been described in both *Advanced Science* and *Advanced Electronic Materials*.

"Semiconductor diodes and amplifiers, which often are made of silicon or germanium, are key elements in modern electronic devices," Singh said. "A diode normally conducts current and voltage through the device along only one biasing direction, but when the voltage is reversed, the current stops. This switching process costs significant energy due to dissipation, or the depletion of the power source, thus affecting battery life. By substituting the semiconductor with a magnetic system, we believed we could create an energetically effective device that consumes much less power with enhanced functionalities."

The magnetic diode paves the way for new magnetic transistors and amplifiers that dissipate very little power, thus increasing the efficiency of the power source. This could mean that designers could increase the life of batteries by more than a 100-fold. Less dissipative power in computer processors could also reduce the heat generated in laptop or desktop CPUs.

"Although more work needs to be done to develop the end product, the device could mean that a normal 5-hour charge could increase to more than a 500-hour charge," Singh said. "The device could also act as an on/off switch for other periphery components such as closed-circuit cameras or radiofrequency attenuators, which reduces power flowing through a device."

The scientists have already applied for a US patent and have begun the process of incorporating a spin-off company to help them take the device to market.

ELECTRONIC SKIN NOMINATED FOR ASPIRE PRIZE

The Australian Government has congratulated RMIT University's Associate Professor Madhu Bhaskaran on being chosen as Australia's 2018 nominee for the prestigious APEC Science Prize for Innovation, Research and Education (ASPIRE).

ASPIRE is an annual award which recognises young scientists from Asia-Pacific Economic Cooperation (APEC) who have demonstrated a commitment to excellence in innovation, research and education. Each APEC member economy, through its representative in the APEC Policy Partnership for Science, Technology and Innovation (PPSTI), is invited to nominate one young scientist under the age of 40 to be considered for the US\$25,000 prize.

Associate Professor Bhaskaran was nominated for the award by the Australian Academy of Science for her work developing unbreakable and transparent electronic devices that monitor the environment and the human body and can be worn like an 'electronic skin'. Her devices have practical and potentially life-saving applications such as detecting dangerous gases in mines, reducing skin cancer with widespread use of UV sensors and smart contact lenses that can analyse tears for biomarkers.

"Associate Professor Bhaskaran has developed technology that has the potential to improve the lives of thousands of people in Australia and across the world," said Minister for Jobs and Innovation Michaelia Cash.

Bhaskaran said it was an "absolute honour" to be Australia's nominee for the 2018 ASPIRE Prize, noting that her research aligned closely with this year's theme of 'Smart Technologies for Healthy Societies'.

"This is an exciting and fast-developing field of research which could have far-reaching implications in health care and enable people to age well and age productively," she said.

The ASPIRE award ceremony will take place at the 12th APEC PPSTI meeting in Papua New Guinea later this year.

Pictured: Associate Professor Madhu Bhaskaran.



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MOTOR-DRIVER BOARD FOR 3D PRINTING

STMicroelectronics' EVALSP820-XS motor-driver board brings ST's industrial-control expertise to the RAMPS (RepRap Arduino Mega Pololu Shield) open-source 3D-printer platform, enabling 3D printer makers to unleash the potential of their machines for faster printing and smoother surface finish.

The RAMPS modular platform is making fused filament fabrication (FFF) 3D printing accessible to makers, small businesses and home users, for fast prototyping, making replacement parts or education. The Arduino Mega 2560, or Arduino DUE, baseboard provides basic control, ready for users to plug in their own choice of motor driver, extruder controller and any other desired functions using Mega-compatible expansion shields.

As a plug-and-play expansion board, the EVALSP820-XS can drive RAMPS printers at a high speed for increased throughput, ensuring good smoothness with microstepping resolution from 1/2-step to 1/256-step per microstep. Key to this increase in printing performance is ST's STSPIN820 stepper-driver IC.

The IC embeds high-speed motor-control input circuitry and algorithms developed for industrial applications. It also integrates a powerful 1.5 A_{rms} output stage in the compact 4 x 4 mm QFN package. Industrial ruggedness is assured with comprehensive built-in protection including undervoltage lockout, overcurrent/short-circuit protection and thermal shutdown.

The board can be used in other projects to accelerate development of smooth, high-speed stepper control for equipment such as surveillance-camera platforms, textile-manufacturing or sewing machines, medical devices, cash-handling machines, office and home automation, point-of-sale terminals and robotics. With its 7–45 V operating-voltage range and simple host interface comprising step-clock and direction-input pins, the expansion board is versatile and easy to integrate.

STMicroelectronics Pty Ltd
www.st.com

SIGNAL ANALYSER FOR 5G NR ANALYSIS

Anritsu announces the launch of five additional 5G measurement software options for its MS2850A Signal Analyzer. The five software options are compliant with the 3GPP 5G standards (5G NR hereafter) and used for measuring the RF Tx characteristics of next-generation 5G base stations and mobile terminals.

The options include 5G Standard Measurement Software, NR TDD sub-6 GHz Downlink, NR TDD sub-6 GHz Uplink, NR TDD mmWave Downlink and NR TDD mmWave Uplink.

For any telecoms operators looking for early deployment of commercial 5G services, these modules, when combined with the MS2850A Signal analyser, provide an effective solution for fast and stable signal-analysis measurements, such as Tx power, frequency error, EVM, etc. Analysis can be performed on frequencies below 6 GHz (sub-6 GHz) and in the millimetre wavebands (mmWave) such as the 28 GHz band and 39 GHz band.

The MS2850A has the same or better dynamic range and amplitude/phase flatness as higher-end models, according to the company, assuring both high-precision signal analysis and high finished product quality. Anritsu has developed the product to help facilitate early deployment of 5G services while meeting demands for high-level measurement technologies.

Anritsu Pty Ltd
www.anritsu.com



SURGE PROTECTORS FOR RAILWAY CONVERTERS

RECOM has added the RSP-168 surge protectors to its portfolio, allowing DC/DC converters to meet both RIA12 and NF F 01-510 surge immunity specifications for railway applications. Three versions cover the wide range of RECOM's railway certified DC/DC converters from 20 to 240 W.

The RSPxxx-168 surge protector modules are designed to protect railway DC/DC converters from excessive voltage surges of up to 385 VDC. The output voltage tracks the input voltage up to 165 VDC; thereafter the output voltage is clamped to prevent damage to the converter from input overvoltage conditions that cannot normally be filtered out.

There are three options available: the RSP20-168 is suitable for up to 20 W, the RSP150-168 for up to 150 W and the RSP300-168 for up to 300 W converters. To achieve compliance with both the RIA12 and NF F 01-510 surge immunity specifications, these modules are simply connected in series with the input of the DC/DC converter.

RECOM Power GmbH
www.recom-power.com

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221 Series - The Way to Connect Just got Bigger

As with other 221 Series models, installation with WAGO's new 6 mm² splicing connectors is simple. Stripped conductors are pushed into the connector until they hit the backstop after opening the clamp with an orange lever. The conductor is securely connected after closing the lever, while the transparent housing enables visual inspection of the connection. OEMs benefit from the new connector that offers options for easy, fast and safe wiring of high-power lighting and signal systems, or HVAC systems within commercial buildings.

WHY WAGO?

- Easy conductor termination up to 6 mm² (10 AWG) accommodating any wire type (solid, stranded and fine-stranded)
- Safe wiring thanks to WAGO's spring pressure connection technology
- Time-saving for Electricians, OEMs and building technicians with faster installation of devices
- Compliant for use in Australia and New Zealand



4 mm² variant
450 V / 32A

6 mm² variant
450 V / 41A

832 Series - Lever Terminal Blocks

Thanks to WAGO's innovative spring pressure connection technology, the WAGO PCB Terminal Blocks for all applications ideally blend ergonomics and safety. Push-in CAGE CLAMP® enables solid and ferruled conductors to be connected by simply pushing them into the unit, while guaranteeing secure and maintenance-free connections for all conductor types. Furthermore, our products are not only simple and easy to use, but also offer maximum wiring flexibility.

WHY WAGO?

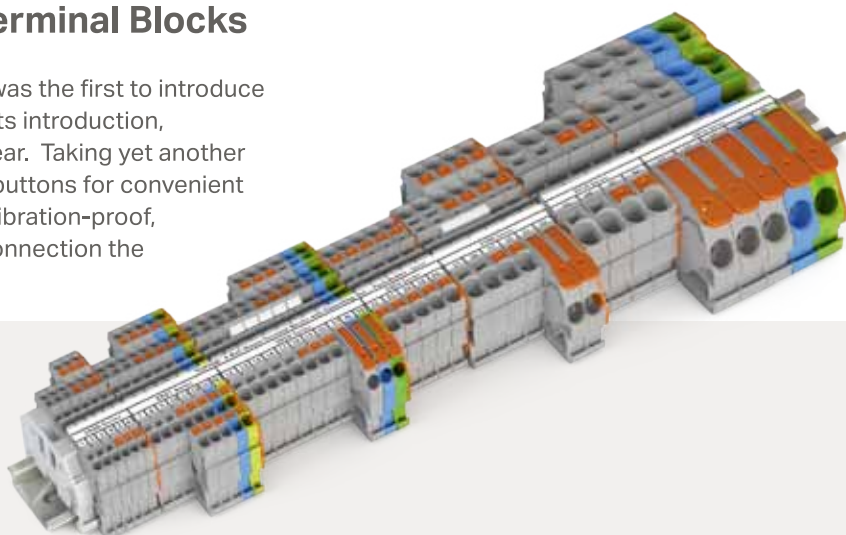
- Female and male connectors with levers and Push-in CAGE CLAMP®
- Insert solid and fine-stranded ferruled conductors via Push-in termination
- Test slot 0° and 90° to conductor entry
- Secure connection via simple, effortless lever actuation into closed position

TOPJOB® S Series - Rail Mount Terminal Blocks

The TOPJOB® S family, with Push-in CAGE CLAMP® was the first to introduce Push-in wiring for rail mount terminal blocks. Since its introduction, new features and benefits have been added every year. Taking yet another leap forward, the family now offers levers and push-buttons for convenient and intuitive wire termination while maintaining the vibration-proof, gas-tight, corrosion and thermal-cycling resistant connection the industry has come to expect from us.

WHY WAGO?

- Push-in wiring technology with the Push-in CAGE CLAMP®
- Industry's broadest jumper system and TOPJOB® S exclusive jumper retention spring
- Built-in test ports
- Continuous, multi-line marking



FRAMELESS DC MOTOR AND ENCODER

maxon motor's frameless DC motor and encoder set is designed to allow for miniaturisation and integration. The motors meet the increasing need for smaller robotic actuation by assembling individual parts directly into the robotic joint.

The frameless brushless DC motor (BLDC) has a diameter of 45 mm and an assembled depth of 23.7 mm. It has a continuous rating of 50 W; 70 and 130 W versions are also available. The frameless design is particularly suitable for processing machine or rotary stage manufacturers who need a large through bore to pass cabling or tubing.

For positioning, a high-resolution magnetic encoder ring with the same bore as the motor rotor is supplied. The encoder ring is marked with the zero position to allow alignment with the motor zero commutation point in the application and is available in IP-rated, absolute and incremental options.

The combination gives a low-profile, large-bore positioning system made up from standard parts with shorter lead times than specialty manufactured complete assemblies, according to the company. It is suitable for space saving in applications already containing joint actuation bearings or mounting systems, as there is no need for a second set within the motor.

maxon motor Australia Pty Ltd
www.maxonmotor.com.au



32-BIT MCU

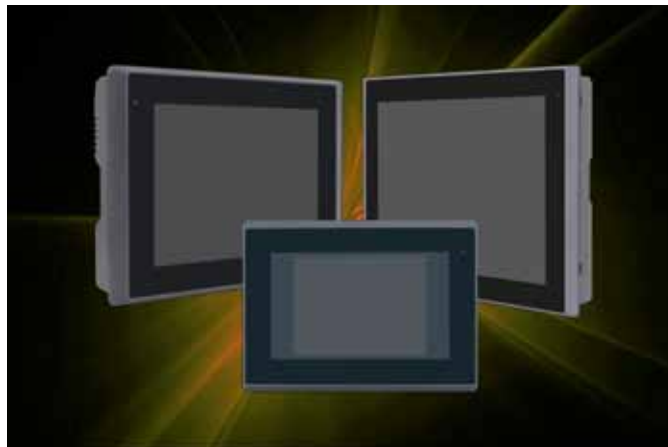
With the growth of IoT nodes, security has become an afterthought for many designers, increasing the risk of exposing intellectual property (IP) and sensitive information. Fortunately, the SAM L10 and SAM L11 MCU families from Microchip can help designers plan for security at an early stage with Arm TrustZone for Armv8-M, a programmable environment that provides hardware isolation between certified libraries, IP and application code.

The MCUs, based on the Arm Cortex-M23 core, feature chip-level tamper resistance, secure boot and secure key storage that, when combined with TrustZone technology, protect customer applications from both remote and physical attacks. The SAM L11 family also includes an onboard cryptographic module supporting Advanced Encryption Standard (AES), Galois/Counter Mode (GCM) and Secure Hash Algorithm (SHA), as well as a secure bootloader for secure firmware upgrades.

Both MCU families offer Microchip's latest generation Peripheral Touch Controller (PTC) for capacitive touch capability with good water tolerance and noise immunity, making the devices suitable for automotive, appliance, medical and consumer human machine interface (HMI) applications.

In addition, they provide good power consumption in active and all sleep modes with the company's picoPower technology. The SAM L10 received a ULPMark score of 405, which is said to be over 200% better performance than the nearest competitor certified by EEMBC. A power debugger and data analyser tool is available to monitor and analyse power consumption in real time and fine-tune the consumption numbers on the fly to meet application needs.

Microchip Technology Hong Kong
www.microchip.com



INDUSTRIAL MONITORS

Aplex Technology's ADP-1XX0A series industrial-grade monitors feature a lightweight and compact design. The series has five models of LCD sizes from 5.6" to 12.1", making it suitable for factory automation and other space-saving applications.

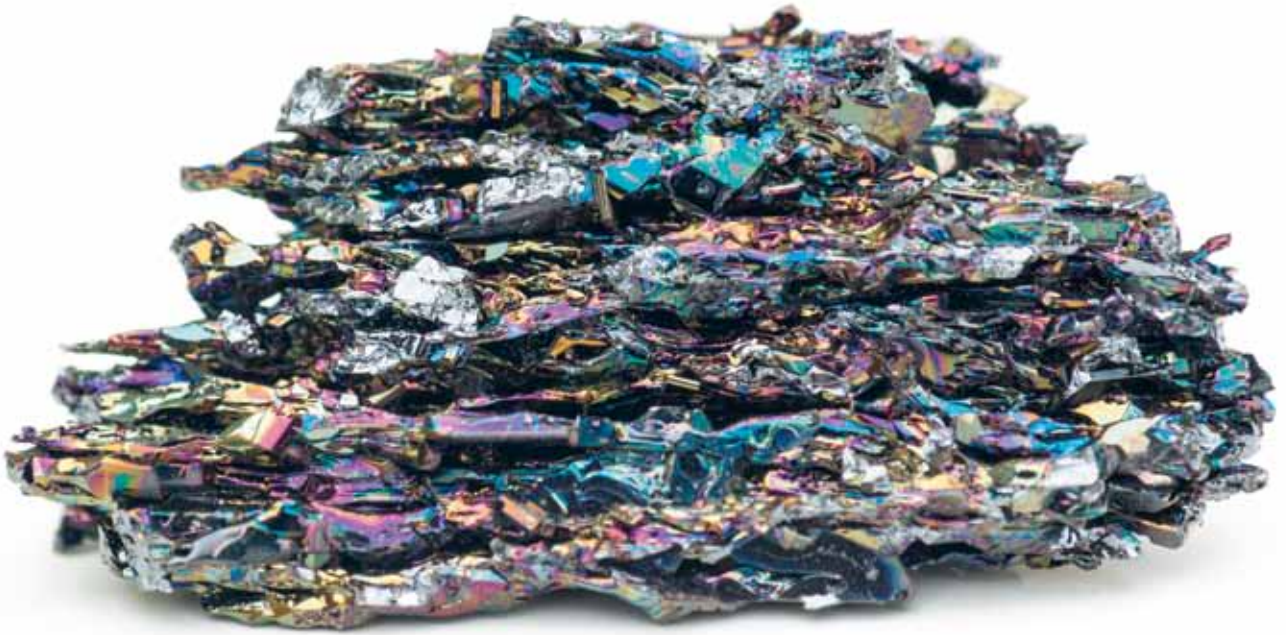
Four of the models in the series are equipped with a choice of either resistive touch screen or a projected capacitive touch (PCT) screen. These models include the ADP-1070A with a screen size of 7", the ADP-1080A with a screen size of 8", the ADP-1100A with a 10.1" screen and the ADP-1120A with a 12.1" screen. The ADP-1050A, which has a 5.6" screen, is only available with a resistive touch screen.

All models in the series feature industrial-grade plastic housing that makes the monitors thin and lightweight, which allows for easy installation. An IP65 protected front panel is resistant to dust and water and the industrial temperature range is able to withstand temperatures from 0 to +50°C.

All the monitors in the series come equipped with both VGA and DVI connections and feature five OSD function keys on the rear of the unit. This enables easy access to turn off the unit as well as open the monitor's menu and navigate the menu with the function keys.

Featuring wide-ranging 9–36 VDC power input, the series supports both panel mounting and VESA mounting options, making it a good entry-level option for industrial needs.

Backplane Systems Technology Pty Ltd
www.backplane.com.au



FULL SiC PERFORMANCE IN POWER MODULES

THE TUNING MAKES THE DIFFERENCE

Discrete devices such as the TO-247 are fine as a first step towards integrating silicon carbide into various applications, but for more powerful and sophisticated designs, the integration capabilities of power modules make them the first choice. But which packages are suitable for fast switching silicon carbide devices?

Silicon carbide can be the right semiconductor to choose when conventional silicon devices reach their limits in terms of power losses and switching frequency. Up to 30–40 kHz, the latest-generation silicon IGBTs and diodes combined with new topologies such as multilevel configuration provide the best cost-performance ratio. Hybrid silicon carbide, combining a high-speed silicon IGBT and a silicon carbide Schottky free-wheeling diode, is also a great option, reducing the power losses by up to 50% compared to silicon-only solutions.

Above 40 kHz, SiC MOSFETs can be the best choice, but lead to challenges for the power module and system design. Fast switching incurs steep current slopes and high di/dt values. The module's and system's parasitic inductances, L_{Module} and $L_{\text{DC-Link}}$, cause voltage drops due to this di/dt , resulting in voltage overshoot across the chips.

If the current slope is too high, this overvoltage might exceed the maximum blocking voltage, eg, 1200 V, of the SiC device. Decreasing the switching speed or the DC link voltage $V_{\text{DC-link}}$ will reduce the overvoltage but compromise the SiC power module's

performance. A module and system design focused on low commutation inductance is therefore essential.

The module's commutation inductance is mainly provided by the DC bus terminals with 12 to 18 nH, depending on the power module design. The DBC design, ie, DBC tracks and wire bonds, contribute another 1 to 6 nH. The degree of optimisation freedom depends greatly on the overall power module design.

The SEMITRANS 3 module includes optimised DC bus terminals. Thanks to parallel guidance of the terminals internally, the commutation inductance of the complete package is 15 nH. This makes the SEMITRANS 3 good for medium- and high-power silicon carbide designs using medium switching speeds and frequencies up to approximately 25 kHz. Full SiC half-bridge topologies are available with rated currents of 350 and 500 A, with and without a SiC Schottky free-wheeling 1200 V diode.

Another example is the MiniSKiiP, a baseplate-less power module using Semikron's SPRiNG system to connect the power and auxiliary terminals to the PCB. Having spring positions fixed by the housing design, commutation inductance can only be improved within the

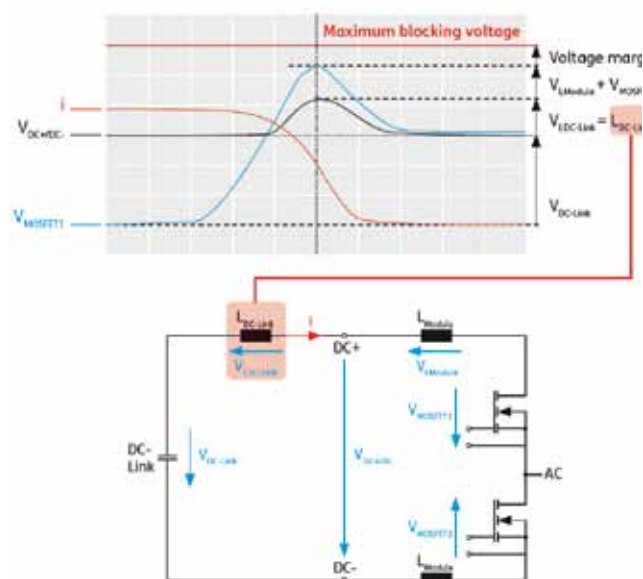


Figure 1: Module and system inductance and their influence on transient overvoltage during MOSFET turn-off.

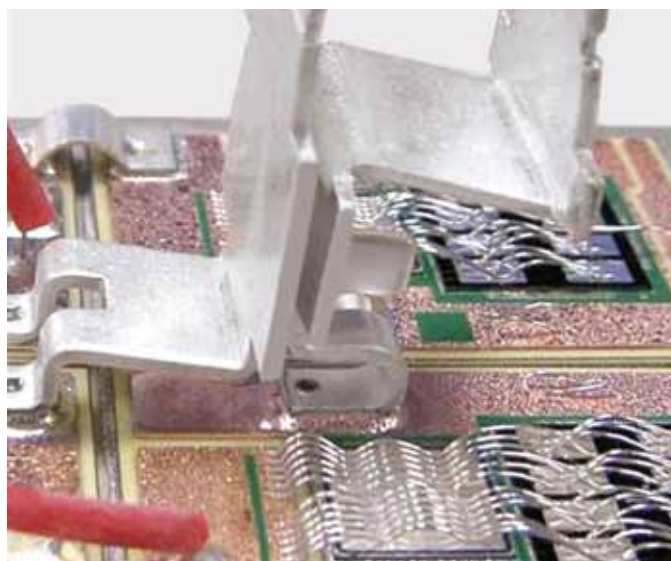


Figure 2: SEMITRANS 3 DC bus terminals — parallel construction minimises stray inductance.

Ceramic substrate material	Al ₂ O ₃	Si ₃ N ₄	AlN
Thermal conductivity (W/mK)	~25	~90	~180
Standard thickness (mm)	0.38	0.32	0.63
Resulting thermal performance	100%	~400%	~400%
Bending strength (MPa)	450	650	320
Fracture toughness (MPa√m)	3.8–4.2	6.5–7	2.6
Mechanical robustness	o	+	–

Table 1: Mechanical and thermal specifications of different ceramic substrates.

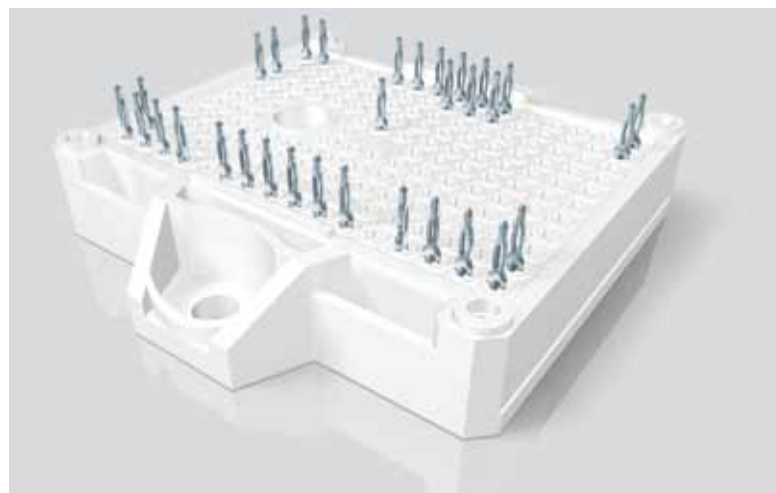


Figure 3: SEMITOP E2 with its pin-grid structure.

limits of the DBC design. The resulting commutation inductance is around 20 nH for six-pack power modules, which allows full SiC modules for the low- and medium-power range. In full SiC MiniSKiiP is available with 25 to 90 A in six-pack topology for 1200 V and with 50, 100 and 150 A with hybrid SiC chipsets.

SEMISTOP E2 is the baseplate-less module that allows full optimisation. With its pin-grid structure on the top of the housing, the press-fit pins can be freely distributed over the complete footprint. Extensive simulations helped to create a half-bridge design with only 6 nH commutation inductance. The module is equipped with six SiC MOSFETs in parallel, resulting in an $R_{DS(on)}$ of 7.5 mΩ at 25°C.

Thanks to the design, the AC and DC sides are separated on opposite edges of the module, so the DC link PCB can be designed to be low-inductance as well. This means DC+ and DC– can remain paralleled within the PCB for a maximum distance, reducing the commutation loop.

The advantage of optimised commutation inductance is a safe operating area that supports switching speeds of over 50 kV/μs at 600 VDC link voltage, including a sufficient margin between the blocking voltage of the SiC MOSFET and the overvoltage measured across the MOSFET chips. Figure 4 shows the switching losses versus the drain current with an external gate resistor of 0.5Ω in addition to the internal gate resistor of 0.5Ω.

The overall thermal performance of the power module is also important. The power density of silicon carbide chips is higher than that of silicon devices. SiC MOSFETs demonstrate significantly lower switching losses in general and especially lower voltage drops under partial load than silicon IGBTs with the same nominal current. This produces smaller chip areas under nominal load, with

	SEMISTRANS 3 Full SiC Al ₂ O ₃	SEMISTRANS 3 Full SiC AlN
No. of chips per switch	12	8
Used chip area	100%	66%
$R_{th(j-c)}$ per chip	0.84 K/W	0.54 K/W
Cont. drain current I_D ($T_J=175^\circ\text{C}/T_C=80^\circ\text{C}$)	431 A	416 A
Module cost	100%	75%

Table 2: SEMISTRANS 3 full SiC case study.

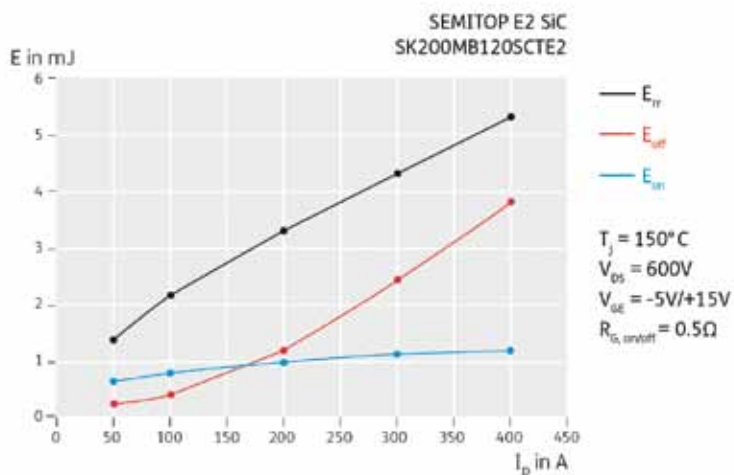


Figure 4: Switching losses of the SEMITOP E2 SiC versus the drain current I_D .

an undesirable higher thermal resistance from chip to baseplate or heatsink ($R_{th(j-c)}$ resp. $R_{th(j-s)}$).

Yet the chip area might then not be sufficient for overload conditions. Due to the usually positive temperature coefficient of SiC devices, the static or forward losses gain importance and increase the overall losses during an overload. Adding additional SiC MOSFET chips to reduce the $R_{DS(on)}$ would increase the overload capability, but also the cost of the power module. SiC is still expensive and only the minimum SiC chip area required should be used. The solution lies in improving the module's thermal resistance.

Within a baseplate power module, the ceramic substrate that electrically insulates the module to the heatsink represents the biggest share of overall thermal resistance. Today, numerous materials exhibiting different mechanical and thermal behaviour are available. Table 1 gives an overview of the most commonly used materials: aluminium oxide (Al_2O_3), silicon nitride (Si_3N_4) and aluminium nitride (AlN).

The standard today is aluminium oxide, providing a good trade-off between thermal/mechanical behaviour and cost. AlN has nine times the thermal conductivity of Al_2O_3 , but is less mechanically stable. This weakness must be offset with increased thickness, which compromises thermal improvement.

Si_3N_4 has 3.5 times the thermal conductivity of Al_2O_3 but has the best mechanical specifications. This material is therefore used in thinner layers, which compensates for the lower thermal conductivity and produces a similar thermal performance to AlN. Table 1 shows an overview of the three materials, summarising their thermal performance and mechanical robustness.

Table 2 shows a case study for the SEMITRANS 3 full SiC half-bridge power module. Available with Al_2O_3 and AlN substrates, the benefit of a substrate with increased thermal performance is obvious. The Al_2O_3 version uses 12 chips per switch at 100% module cost to achieve a continuous drain current of 431 A. If the substrate is changed to AlN and the chips reduced to eight, the continuous drain current remains in the same range while the cost of the power module is reduced to 75%.

Replacing time-consuming production processes with TO device-based power designs is only possible using silicon or silicon carbide power modules. The specific features of SiC require optimisation of the commutation inductance and thermal performance. As a result, the cost-performance ratio can be improved and the advantages of SiC fully utilised to the application's benefit.

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ETHERNET SWITCH

The EKI-2525LI is an unmanaged, 5-port Ethernet switch that comes in an ultrasmall palm size. This makes it a suitable solution for environments with limited space, such as electronic boxes, cabinets and high-density plants.

Compact devices such as PLCs typically have a height of only approximately 10 cm. Conventional Ethernet switches, however, are usually taller than this, resulting in a waste of space. The EKI-2525LI overcomes this and can be easily fitted into a rackmount cabinet to maximise space utilisation, thus offering an easy and immediate upgrade for Industrial IoT applications. The product can also be fitted into any already wired electronic boxes or shelves where extra connectivity and communication services are required, but space is limited, therefore aiding businesses with key infrastructure upgrades.

The EKI-2525LI can serve as an embedded device in any working equipment such as kiosk, AGV and CNC machines. This ensures smooth data transmission between embedded devices and thereby promotes seamless information communication.

Advantech Australia Pty Ltd
www.advantech.net.au



DIGITAL MULTIMETER WITH REMOTE DISPLAY

The Fluke 233 Digital Multimeter features a removable display which gives the user flexibility in unusual measurement scenarios. It is available to rent from TechRentals.

Users can simply put the meter where measurements are required and place the display where it can be seen easily. This functionality eliminates the need to juggle leads and the meter while reaching into confined spaces.

With a range of 10 m, the removable display allows for measurement in hard-to-reach spaces and machines or panels that are physically separated from a limit or isolator switch. It can also be used in environments unsuitable for operators such as clean rooms or hazardous areas.

The product features True-RMS AC voltage and current for precise measurements on non-linear signals. It can measure up to 1000 V AC and DC, up to 10 A (20 A for 30 s) and has a capacitance range of 10,000 μ F.

TechRentals
www.techrentals.com.au

FIXED INPUT DC CONVERTERS

Mornsun's R3 series fixed input DC converters offer solutions to three common issues with power supply design: short-circuit protection where large capacitive loads make it difficult to coexist; focus on high efficiency at full load while ignoring efficiency at low-load, standby current power consumption; and situations where a large capacitor cannot be used as it may cause start-up failure or destroy the converter.

Mornsun's R3 series fixed input voltage DC/DC converters have adopted IC technologies that decouple these conflicts while maintaining continuous short-circuit protection, capacitive load and start-up capability, which greatly resolves problems existing in the design.

The 1 W DC/DC converters free up users' time from power supply design with a simple and effective solution with a small footprint. They are available in a comprehensive range of cross-industry SIP, DIP and SMD pin-compatible packages.

The converters feature high efficiencies at low- and high-load low-standby power consumption, high capacitive loading up to 2400 μ F and short-circuit protection with soft start-up. UL62368/EN62368 certifications are in place.

DLPC Pty Ltd
www.dlpc.com.au



FORTE

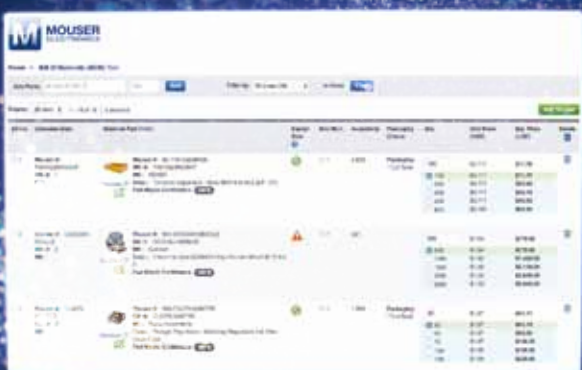
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AC/DC CONVERTERS FOR IoT AND SMART HOME

The RAC15-K and RAC20-K series are PCB-mount AC/DC modules with ultralow energy losses, especially in light load conditions. With high efficiency over a wide load range and minimal standby power consumption, this makes them suitable for the always-on and standby mode operations needed for low power IoT and smart home devices.

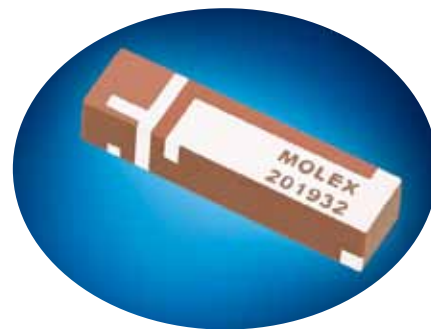
Based on the latest developments of integrated power, the products have a high level of efficiency, allowing 20 W of power in a modular 2" x 1" case size.

The AC/DC converters have a universal mains input range of 85 VAC up to 264 VAC for worldwide use and come with international safety certifications for industrial, AV and ITE as well as household standards.

Both the RAC15-K and RAC20-K are able to operate within a temperature range of -40 to +80°C and offer fully protected 5 VDC single outputs. The complete range of single-output (5–48 VDC), dual-output (12 and 15 VDC) and wired versions will be available later this year. They easily meet EMC class B far below the limits without the need for any external components.

RECOM Power GmbH

www.recom-power.com



TRIPLE-BAND WI-FI ANTENNA

The triple-band Wi-Fi antenna from Molex is designed to penetrate areas of interference and deliver internet connectivity to places where walls and barriers present a challenge. Offering increased power efficiency and long-range connectivity to Wi-Fi certified products, the ceramic antenna is a robust option for Internet of Things (IoT) and machine-to-machine (M2M) applications.

The Wi-Fi antenna offers 900 MHz, 2.4 GHz and 5 GHz frequencies for increased range and penetration in areas of interference. The 900 MHz band also results in reduced power consumption when compared with similar 2.4 GHz and 5 GHz antennas, according to the company. The compact, surface-mount antenna features a ceramic housing that enables it to withstand temperatures ranging from -40 to +125°C.

The product is suitable for a wide range of applications that demand a broad signal range. The antenna supports IP-based cloud connectivity, making it suitable for the development of IoT and M2M solutions such as connected vehicles, smart homes and smart cities. Additionally, the device's extended range makes it a useful choice for medical, retail and agricultural applications demanding signal penetration and wide range.

Mouser Electronics

www.mouser.com

FLEXIBLE FANLESS EMBEDDED SYSTEM

iEi Integration's TANK-870e-H110 is a flexible, fanless embedded system, powered by Intel's 6th and 7th Generation iCore CPUs.

The product is rich in I/O which supports four USB 3.0 ports, two Gigabit Ethernet ports and two RS-232/422/485 COM ports. For video-out the unit comes equipped with one VGA port supporting resolutions up to 1920 x 1200 and one HDMI 1.4 port supporting resolutions all the way up to 4096 x 2160.

The device has room for storage, featuring a 2.5" HDD or SSD bay and one full-size mini PCIe slot that can accommodate an mSATA SSD. The system also features one full-size mini PCIe slot that can support a Wi-Fi card for wireless network access. It has a rugged design, with its wide temperature range withstanding temperatures of -20 to +50°C.

Other features include: Intel H110 chipset and DDR4 memory; support for dual display VGA+HDMI; an onboard Internal power connector for providing power to add-on cards; and good flexibility for hardware expansion.

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THE HIDDEN VALUE OF THE ADELAIDE ELECTRONICS INDUSTRY

Dr Ronald Grill, Managing Director, Technology Management Pty Ltd

The electronics design and manufacturing industry in Adelaide is significantly larger and more valuable to our regional economy than you might think.

To the wider community electronics typically means iPhones, microwave ovens and TV receivers and it is well known that these standardised 'consumer electronics' products are mass-produced overseas. It is true that many high-volume consumer products including passenger cars, washing machines, refrigerators and Hills Hoists are now manufactured overseas, and it is widely believed by our community that manufacturing in Australia has virtually ceased.

These same people are often genuinely surprised to learn that we have an advanced manufacturing industry in Adelaide that designs and manufactures high-technology, intellectual property-based, high value-adding, complex electronics products and systems that are sold across Australia and in more than 150 other countries. Most of our citizens do not know that the

Adelaide electronics industry is one of South Australia's largest manufacturing industries with 300 companies, 11,000 staff and \$4 billion annual revenue.¹

A significant factor in the virtual invisibility of the Adelaide electronics industry is that its sales are typically made on a business-to-business (B2B) basis with no retail display or advertising. Adelaide-designed electronics products are sold to industrial, commercial, government, education, health and research sectors. But why is the industry so valuable?

First, the products and systems of the Adelaide electronics industry enable most sectors in our modern economy and are critically important inputs to all 'Knowledge Age' industries including aerospace, AI, biotechnology, computing, communications, defence, education, environment, IoT, mining, manufacturing, research and robotics. These sectors and many others enabled by electronics greatly benefit our community despite our minimal awareness of them. It is sobering to note that without electronic products and systems our current lifestyle would be unsustainable.



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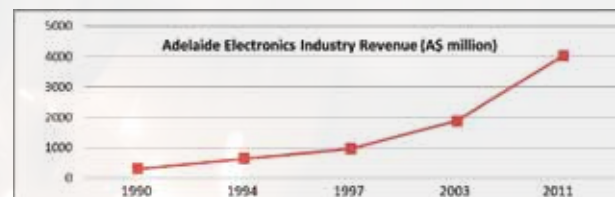
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Compound annual growth rate of revenue was 13% from 1990, or 13 times over 20 years.



THE PRODUCTS AND SYSTEMS OF THE ADELAIDE ELECTRONICS INDUSTRY ENABLE MOST SECTORS IN OUR MODERN ECONOMY AND ARE CRITICALLY IMPORTANT INPUTS TO ALL 'KNOWLEDGE AGE' INDUSTRIES

Second, our regional economy is in transition from our past dependence on high-volume 'Industrial Age' manufacturing systems and products to our logical future as a Knowledge Age region where education, research and smaller scale technology-based industry provides high value-added products, more satisfying work and higher economic returns than are achievable under the older Industrial-Age paradigm.

Productivity measured across the total South Australian manufacturing sector is \$113,600 per person.² Productivity in the Adelaide electronics industry was more than three times higher at \$343,600 per person.³ This large difference is principally the return on the intellectual property that is inherent in the design, in the manufacturing processes and is also embedded in the products of the Adelaide electronics industry.

These higher returns allow the electronics industry to invest more in research and development (R&D) than Industrial Age industries. This investment assists our industry to retain its leading position. Firms in the Adelaide electronics industry invest an average of 4.9% of revenue in R&D⁴ and many of these firms invest more than double that amount. Across all other Australian industry the level of investment on R&D is about 1% of revenue.⁵

One of the most valuable characteristics of the Adelaide electronics industry is the self-organised cluster structure of its firms and the value of this clustering is evidenced by the high level of firm-to-firm collaboration. Our small city size and relatively low traffic density facilitate frequent face-to-face contact between industry people, which creates trust and develops collaboration between specialist firms. Collaborating firms achieve more than could be achieved by either firm working alone.

Research shows that collaboration has developed strongly in the Adelaide electronics industry with firm-to-firm interdependence measured at 43%, whereas this factor was 13% in the industry in Sydney⁶ where city size, traffic density and topography inhibit face-to-face contact and thus limit collaboration and clustering.

The high levels of interdependence developed between Adelaide electronics firms and the high proportion of locally owned SMEs are important sustainability factors. The industry typically produces small volumes of technically complex products, so copying is both difficult and unrewarding. These two factors combine to further boost sustainability.

The Adelaide electronics industry is more valuable to our regional economy than is generally understood by our community and governments. Its high productivity, large and continuing investment in research and development, dense cluster structure, its high proportion of locally owned SMEs and its inherent sustainability combine to make this advanced manufacturing industry a leader in the transition of our regional economy from its past dependence on Industrial-Age manufacturing to our logical future as an education, research and Knowledge-Age industry region.

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FANLESS EMBEDDED PC

The Neosys Technology Nuvo-7000 Series fanless embedded PC is powered by Intel 8th-Gen Core i processors with an up to 6-core/12-thread architecture that offers significant performance improvement over previous 6th or 7th generation platforms.

The series incorporates the company's technologies for ruggedness and versatility, such as an effective passive cooling design, expansion cassette and MezzIO interface. It offers a

wide selection of onboard I/O functions such as Gb Ethernet, USB 3.1 and COM ports, and also features protection circuits to endure stress from ESD and power surges. It has a wide temperature range of -25 to +70°C.

The series is flexible and versatile for a variety of applications, featuring variants with different cassette expansions options. The platform can accommodate a single PCIe card (Nuvo-7000E), dual PCIe cards (Nuvo-7000DE) or a single PCI card (Nuvo-7000P) according to the user's application needs. It has a VGA/DVI/DP triple independent display, supporting 4K2K resolution.

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MPLAB PICKit 4
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The FTK1000 Multimode Fibre Optic Light Source, used in conjunction with the Simpli-Fiber Pro power meter, effectively measures power and loss across fibre-optic networks. Collaboratively using these devices enables technicians to conduct fast optical fibre cabling and installation. It is available to rent from TechRentals.

Wavelengths are automatically detected and transmitted simultaneously in 850 and 1300 nm with the light source. The power meter has 850/1300 nm in multimode and 1310/1550 nm in single mode. Users can manage results and print reports with ease via power meter memory, PC and supplied software.

Key advantages of the device include: single-person operation; measurements taken at both wavelengths are saved into one record; and the four-button intuitive design makes the device simple to use.

TechRentals

www.techrentals.com.au

INDUSTRIAL DATA COLLECTION SERVER

iEi Integration's IBX-660 data collection server allows for up to 8 TB of storage. The product is powered by the Intel Atom E3845 1.9 GHz Quad Core processor, enabling the system to be powerful, efficient and able to support up to 8 GB of DDR4 RAM.

The system features a rugged and fanless design and is intended to be deployed in harsh environments, supporting a wide temperature range from -40 to +50°C. It is also compliant with the military-grade MIL-STD-810G-514.6E-1 standard for vibration, making it suitable for installations in a factory or vehicle environment.

Designed for data collection and analysis, the product is able to hold four 2.5" SSDs or HDDs and has the ability to boot off the 32 GB of internal eMMC storage, so the operating system does not take up any of the system's additional storage. It has a fully integrated range of I/O, including two Gigabit Ethernet ports, two USB 3.0 ports, two USB 2.0 ports and a 9–36 V power input terminal block.

ICP Electronics Australia Pty Ltd

www.icp-australia.com.au



LED PANEL INDICATORS

Marl's LED panel indicators provide a durable communication equipment solution for all types of defence applications, including ship, helicopter and plane equipment. The 677 EMC Series is designed for control panel indication in harsh environments where high levels of shock and vibration are likely but a wide viewing angle and good on/off contrast ratio are necessary.

The series is an 8.1 mm mounting black chrome aluminium housing indicator with a stainless steel mesh under the lens and a conductive panel seal, giving EMI and weather protection to IP67. Available in voltages from 2 VDC to 110 VAC, and a range of LED colours including white and blue, the series can be fitted with either industrial tags or wire terminations.

Aerospace & Defence Products

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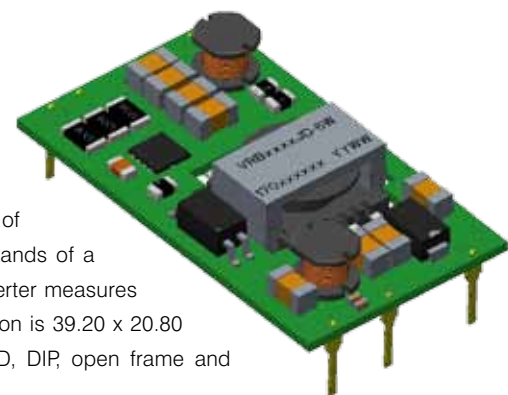
ULTRATHIN DC/DC CONVERTERS

Mornsun has developed an ultrathin range of DC/DC converters in order to meet the demands of a diverse range of applications. The 6 W converter measures 31.60 x 18.10 x 6.10 mm and the 10 W version is 39.20 x 20.80 x 6.10 mm, with packages available in SMD, DIP, open frame and metal case.

The SMD 6 and 10 W DC/DC converters feature 500 VAC isolation; ultrawide input voltage ranges 4:1 and 2:1 with up to 88% efficiency; no-load power consumption as low as 0.096 W; and a wide operating temperature range of -40 to +85°C. They also have multiple protections, including short circuit, overcurrent, overvoltage and input undervoltage.

DLPC Pty Ltd

www.dlpc.com.au





FANLESS RUGGED NUC

The rNUC released by Kontron is a fanless ruggedised NUC (Next Unit Computing by Intel). Thermally designed to run fanless, the rNUC features the Intel NUC platform running the Intel Celeron J3455 Quad-Core 1.5 CPU.

The fanless application provides for smooth operation in harsh environments from industrial to commercial applications where reliability is the main concern. It is an IoT-ready platform offering wireless AC + BT features.

The rNUC can be configured with 2 to 8 GB of DD3L memory, Intel HD graphics, Wireless-AC3168 + BT 4.2 Wi-Fi, 4x USB3, 1x M.2 slot with PCIe x1 lane, 1x Micro SDXC, onboard 32 Gb eMMC storage, software support for both Windows and Linux, and 12–19 VDC input.

Kontron Australia Pty Ltd

www.kontron.com.au

BIDIRECTIONAL 48/12 V CONVERTER

Vicor has released a bidirectional non-isolated fixed-ratio converter for hybrid 48/12 V power systems in data centre and automotive applications. The 2317 NBM is capable of providing up to 750 W continuously at 48 V from 12 V, or at 12 V from 48 V, with over 98% peak efficiency.

With up to 1 kW of peak power capability (for up to 2 ms) in a 23 x 17 x 7 mm surface-mount package, the product provides a complete solution with no external circuitry needed. By switching at 2 MHz, it provides low output impedance and fast transient response to dynamic loads. The unit incorporates hot-swap and inrush current limiting, increasing power system density and saving valuable board space.

In data centres that are still relying on legacy 12 V distribution, the converter supports 48 V input GPUs using Power-on-Package (PoP) modular current multipliers (MCMs) driven from a 48 V node sourcing a small fraction (1/48) of the GPU current. Current multiplication overcomes the power delivery boundaries imposed by traditional 12 V systems that limit higher bandwidth and connectivity.

In data centres that have been upgraded to a 48 V infrastructure, the converter can be used to support legacy 12 V loads. In mild hybrid and autonomous vehicles using 48 V, the product supports legacy 12 V subsystems from efficient power distribution at 48 V with or without dual batteries.

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ON-CHIP FLASH MEMORY MICROCONTROLLER

Renesas Electronics has announced what is claimed to be the industry's first on-chip flash memory microcontroller (MCU) using 28 nm process technology. The RH850/E2x Series MCU incorporates up to six 400 MHz CPU cores, achieving processing performance of 9600 MIPS.

Compared to the earlier 40 nm MCUs, the series is said to achieve approximately three times the performance at the same power level.

It realises increased automotive control system integration, according

to Renesas, by including enhanced sensor interfaces necessary for precise automotive control functions.

The series is equipped with up to 16 MB of flash ROM and, to suit the user's needs and preferences, it is possible to only update certain arbitrary areas during program operation. The series also comes with improved serial interfaces, including up to 10 channels of CAN FD and one Ethernet channel. Security functions that support Evita Medium enable the MCUs to support safe and rapid OTA updating of the software.

Targeting ASIL-D, the highest level of the ISO 26262 functional safety standard for automotive E/E systems, the series adopts the dual core lock step CPU structure that ensures that the calculations performed by two CPU cores are identical. The series also provides up to four sets of CPU pairs and features a variety of hardware functional safety improvements. In applications where a system malfunction could lead to life-endangering accidents, these features immediately detect faults should a malfunction occur and allow system safety to be maintained.

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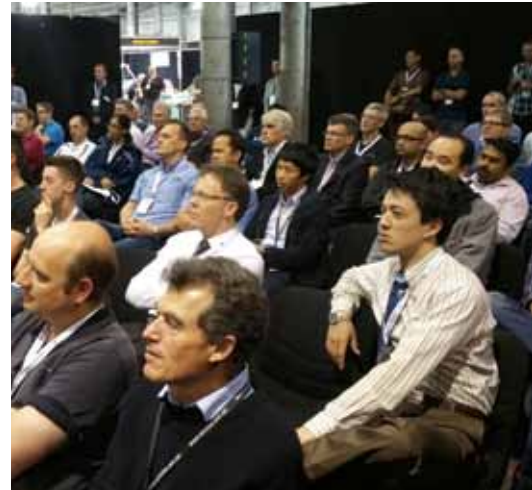


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ELECTRONEX

RETURNS TO SYDNEY



Australia's dedicated trade event for the electronics industry will this year be held in Sydney in September.

Electronex – The Electronics Design and Assembly Expo will be staged from 5–6 September at Rosehill Gardens Event Centre with free parking for visitors. The expo is now in its ninth year and alternates annually between Sydney and Melbourne. With over 90 companies represented at the expo and 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 involve electronics.

This year's event will feature a host of new product releases as well as advanced manufacturing solutions as Australian companies embrace the move towards niche and specialised manufacturing applications. In recent years there has been a resurgence of companies sourcing 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 Australian-based 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 event in Sydney in 2016 attracted over 1200 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. Trade visitors can register for free online.

SMCBA conference

Since 1988 the Surface Mount and Circuit Board Association (SMCBA) has conducted Australia's only conference dedicated to electronics design and manufacture. The 2018 conference will again be held as part of Electronex, an initiative of the SMCBA which has given the electronics industry a dedicated exhibition and conference. Since the first staging of the Electronex event in 2010, the number of exhibitors has increased threefold.

WHAT: Electronex expo and SMCBA conference

WHEN: 5–6 September

WHERE: Rosehill Gardens Event Centre

WEB: www.electronex.com.au / www.smcba.asn.au/conference

The conference brings together local and international speakers to share information critical to the successful design and development of leading-edge electronic products and systems engineering solutions. This year, leading international speakers Susy Webb and Jasbir Bath will join local presenters to deliver a wealth of information on electronics design and manufacture, embedded systems and new product development.

"We are delighted that Susy Webb and Jasbir Bath, both from the US, have accepted our invitations to present workshops at the conference in 2018," said Andrew Pollock, Executive Officer of the SMCBA. "They bring a wealth of electronics design and manufacturing knowledge which they will generously share with attendees."

Webb, a senior PCB designer with 37 years of experience, is a regular speaker at the PCB, IPC and international design conferences. She will be holding workshops on the following topics:

- Designing Beyond Simulation
- Building a Bridge from Design to Manufacturing
- The Complexities of Designing with Fine Pitch BGAs
- Part Placement Choices and Consequences

Bath, meanwhile, has over 20 years of experience in research, design, development and implementation in the areas of soldering, surface mount and packaging technologies. His workshops will cover:

- Design for Manufacturability and Reliability
- Printing and Its Effect on Manufacturing Yield
- Reflow, Wave and Rework Soldering Process Optimisation in Electronics Manufacturing

In addition, the IPC training and certification program 'PC-A-610 Acceptability of Electronics Assemblies' course will be conducted by one of the SMCBA's Master IPC Trainers. The IPC-A-610 is the most widely used document in the electronics industry worldwide and the SMCBA has been conducting these programs for over 20 years.

FPBB RAIL — COMPACT DIN-RAIL FILTER



The FPBB RAIL filter from SCHURTER is an extraordinarily slim double-stage, single-phase filter, measuring only 25 mm in width. The attractive space-saving design integrates an optional fuseholder or circuit breaker. Additionally, an overvoltage varistor is available in all three variations. FPBB RAIL: three functions in one ultra-slim housing.

Space can be a scarce commodity on a panel, particularly panel designs in control cabinets for industrial machinery. Densely populated interference generating components, such as switching power supplies or inverters, can further complicate design when high performance filters are required to reach CE conformity. These filters can be large and can occupy premium space on the DIN-Rail. SCHURTER provides a solution with the FPBB RAIL. The new two-stage filter offers a very high EMI attenuation in an ultra-slim, space-saving housing.

Typical areas of application for the FPBB RAIL are industrial or machine controls, where downsizing and possible relocation of the control cabinet to a more accessible area can be realised. A backplane screw mount version is also available for further flexibility in design. The powerful, slim filters are also ideal for medical equipment according to IEC / UL 60601-1 and ICT equipment according to IEC / UL 60950, offering low leakage or standard current options. Further features include cage clamp terminals for particularly efficient, fast wiring.

The FPBB RAIL is designed for currents from 1 A to 16 A with a maximum of 125 / 250 VAC and 250 VDC according to IEC and UL / CSA standards. The series is ENEC and cURus approved. The filter version can be used over a wide temperature range from -40°C to 100°C. Versions with fuseholder and overvoltage protection operate over a range of -40°C to 85°C, while those with a circuit breaker are rated for a range of -5°C to 60°C.

Technical Data

- Single-phase DIN rail filter 250 VAC / 250 VDC
- Double-stage filter with very high attenuation

- Filter available in standard or medical M5 / M80 versions
- Rated currents: 1, 3, 6, 10, 12, 16 A (ENEC / UL / CSA) at 40°C
- Operating temperature: -40°C to 100°C
- DIN rail mounting or backplane chassis mounting
- Cage clamp terminals 0.2–2.5 mm², 24–12 AWG

Application

- Industrial controls
- Industrial applications
- Datacom equipment
- Medical equipment
- Controls in door jams, e.g. elevators

Datasheet FPBB RAIL: https://www.schurter.com/en/datasheet/FPBB_RAIL

About SCHURTER

SCHURTER is an internationally leading innovator and manufacturer of electric and electronic components. The company focuses on safe power supply and easy-to-use equipment. Its extensive product portfolio comprises standard solutions in the fields of circuit protection, plugs and connectors, EMV products, switches, input systems and electronic manufacturing services. SCHURTER's global network of representative offices ensures reliable delivery and professional customer service. Where standard products are unsuitable, the company develops client-specific solutions.

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STAND A1 SOLDERING AND DESOLDERING STATIONS

Ersa has re-engineered its i-CON soldering stations and enhanced their functions. The i-CON 1V and i-CON 2V comprise the control electronics already implemented in the i-CON VARIO multichannel soldering and desoldering stations.

The one- or two-station products can now operate the soldering and desoldering tools CHIP TOOL VARIO and X-TOOL VARIO. The compact vacuum unit supplies vacuum for the X-TOOL VARIO or existing X-TOOLS. In addition, present Ersa soldering tools like the 80 W POWER TOOL can be connected to the stations. Together, the i-CON 1V and 2V control units are able to drive eight different Ersa soldering tools.

The units feature digital temperature control with intelligent power management, intuitive one-touch operation with a multifunctional display and micro-SD technology that allows users to update the soldering station's software. Future soldering tools and additional functions can be used with the existing hardware. An optional interface allows users to control the heating plate and fume extraction unit.

Machinery Forum Pty Ltd

www.machineryforum.com.au

STAND D26 RASPBERRY PI 3 MODEL B+ SINGLE- BOARD COMPUTER

element14 has launched the Raspberry Pi 3 Model B+, the latest product in the Raspberry Pi 3 range of single-board computers. Features include a 64-bit quad core processor running at 1.4 GHz, dual band 2.4/5 GHz wireless, Bluetooth 4.2/BLE, fast Ethernet and PoE capability via a separate PoE HAT.

The dual band wireless comes with modular compliance certification, allowing the board to be designed into an end product without the need for further wireless compliance testing. This improves time to market.

The computer is available as part of the Raspberry Pi 3 Model B+ starter pack, containing all the official products needed to get started with the Raspberry Pi 3 Model B+.

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STAND B1 3D PRINTED ELECTRONICS

Emona Instruments is bringing high-technology 3D printing solutions to Australian industry for electronics R&D, manufacturing, research and education with the printing of multilayer PCBs, as well as resistors, capacitors, antennas, sensors and thin film transistors.

The company's multilayer PCB 3D printing solution is provided by Nano-Dimension's DragonFly 2020 Pro. The system brings together a precise inkjet deposition printer, high-performance silver nanoparticle conductive and dielectric inks as well as dedicated software, enabling companies to bring designs to the market quickly while keeping sensitive design information in-house.

Emona's 3D printing of electronics is provided by Optomec's Aerosol Jet technology. Electronic components such as resistors, capacitors, antennas, sensors and thin film transistors have all been printed with Aerosol Jet technology. The performance parameters of printed components, eg, the ohm value of a resistor, can be controlled through printing parameters. Components can also be printed onto 3D surfaces, eliminating the need for a separate substrate and thereby reducing the size, thickness and weight of the end product. For example, Aerosol Jet is used to print antennas and sensors that conform to the shape of the underlying substrate such as a mobile phone case.

The Aerosol Jet process supports printing on a wide variety of substrates including plastics, ceramics and metallic structures. Nanoparticle inks have been optimised for the Aerosol Jet process to allow printing (and subsequent ink sintering) onto plastic substrates with low heat deflection temperatures.

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LOW-POWER APPLICATION DESIGN

WITH MEMS ACCELEROMETERS

Petr Stukjuner

Low-power applications take advantage of MEMS accelerometer sensors for increasing battery life.

Sensors are becoming less and less power hungry and embed features that help decrease overall system power consumption. For example, motion-activated wake-up allows the entire system to sleep when the user is not using the device. Nevertheless, there are also other ways to make use of a MEMS accelerometer to decrease overall power consumption.

Starting from the MEMS accelerometer sensor itself, it should be flexible in its operating modes. As depicted in Figure 1, there is a well-known trade-off between a sensor's resolution and its output data rate on one side and the current consumption on the other side — the higher the resolution or the data rate, the higher the current consumption and vice versa. Fortunately, there are sensors on the market that are able to operate at a few microamps and consume a couple of nanoamps in power-down or standby mode.

For high-demanding applications the operating mode of the sensor can be changed on the fly, utilising higher resolution and data rates only when it is really needed. Some sensors are even able to perform this mode switching automatically. The user configures the resolution and data rate needed in the active state and defines a condition for enabling it. Then the sensor is switched to the inactive state, where it still measures data but at a very low data rate and resolution, waiting for the condition (a motion event) to switch it back to active state.

Another good design practice is to utilise a low power supply level, because lower power supply levels mean lower current consumption. That's why for low-power applications a 1.8 V power supply is preferred.

In some designs, power cycling of the sensor can be used. The sensor's power supply is activated only when motion data is supposed to be measured; otherwise the sensor is powered off. This can even be achieved by supplying the sensor from a microcontroller's pin, as shown in Figure 2. When applying this technique the power consumption budget needs to be calculated properly, because with every start of the sensor the user needs to configure it and wait until its outputs are settled to provide the correct data.

The majority of MEMS accelerometers are digital sensors, which means they internally convert measured analog signals to digital data. Benefits include a smaller bill of materials due to the integrated AD converter and lower susceptibility to signal distortions. Thanks to embedded interrupt generators, MEMS accelerometers can generate a trigger signal when certain user-parametrised conditions are met. This is where motion-activated wake-up comes from. The microcontroller (MCU) configures the sensor to generate a wake-up trigger and goes itself into a very low-power sleep mode. When a motion is detected, the sensor will

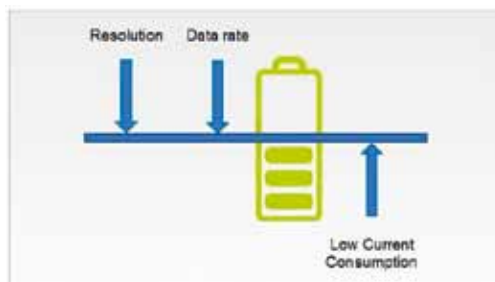


Figure 1: Sensor parameters impacting battery life.

generate an interrupt signal; the MCU then receives the signal, switches into an appropriate operating mode and finally handles the situation that has occurred.

Digital sensors can also take over tasks related to motion processing normally done in an MCU. An MCU could do the same job of course, but with much lower power efficiency — the MCU in the milliamp range and the sensor in the microamp range. Detection of movements like free fall, single- and double-tap (user actions similar to a mouse click), portrait/landscape orientation detection and others are realised by an internal logic sensor. An MCU does not need to make any computations; it just waits for an interrupt trigger and reacts to the movement only when it occurs.

Digital sensors often integrate configurable filters which are conditioning acceleration data just measured. These can be low-pass, high-pass or even anti-aliasing filters that pre-process data for the MCU and offload it even more.

A data buffer, in most cases FIFO type, embedded in a sensor will lower current consumption too, because it will allow the MCU to read data less frequently. This way the MCU will be able to do other tasks, stay asleep for longer and save time needed for serial communication with the sensor.

Serial communication between the sensor and MCU contributes to overall power consumption too. For very low-power applications dealing with every microamp, serial communication could have a significant impact. Most MEMS accelerometers communicate over SPI or I²C interfaces. An SPI interface is more efficient in terms of power consumption for three reasons: first, there are no pull-ups on communication lines causing extra current consumption; second, it supports higher data rates; and third, it has less overhead in serial protocol.

Regardless of the interface, significant reduction of serial communication can be achieved if instead of polling the sensor, ie, continuously asking for the status of new data availability, the

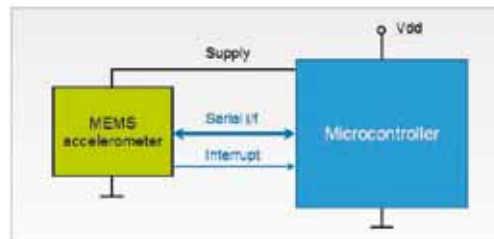


Figure 2: Sensor's power supply control by microcontroller pin.

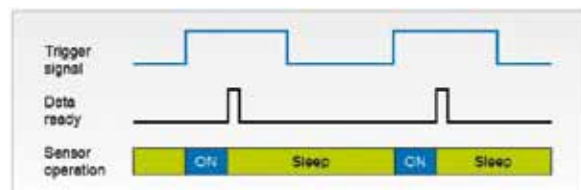


Figure 3: Single data conversion mechanism.

application rather utilises data-ready interrupt. Data-ready interrupt is automatically generated by a sensor when it has finished data measurement and conversion and a new set of data is ready to be read by the MCU. When this interrupt is activated, the MCU can immediately read output data from the sensor in one single-read operation.

As stated already, a lower sensor output data rate means lower current consumption. A so-called single data conversion mechanism allows the data rate of the sensor to match perfectly with application needs, as shown in Figure 3. Using this mechanism, measurements are started either by an external trigger signal routed on a sensor's pin or by register write initiated from the MCU using serial command. Data acquired this way is then stored inside the sensor. The sensor can also initiate a data-ready interrupt signal informing the MCU that data conversion has been completed and data is now available to be read by the application. Thanks to this feature, data rates even smaller than 1 Hz or basically any other rates beside the predefined ones are achievable.

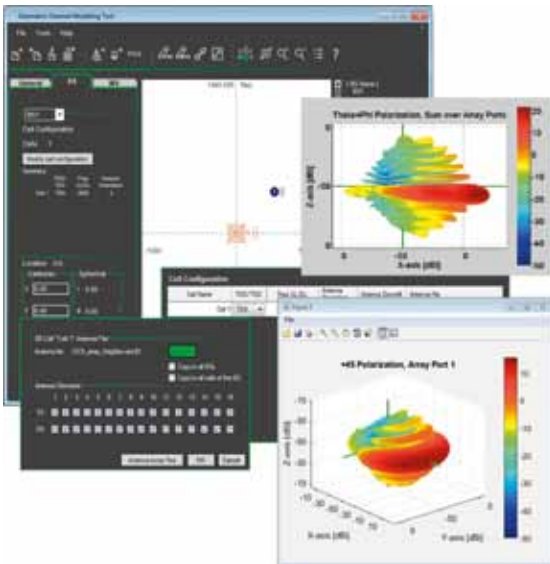
We have discussed the features of a MEMS accelerometer that are important for low-power applications and also ways how to utilise them in system design. STMicroelectronics' latest ultralow-power 3-axis MEMS accelerometer, the LIS2DW12, brings flexibility

in designing new applications with accelerometer sensors thanks to its low current consumption down to 1 μ A, number of operating modes, wide range of output data rates, rich set of embedded digital features, high temperature stability, and enhanced features like digital filters and FIFO buffer. Advantages include motion-activated functions and user interfaces; smart power saving for handheld devices; motion detection for appliances; and impact recognition logging for wireless sensor nodes.

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STAND B27 5G NR-READY CHANNEL EMULATION SOLUTION

Keysight Technologies has announced PROPSIM F64 5G Channel Emulation Solution, a 5G New Radio (NR)-ready channel emulation solution. The product enables chipset, device and network equipment manufacturers to characterise end-to-end system performance of the latest 4G and 5G base stations and mobile devices by emulating real-world radio conditions in the lab.

5G NR deployments require advanced technologies to achieve high data rates of up to 20 Gbps. The use of wide signal bandwidths, mmWave frequencies and Massive MIMO with hybrid beamforming leads to more effective use of the wireless propagation channel to enable these high data rates. Consequently, designers need to validate the end-to-end performance of multimode devices and base stations under real-world complex 3D fading and interference channel conditions.

To address this growing need, the PROPSIM F64 5G supports all 5G NR signal bandwidths and carrier aggregation (CA) schemes, and offers high number of channels for Massive MIMO channel emulation and testing. The solution integrates channel modelling tools for user-defined 3D spatial scenarios and dynamic modelling of movement. It supports both conducted and over-the-air (OTA) testing across sub-6 GHz and mmWave frequencies.

The channel emulation solution integrates seamlessly with Keysight's end-to-end network emulation portfolio to address the entire device workflow from R&D to design validation to manufacturing. This enables users to validate protocol layers and radiofrequency (RF) performance of a 5G NR device, as well as gain access to key performance indicators for beam management, data throughput and stability under 5G fading channel conditions.

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THE BENEFITS OF COPPER FOR HYBRID PCBs

Heat generation in electronic circuits creates a level of inefficiency; however, it is almost impossible to create a circuit that operates at 100% efficiency as the laws of physics and thermodynamics demonstrate this through the fundamentals of temperature, energy and entropy. Therefore, we must accept that any electronic circuit will generate some amount of heat when it is in operation and account for this in the initial design process.

As most electronic components are now available as miniature and surface mount technology, removal of heat from these devices can create an issue, especially when mounting them on a printed circuit board (PCB) — one that may be a poor conductor of heat.

A typical PCB has an insulating core, which also does not conduct heat very well. Although there are copper traces present, the amount of heat conducted by conventional PCBs depends on their design specifically regarding the surface area of the copper traces. It is known that broad traces will conduct heat more efficiently than thin traces. Engineers eliminate the problem of heat conduction, drawing heat away from the PCB by using metal core PCBs (MCPCBs). The MCPCBs utilise a metal core as the base material, replacing FR4 or CEM3 which are most commonly utilised.

Why use copper?

As copper has high thermal conductivity, it is an efficient choice for use as a heat sink in MCPCBs. Circuit traces, necessary to interconnect various components on the PCB, remain electrically insulated from the base metal core as there is a thermally conductive dielectric layer separating them. This dielectric layer bonds the circuit traces to the base metal. The thermal performance of any MCPCB depends exclusively on this dielectric layer.

MCPCBs with solid copper bases are utilised by engineers for mounting LED lights, due to the high thermal conductivity and efficiency. Although an SMD LED is a high-efficiency device and converts a major part of its input power into visible light, a minor part generates waste heat within the LED chip. Therefore, high-power LED lights will tend to generate more heat as a wasted by-product. Unless this by-product is removed, this waste heat build-up can be fatal to the function of the LED.

Creating efficiency

Engineers design the removal of the excess heat from the LEDs on the PCB in two main ways: by using broad traces of copper to interconnect the LEDs with the rest of the circuit and/or by adding a solid copper base creating insulation with a thermally conducting dielectric. For medium-power LEDs, the terminals conduct the heat generated from within the LED chip to the broad traces to which

the terminals are soldered, dissipating the heat effectively. Part of the heat also travels through the thermally conducting dielectric to the solid copper base, which serves as the ultimate heat sink.

For high-power LEDs and circuits generating copious amounts of heat, additional channels are necessary to conduct more of the heat into the solid copper base. Engineers handle this with two additional mechanisms: through a heat-conducting metal tab under the LED or through the IC attached to its internal die while implementing the use of metal-filled thermal vias.

By incorporating a copper land immediately under the device, the IC or LED can transfer the heat from its die through the metal tab directly to the copper land. Therefore, multiple metal-filled thermal vias, connecting the copper land to the solid copper base effectively, can transfer enough heat to the heat sink to keep the LED or IC cool and operating safely.

Case study: Aluminium vs copper

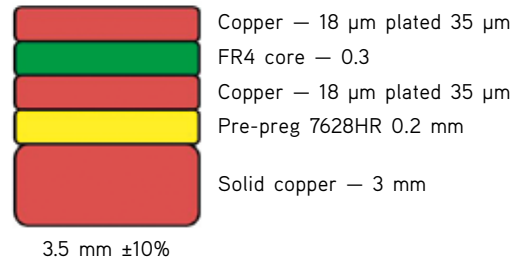
We know that the lighting industry in particular has driven aluminium PCB fabrication technologies to date in various thicknesses in a one-, two- and four-layer construction, but the less complex, more specialised hybrid aluminium PCB has also seen an increase in production as a simpler version of construction and a more complex circuit design in a two-layer version.

Traditionally, electronics engineers would design a standard 1.6 mm two-layer PCB which would then be bonded to 1.5 mm of aluminium via a 0.3 mm thermal conductive prepreg layer, all of which works well — except that transferring heat through a 1.6 mm FR4 material + 0.3 mm prepreg is inefficient. So electronics engineers started design hybrid PCBs with thinner and thinner two-layer FR4 cores, which makes sense to increase the heat-transferring efficiency by decreasing the distance between copper tracks and aluminium substrate — but this has its limitations.

A project that was recently fabricated by PCB Global required a hybrid PCB, with the original design created as a 3 mm aluminium-based hybrid PCB with a 0.2 mm thermal conductive dielectric prepreg layer and 0.3 mm two-layer PCB. We experienced an unexpected outcome after pressing the 0.3 mm FR4 to the 3 mm aluminium substrate. The top-layer FR4 circuit became distorted and the solder paste stencil did not align. This was a great mystery, as the design file provided did not seem to have any flaws.



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Investigation

With further detailed investigations, we concluded that the tensile strength of the aluminium base material was too high at approximately 310 MPa. When pressing the 0.3 mm FR4 under standard multilayer heat and pressure fabrication conditions, the thin substrate 0.3 mm FR4 (even with a high TG=170 material) tended to reach its glass transition temperature (TG), creating movement and distortion around 0.17 mm across a 375 mm long PCB.

Solution

The 3 mm aluminium metal base was substituted for a 3 mm solid copper base material. Copper has a much lower tensile strength of 200 MPa and we soon discovered that the issue of distortion was completely eliminated, thus resulting in a more efficient heat-dissipating product and also increasing the longevity of the product.

Our company

At PCB Global, we continuously encounter many challenges experienced by our customers in their design process and we have always progressed towards finding a solution that is both efficient and beneficial to customers' requirements. Quotes and orders are processed 24 hours a day, seven days a week and 365 days a year on our easy-to-follow online portal, to which automated instant quotes are created by you to your specifications. Please don't hesitate to contact us at sales@pcbglobal.com or, to find out more about our company, please visit www.pcbglobal.com.

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STAND B27 USB INSTRUMENTS

The Keysight Streamline Series comprises compact USB instruments — including vector network analysers (VNAs), oscilloscopes and an arbitrary waveform generator (AWG) — that leverage Keysight technologies, measurement algorithms and application software. The platform is available in three models.

The P937xA models are compact two-port VNAs with frequency coverage up to 26.5 GHz. All are designed to test passive devices such as antennas, filters and duplexers. Running on a host PC, the context-sensitive user interface is identical to that of Keysight's latest benchtop VNAs.

The P924xA high-performance oscilloscopes provide full measurement functionality along with advanced triggering, rapid waveform updates and popular features such as zone triggering. With the Keysight InfiniiVision interface running on the user's PC, the look and feel is consistent with familiar benchtop oscilloscopes.

The P9336A three-channel AWG provides 16-bit resolution with maximum analysis bandwidth of 540 MHz and maximum onboard memory of 4 GB. Applications range from general-purpose testing to complex I/Q signal generation for characterisation of transceivers and modulators.

Controlled via PC through a USB connection, the instruments help users save space on the test bench and are easily shared among members of a development team. The small rack size makes them suitable for manual or semiautomated testing in design-validation and light-manufacturing applications.

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STAND C9 DESKTOP BATTERY TESTER

GW Instek has launched the GBM-3000 series desktop battery tester, which uses AC 1 kHz as the test signal and measures a battery's voltage and internal resistance to 300 V (GBM-3300) and 80 V (GBM-3080).

The series features 3.5" TFT LCD, a 4-wire measurement method, a high-resolution (6-digit voltage/5-digit resistance) measurement display capability, independent GO/NOGO determination of voltage and resistance, and various communications interfaces to meet various types of battery measurements, ranging from single cell to battery cell to the end product (battery), helping users achieve correct measurements at all stages of production.

The series provides several features for various types of batteries in measuring open circuit voltage and resistance. For voltage measurement, the accuracy is as high as $\pm(0.01\% \text{ reading} + 3 \text{ digits})$ and measurement resolution is up to $10 \mu\text{V}$ (at 8 V). For resistance measurement, the accuracy reaches $\pm(0.5\% \text{ reading} + 5 \text{ digits})$ and the resolution achieves $0.1 \mu\Omega$ (at $3 \text{ m}\Omega$), which is particularly suitable for the sorting of single cell measurements to achieve a better output balance for the follow-up series and parallel connections.

In order to help users quickly and clearly interpret the measurement results, the series features HI/LO determination based on voltage and resistance respectively and can be switched to the simple (big numerical display) mode to meet the requirements of test accuracy. Results are made clear and easy to read, with elevated inspection efficiency and capabilities.

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WHY TRI COMPONENTS?

Christopher Dawson, General Manager

For nearly 50 years TRI Components has been operating from our base in Melbourne and we are proudly 100% Australian owned and operated.

We only supply the best electronic components for Australia and New Zealand customers from the best suppliers.

Our experience and expertise in the RF, POWER and EMI fields ensure that we can help to solve any requirement and provide the best solutions quickly. Our team are dedicated to providing good old-fashioned service with a smile that ensures that all of our customers return time and again to us.

Our Points of Difference

- **FREE SAMPLES:** We are a supplier that keeps FREE samples on site in our Melbourne warehouse for immediate issue. Other suppliers in Australia/NZ do not offer free samples at all let alone so quickly.
- **PRICE:** We beat online pricing and account holders will be invoiced, therefore there's no need to pay upfront when ordering. COD is also available on request. Purchasing through the official Australian representative eliminates the additional costs of duties and expensive overseas freights.
- **LOCAL SUPPORT:** Our Engineers have over 50+ years of experience, offering supportive expert advice. We have knowledgeable and friendly staff within all aspects of the business that provide fast and reliable support.
It's time to TRI us!

Our Suppliers

COILCRAFT

- Magnetics for RF, Power, Filter And Data applications
- Warehouse stocked parts here in Melbourne to reduce lead times
- FREE Samples to evaluate
- Engineering Designer kits for prototyping
- Custom-made parts

International Manufacturing Services (IMS)

- SMD Products for RF, Power, Thermal, Filter and Microwave applications
- Very short delivery lead times
- FREE Samples to evaluate
- Engineering Designer KITS for prototyping
- Ideal for Medical, Defence, Aerospace and Communications

Leadertech

- Shielding solutions for Board, Enclosure and Cables
- Most products have very short lead times
- FREE Samples to evaluate
- Thermal management Solutions
- Custom Shields

MY Experience with TRI Components!

I have been with TRI Components for nearly 19 years and over my time here, the electronics industry has evolved tremendously. Gone are faxes for communication between suppliers and customers with now all communication processed instantly via emails. I am extremely proud that we can process orders and customer requests within hours not days as it was in the past when I first started.

Unfortunately, most of the production has now moved offshore from Australia with lower costs for manufacturing process, but there still is a valued electronics industry thriving with new designs and concepts appearing. I still find that the ability for us to communicate directly with the engineer or designer at the very start of the project works very well.

A Case Study with TRI Components

Scott Armstrong-Taylor, Managing Director, TGS Electronics P/L, New Gisborne, Victoria

TGS Electronics is a manufacturer of medical and veterinary electronic therapy devices and has been locally designing and manufacturing its electronic equipment since 1980. We were committed to using locally manufactured components wherever possible to support our local electronic component manufacturers and suppliers.

During 2015 we found it necessary to redevelop our Ultrasonic Therapy unit due to issues with sourcing the locally produced and supplied components that were no longer available.

Due to the fact that the design incorporates both variable and fixed inductors we started to request samples for the initial prototyping from various suppliers to incorporate in our product.

The response from the suppliers we contacted for free samples and quick product lead time was mixed, from no supply of samples and very poor lead times to the immediate supply of 10 pieces of each sample and a lead time of under a week if we so required.

Our number one pick was Tri Components P/L, who issued the 10 samples of our required 3 inductors virtually overnight and backed this up with engineering and technical support to the completion of our end design. When this product initially went into production, we found TRI Components to be very competitive with pricing on the low-volume initial run and then the high-volume production quantity.

Over the subsequent years product performance, on-time delivery, technical support and price have been excellent and would compel us to continue to purchase their Coilcraft Inductors into the future.

TRI Components Pty Ltd
www.tricomponents.com.au





STAND C22 LOW-PRESSURE OVERMOULDING MACHINE

Suitable for low- to medium-volume, high-mix manufacturing, the Alpha 100J – EMTT03 is a versatile low-pressure overmoulding solution. The 3 L tank coupled with the handheld dispensing head enables the user to encapsulate multiple products concurrently, enabling efficient workflow. The tank capacity means refills are minimised and production can continue with less downtime.

With the ability to process most Technomelt materials, three thermal control zones and pump speed control, the product is a compact machine suitable for PCB protection, connector overmoulding and general electronics encapsulation.

Tarapath Pty Ltd
www.tarapath.com.au

STAND A7 POLYCARBONATE DECALS

Utilising a polycarbonate decal is a stylish way to add a professional appearance to a product directly. Screen Process Circuits will screen print the user's desired logo, image or graphic on the subsurface of the polycarbonate, protecting the decal so that it is hardwearing and will last for years.

To meet users' requirements, the company can apply an adhesive entirely or partially, allowing for areas such as buttons, lights, cut-outs and windows. It will also offer advice to help select the most suitable material, texture and thickness, depending on the application. This ensures the decal will withstand any heat, cold, UV and abrasive conditions it may be subjected to.

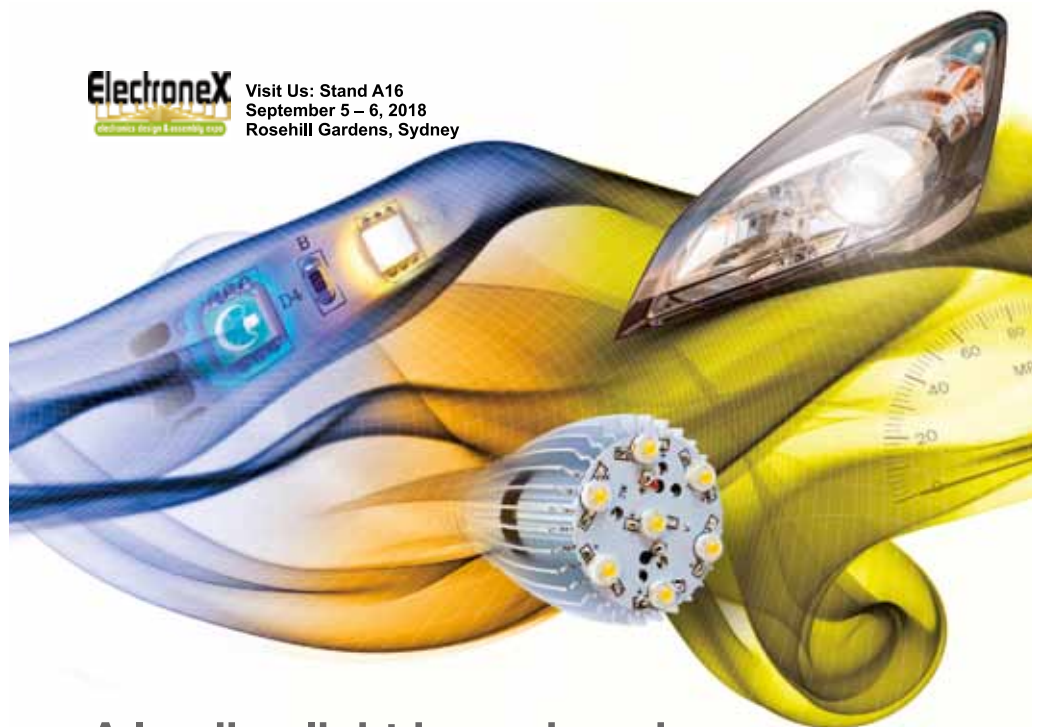
Screen Process Circuits offers embossing, colour matching, die-cutting, routing and laser cutting. The company custom-makes users' decals to their exact specifications and has a fully equipped graphic/engineering design and artwork-creation facility. Artwork may be supplied by the user or created by the company.

With a wide range of uses, such as on instrument panels, instructions, machines, equipment and name plates, a polycarbonate decal is a tough, long-lasting choice. Screen Process Circuits has over 30 years' experience as a screen printer, providing quality products, quick turnaround and good service.

Screen Process Circuits
www.screenprocesscircuits.com.au



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STAND A26 ENCLOSURE

With the enclosure size 100, the range of EVOTEC enclosures by OKW Gehäusesysteme has grown further.

The small EVOTEC 100 is suitable for applications that require a reduced installation volume. The enclosures are particularly robust and are suitable for harsh working environments.

The wide variety of applications is rounded off by a wall suspension element for the sizes 200/250. Examples of possible applications include measurement and control engineering, control technology, GSM modules, networks, medical and laboratory technology, or information technology.

The EVOTEC 100 enclosures are available with two flat-top parts that differ only in height. The EVOTEC 150/200 or 250 from the standard range are suitable for even more installation volume, and desktop versions with/without recessed surfaces are available in the sizes 200 and 250. Pleasant contours ensure an elegant appearance.

All versions are made from high-quality ASA+PC-FR with high UV protection. Due to the optional seal, the enclosures achieve protection class IP65. Additional modifications, such as mechanical processing for interfaces, lettering, painting/special colours and printing or EMC coating, allow the enclosure to be customised according to the user's individual requirements.

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STAND C2 REMOTE MONITORING DEVICE

The RMS Series is a remote voltage monitoring, data acquisition and control device specifically designed for use with battery-powered wireless internet repeater sites, or other AC- and DC-powered remote equipment. No matter how remote a site's location may be, as long as there is internet connectivity the series allows users to monitor their battery voltage over the internet with isolated voltmeters.

The device can control generators, pumps and lights, and turn devices on or off. It enables the measurement of battery voltage and charging and provides measurement of wind turbine and solar panel output, plus detection of A/C power, presence or absence. It also has door and window contact monitoring and fuel tank level monitoring with email and SMS alerts via the Helios RMS100, RMS200 or RMS300 remote monitoring card.

The RMS Series monitoring card allows users to monitor their sites and gather the data they need to plan a site visit. The product has ultralow power consumption of 1.2 W and is powered by DC voltage from 10 to 60 V. It uses embedded Ethernet technology for internet data acquisition and remote voltage monitoring and a Linux operating system for versatility, stability and security.

Helios Power Solutions
www.heliosps.com.au



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STAND B20 6 MM² SPLICING CONNECTORS

WAGO's 221 Series splicing connectors are easy, fast and safe to use, and now offer a model for conductors up to 6 mm² (10 AWG). Previously, stranded or fine-stranded conductors up to 4 mm² (12 AWG) were connected with

the splicing connectors.

As with other 221 Series models, installation with WAGO's 6 mm² splicing connectors is simple. Stripped conductors are pushed into the connector until they hit the backstop after opening the clamp with an orange lever. The conductor is securely connected after closing the lever, while the transparent housing enables visual inspection of the connection. OEMs benefit from a connector that offers options for easy, fast and safe wiring of high-power lighting and signal systems, or HVAC systems within commercial buildings.

Features include: fast installation of devices with high levels of power consumption; time-saving and safe installation of long cable runs with large conductor cross-sections; the creation of more applications for electrical appliance manufacturers; easy conductor termination up to 6 mm² (10 AWG); safe wiring due to WAGO's spring pressure connection technology; and time savings for OEMs and building technicians.

WAGO Pty Ltd

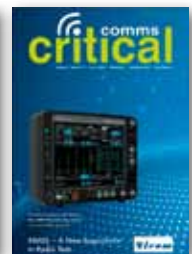
www.wago.com.au

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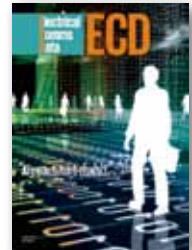
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STAND C23 CONTRACT ELECTRONIC MANUFACTURER

On-track Technology is a locally owned contract electronic manufacturer (CEM) with a manufacturing facility operating out of Mascot, Sydney. The company helps OEMs and local designers with a wide range of manufacturing solutions to assist them in their electronic manufacturing.

Whether businesses require a full turnkey box build or assistance in just one subassembly of their product manufacture, On-track Technology is flexible in tailoring its manufacturing services to best fit its clients' manufacturing requirements.

The company helps many local businesses in a wide range of manufacturing services ranging from PCB assembly, bare PCB manufacture, component sourcing, DFM/prototyping PCB, through-hole (TH) auto insertion, traceability of production, cable assembly and/or increasing business manufacturing capacity.

This year On-track Technology has added more high-speed component placement machines inline to its three already existing fully automated SMT placement lines. The company is also running each SMT line longer, across two shifts per day, to give clients even more manufacturing capacity.

The company has also revamped and increased its final chassis assembly to six lines, giving clients more capacity to final assemble all their products in one manufacturing location.

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www.on-track.com.au

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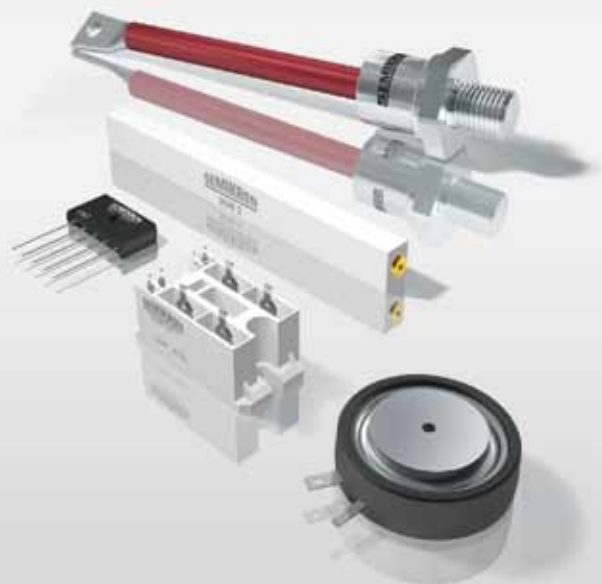


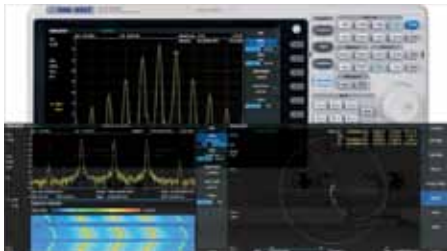
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STAND A11 SPECTRUM AND VECTOR NETWORK ANALYSER

The SIGLENT SVA1000X series spectrum analysers are powerful and flexible tools for broadcast and RF device testing. With a wide frequency range from 9 kHz to 1.5 GHz, the product delivers automatic measurements and features that include a tracking generator, preamplifier and web browser remote control.

The base model is a swept super-heterodyne spectrum analyser. Optional functions include a vector network analyser, a frequency domain reflectometer-based distance-to-fault locator, a modulation analyser and an EMI pre-compliance analyser.

Applications include broadcast monitoring/evaluation, site surveying, EMI pre-compliance, research and development, education, production and maintenance.

TRIO Test & Measurement
www.triotest.com.au

STAND D14 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 C16 COLLABORATIVE ROBOTS

Techman Robot's collaborative robots are useful for automating various tasks around the factory and can help implement any automated Industry 4.0 projects users may have in mind.

On offer are systems capable of 2 kg loads, 900 mm reach and 6 kg loads, 700 mm reach variants. Systems are programmed with an easy-to-learn software package and also can be programmed by axis-arm manual manipulation.

Vision system support is also available, with typical uses including part recognition, pre- and post-inspection and barcode reading.

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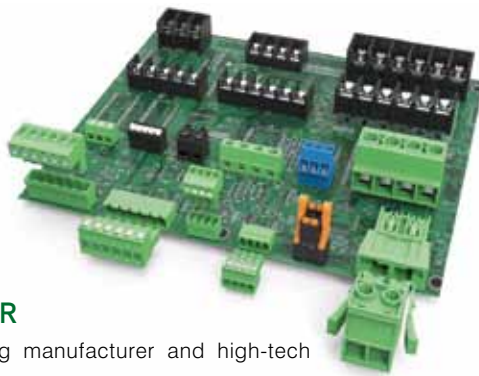
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STAND C27 INDUSTRIAL CONNECTION MANUFACTURER

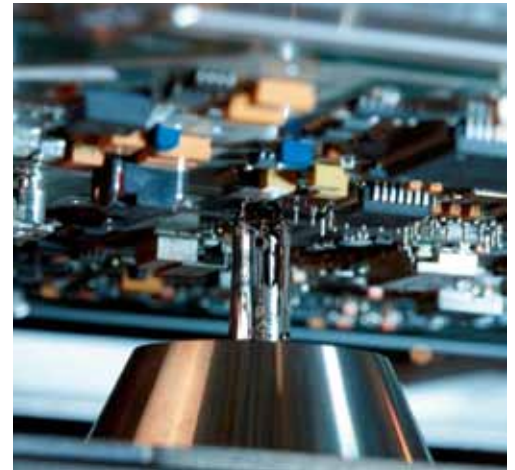
Degson is a leading manufacturer and high-tech enterprise in industrial connection.

The company's lab has been authorised by both UL and VDE in Asia. Its products comply with UL, VDE, TUV, EXCE, CQC, CB, RoHS and REACH certificates and the company has been granted ISO9001, ISO14001, ISO80079-34 and IRIS management certificates.

Ningbo Degson Electrical Co Ltd
www.degson.com



STAND B21 LOW MELTING POINT ALLOYS



Interflux Electronics' LMPA-Q range of low melting point alloys (LMPAs) is designed to allow users to use soldering temperatures that are lower than for traditional lead-free Sn(Ag)Cu (SAC) alloys and other LMPAs on the market. The range can be used in wave, selective and reflow soldering processes and is said to reduce soldering temperatures by up to 70°C.

The range is designed to help users: solder at temperatures between 190 and 250°C; solder up to five times faster with zero defects; reduce voiding below 10%; increase production line capacity; reduce their carbon footprint; avoid heat-related board and component failures; and eliminate dross formation (oxides).

The range is available in solder wire, paste and bar. It removes the need for nitrogen and provides good wetting.

Oritech Pty Ltd
www.oritech.com.au

STAND A10 PASSIVE ELECTRONIC COMPONENTS

Ampec Technologies is a supplier of passive electronic components including connectors, resistors, capacitors, joysticks and self-clinching fasteners. It is also a manufacturer of cable assemblies.

The company's factory is well equipped with fully automatic cut, strip and crimp machines with workers trained to IPC/WHMA-A-620 standard. Besides quality management system endorsed to ISO9001, Ampec is also UL listed for Wiring Harnesses - Component and Computer Interconnection Cable Assemblies.

Clients include OEMs, electronic contract manufacturers, R&D design houses, contractors and end users. The company also serves the overseas operations of some Australian businesses with manufacturing bases in Singapore, Malaysia and China.

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www.ampec.com.au



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SILICON LASER USES SOUND WAVES TO AMPLIFY LIGHT

Yale University scientists have created a new type of silicon laser that uses sound waves to amplify light, with the results published in the journal *Science*.

In recent years, there has been increasing interest in translating optical technologies — such as fibre optics and free-space lasers — into tiny optical or ‘photonic’ integrated circuits. Using light rather than electricity for integrated circuits permits sending and processing information at speeds that would be impossible with conventional electronics. Researchers say silicon photonics — optical circuits based on silicon chips — are one of the leading platforms for such technologies, thanks to their compatibility with existing microelectronics.

“We’ve seen an explosion of growth in silicon photonic technologies the past few years,” said Associate Professor Peter Rakich, who led the Yale research. “Not only are we beginning to see these technologies enter commercial products that help our data centres run flawlessly, we also are discovering new photonic devices and technologies that could be transformative for everything from biosensing to quantum information on a chip. It’s really an exciting time for the field.”

The Yale researchers said this rapid growth has created a pressing need for new silicon lasers to power the new circuits — a problem that has been historically difficult due to silicon’s indirect bandgap.

“Silicon’s intrinsic properties, although very useful for many chip-scale optical technologies, make it extremely difficult to generate laser light using electrical current,” said Nils Otterstrom, first author on

the study. “It’s a problem that’s stymied scientists for more than a decade. To circumvent this issue, we need to find other methods to amplify light on a chip. In our case, we use a combination of light and sound waves.”

The laser design corrals amplified light within a racetrack shape, trapping it in circular motion. As explained by Otterstrom, “The racetrack design was a key part of the innovation. In this way, we can maximise the amplification of the light and provide the feedback necessary for lasing to occur.”

To amplify the light with sound, the silicon laser uses a special structure developed in the Rakich lab. According to Rakich, “It’s essentially a nanoscale waveguide that is designed to tightly confine both light and sound waves and maximise their interaction.”

“What’s unique about this waveguide is that there are two distinct channels for light to propagate,” added Eric Kittlaus, a co-author on the study. “This allows us to shape the light-sound coupling in a way that permits remarkably robust and flexible laser designs.”

Without this type of structure, the researchers explained, amplification of light using sound would not be possible in silicon. “We’ve taken light-sound interactions that were virtually absent in these optical circuits, and have transformed them into the strongest amplification mechanism in silicon,” Rakich said. “Now, we’re able to use it for new types of laser technologies no-one thought possible 10 years ago.”

Otterstrom said there were two main challenges in developing the new laser: “First, designing and fabricating a device where the amplification outpaces the loss, and then figuring out the counterintuitive dynamics of this system. What we observe is that while the system is clearly an optical laser, it also generates very coherent hypersonic waves.”

The research team said these properties may lead to a number of potential applications ranging from integrated oscillators to new schemes for encoding and decoding information.

“Using silicon, we can create a multitude of laser designs, each with unique dynamics and potential applications,” said co-author Ryan Behunin, a former member of the Rakich lab. “These new capabilities dramatically expand our ability to control and shape light in silicon photonic circuits.”

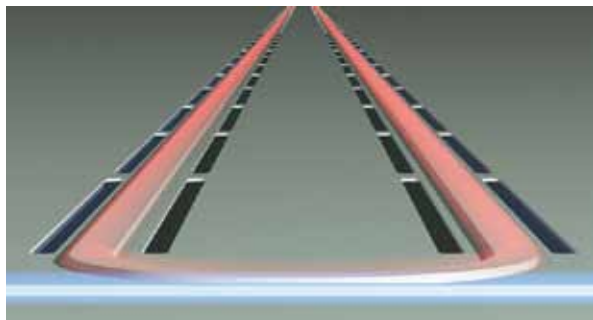


Illustration of the silicon Brillouin laser in operation. The laser is formed from nanoscale silicon structures that confine both light and sound waves.



STAND A12 HIGH-PERFORMANCE OSCILLOSCOPE

The high-performance R&S RTP oscilloscope family combines signal integrity with a high acquisition rate. In standard acquisition mode it can measure a million waveforms per second, which is said to make it more than a 1000 times faster than other oscilloscopes in its class. This helps users to find sporadic errors quickly.

The product compensates for transmission losses from the signal source to the oscilloscope (de-embedding) in real time, meaning the oscilloscope is still fast even with signal correction activated. Due to its digital trigger architecture, it can precisely trigger on compensated signals.

A further time-saving feature is hardware acceleration for a range of analysis functions. Mask tests, histograms and frequency domain analyses can be performed at high speed for fast results.

The device combines multiple instruments; 16 logic channels, four voltage channels and four current measurement channels are available in addition to the analog oscilloscope channels. It supports protocol analysis of serial bus interfaces and offers powerful spectrum and signal analysis functions. Due to its wide range of tools, users can test many different types of signals from complex circuits time-correlated with each other with just one T&M instrument and find related errors fast.

The oscilloscope addresses electronics developers in the wide-base market, particularly in the fields of aerospace and defence, automotive, industry and telecommunications. It is suitable for debugging electronic circuitries with different signals during development, including high-speed buses (USB, PCI Express, MIPI, etc), multichannel RF interfaces (radio or radar), DDR memory interfaces, complex power management units and even simple control and programming buses (I²C, SPI, etc). The product can test all applications where high-resolution signals need to be measured with a wide dynamic range and high sensitivity in the time and frequency domains.

The oscilloscope is compact, with a footprint up to 40% lower than conventional models. Due to the sophisticated cooling concept and the silent fans, the quiet instrument doesn't disturb lab operations. If T&M requirements increase, the measurement bandwidth, memory depth and range of functions can easily be upgraded with hardware and software options. It is available as a 4, 6 or 8 GHz model.

Rohde & Schwarz (Australia) Pty Ltd
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STAND C14 **CONDENSATION REFLOW SOLDERING MACHINE**

The DFA VP-Jumbo soldering solution has been specifically designed for reflow soldering in laboratory and prototype environments. It is useful for processing small-size, low-quantity components and PCBs including QFPs, BGAs and flip-chips as well as hybrids, which can be reflowed defect free with high-quality results.

Due to its compact size, the top-loader, benchtop soldering machine is suitable for operators short on space.

Hawker Richardson

www.hawker-richardson.com.au

STAND A15 **MINIATURE JOYSTICK**

APEM's TS Series Thumbstick is a miniature joystick featuring contactless Hall effect technology to provide long-life proportional control. It is similar in size and operation to 'gamepad' controls and is easy to install. Featuring plastic-threaded housing, the product is suitable for high-volume, price-sensitive applications including UAV and material handling remote controls.

APEM is also expanding the series to include an LED backlighting option. With a total current draw no greater than 16 mA, the LED option is suitable for wireless remote-control applications where visibility is low and battery life and power consumption are critical. The backlighting option utilises an overmoulded polycarbonate castle-style actuator to effectively diffuse the LED and provide illumination over a wide viewing angle. It is available in red or blue.

Features include: one or two axes; USB outputs available; IP67 above-panel sealing; pressure washable to IP69K; redundant outputs available; rear or drop-in mounting available.

Control Devices Australia

www.controldevices.net



STAND C10 **CONFORMAL COATING SERVICE**

Hetech can extend the life of a product by providing high-quality conformal coating services using its state-of-the-art conformal coating machine. Coating services including antistatic, corrosion-resistant, abrasion-resistant, high-temperature, chemical-resistant and conformal coating.

The coating consists of a non-conductive compound that covers all surfaces except those required for electrical or thermal connections. It is clearly visible as a clear, shiny, paint-like material. Some coatings are hard, while others have a slightly rubbery texture. Most coatings include a marker that appears bright greenish-blue under a blacklight (UV). This marker enables easy inspection of the coating thoroughness.

Unlike other conformal coating services, Hetech's machine is custom programmed specifically for the customer's product by its highly trained technicians. This allows the company to provide an even coating with no pooling, ensuring the maximum protection possible for the customer's product.

Hetech

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STAND D29 ELECTRONICS MANUFACTURING SERVICES

Electronics manufacturing services (EMS) from LEACH include components sourcing, PCB assembly, programming/testing, harness and final assembly, and global logistics.

Benefits of the company's services include flexible production for small- to medium-quantity projects; high-mix engineering; DFM for high manufacturability; and supply chain management.

Leach (SZ) Co Ltd
www.leach-pcba.com



STAND A2 LEAD-FREE TOUCHSCREEN SOLDERING STATION

Altronic Distributors has introduced the T 2460A high-power, temperature-controlled soldering station with touch screen.

The soldering station incorporates a special intelligent microchip control design. It has been developed to meet the present and future lead-free soldering needs of the electronic assembly industry and is suitable for work on SMD electronics.

The ergonomic handle with a short distance between heating element and tip enables fast heat-up time and quick heat dispersion. The sensor and heat transfer technology employed is designed to ensure precise temperature regulation required for making consistent soldering connections. The temperature is maintained within $\pm 3^{\circ}\text{C}$.

Altronic Distributors Pty Ltd
www.altronics.com.au

STAND A3 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 brings consulting class product development services to the SME sector. Over the past 20 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.

The company's market is Australian-based electronics manufacturers and entrepreneurial small businesses that want to make a high-quality product in Australia.

Successful Endeavours
www.successful.com.au

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STAND A17 PCB MANUFACTURING AND ASSEMBLY SERVICES

QualiEco Circuits has been offering standard and fast-turnaround PCB manufacturing and assembly services to 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.

The company's 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). It offers attention to detail and technical support.

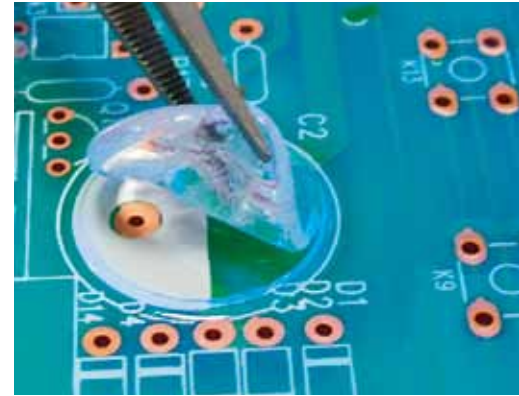
QualiEco Circuits Pty Ltd
www.qualiecocircuits.com.au

STAND C22 HOT MELT ADHESIVE

TechnoMelt AS 8998 is an efficient approach to conventional PCB masking techniques for conformal coating processes. An alternative to manual taping methods, the product is a hot melt adhesive that can be precisely applied to keep-out areas via automated dispensing systems, reducing process time.

The material is compatible with conformal coating chemistries, delivers good control during conformal coating, requires no curing and releases cleanly from various substrate surfaces.

Tarapath Pty Ltd
www.tarapath.com.au



STAND C14 FULL-HD DIGITAL INSPECTION MICROSCOPE



Vision Engineering has released the Evo Cam II digital inspection microscope, exclusive to Hawker Richardson and Re-surface Technologies.

Suitable for inspecting electronics, the microscope makes image capture and documentation simple and fast. It features optical magnification from 1.7 to 300x and high-resolution 1080p/60 fps image quality to deliver ultrasharp images.

The simple and intuitive design of the product makes it easy to use, requiring minimal training. It is therefore useful for production environments with multiple users.

The simple and intuitive design of the product makes it easy to use, requiring minimal training. It is therefore useful for production environments with multiple users.

Re-Surface Technologies
www.resurface.com.au

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STAND B26 RACK-MOUNTING AND DESKTOP ENCLOSURES

Hammond Electronics has added 4U heights and 559 mm depths to all sizes of its RM family of 19" and half-width rack-mounting and desktop enclosures. The enclosures are now available in 1 to 4U heights and five depths: 108 (1 to 3U half-width only), 203, 330, 457 and 559 mm.

Manufactured entirely in aluminium, the units are available with plain or vented top and base

covers. The front and rear panels are interchangeable and all 19" sizes are supplied with front panel mounting angles.

Featuring a hard-wearing black powder coat finish and optional front panel handles, the products are supplied flat-packed for easy assembly. All sizes are supplied with self-adhesive rubber feet for desktop use. Adjustable rear panel mounting angles are also available as an accessory for the 457 mm, 1 to 3U versions.

Hammond Electronics Pty Ltd
www.hammondmfg.com

STAND A16 CONFORMAL COATINGS AND RESINS

Electrolube is an expert in the formulation and application of conformal coatings designed to meet international approvals (including European and American military specifications). Its broad range of products comprises acrylics, silicones, polyurethanes and environmentally friendly VOC-free options.

The company's 2K conformal coatings combine the two-part chemistry of encapsulation resins with the ease of application and process of a conformal coating. The coatings are solvent-free, fast curing and high performance, designed for application by selective coating. The 2K materials provide a solvent-free alternative to both single-part UV and silicone coating materials and are claimed to offer improved performance in harsh environments when compared to silicones.

Electrolube's epoxy, polyurethane and silicone resin ranges have a wide range of potential applications, particularly in the LED market. The ER2224 epoxy provides high thermal conductivity and good thermal cycling performance, making it useful for LED lighting units where it helps to promote heat dissipation and prolong unit service life.

The tough UR5638 polyurethane resin provides high levels of protection while maintaining a clear, transparent finish. It exhibits high UV stability and good transmission of visible light, making it a suitable resin for white light LEDs. Its low exotherm during cure makes it particularly useful for LED applications involving the encapsulation of larger LED lighting units.

Electrolube
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STAND C8 INDUSTRY 4.0 WORKPLACE

The Smart Klaus Industry 4.0 workplace takes advantage of data by reflecting it to workers in a lean process. It is based around a four-step principle — guidance, verify, confirm, document — that divides even complex work processes into clear and structured sub-processes.

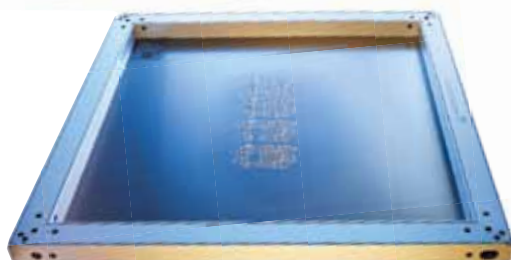
The employee is guided via a touch monitor that indicates which step they have to perform for which article. The image processing software uses database synchronisation to check whether the process step has been completed correctly. Thereafter, the system confirms that it is okay or indicates to the employee that they have made a mistake and gives them the opportunity to correct.

Smart Klaus ensures that the zero-error strategy is actually implemented. If required, the system documents the individual steps to help ensure 100% proof of quality.

The ergonomic, flexibly designed workspace adapts to the worker and offers optimal working conditions. The digital twin supports employees in all industries. The assistance system is suitable for every industry and is characterised by its flexible application options.

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STAND A12 OSCILLOSCOPES

The R&S RTM3000 oscilloscope offers bandwidths of 100, 200, 350 and 500 MHz, and 1 GHz. It incorporates a 5 GS/s 10-bit ADC and each model includes 40 MS (80 MS interleaved) per channel acquisition memory with an optional 400 MS segmented acquisition memory.

The R&S RTA4000 oscilloscope offers bandwidths of 200, 350 and 500 MHz, and 1 GHz. These models include the same 10-bit ADC but have even more memory, with 100 MS (200 MS interleaved) per channel acquisition memory and standard 1 GS (1000 MS) segmented acquisition memory.

Both instrument series feature a 10.1" capacitive touchscreen display to operate quickly and efficiently. They have 10-bit resolution and are claimed to have the deepest memory in their respective classes.

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

STAND B33 INTEGRATED MANUFACTURING ENVIRONMENT

In a competitive market, customers are expecting fast turnaround and high yields. Electronics manufacturer GPC Electronics has addressed this by implementing Industry 4.0, creating an integrated manufacturing environment. This was done by using barcoded PCAs for the SAP system to link equipment (AOI machines, SMT machines, wave soldering machines, automatic radial insertion machines) to displays in the factory, so that operators can monitor and improve processes.

Implementing Industry 4.0 has enhanced real-time process visibility to operators, process engineers and management. It has also improved speed, efficiency, throughput and responsiveness to changes in customer demand. Yields and quality have been improved to industry-leading levels, according to the company, with less rework and failures. The work has also provided traceability of processes for warranty, supply chain information and fault analysis.

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STAND B8 COMPUTER-ON-MODULES

congatec has introduced the conga-TS370 COM Express Type 6 Computer-on-Modules in parallel with the launch of the 8th Generation Embedded Intel Xeon and Intel Core processors. They propel the 35–45 W TDP class of COM Express Type 6 modules to a high level of embedded computing, offering up to six cores, 12 threads and a turbo boost of up to 4.4 GHz.

Tests from congatec suggest that the six-core modules offer 45–50% more multithread and 15–25% more single-thread performance, compared to 7th Gen Intel Core processor-based variants. System designs achieve high bandwidth at low power consumption, leading to high system efficiency. Target applications are high-performance embedded and mobile systems, industrial and medical workstations, storage servers and cloud workstations, media transcoding and edge computing cores.

The modules are available with six-core Intel Xeon and Intel Core i7 processors, or quad core Intel Core i5 processors in a 35 to 45 W cTDP envelope and up to 32 GB DDR4 2666 memory with ECC option. The integrated Intel UHD630 graphics supports up to three independent 4k displays with up to 60 Hz via DP 1.4, HDMI, eDP and LVDS. Designers can switch from eDP to LVDS purely by software without any hardware change.

The modules feature high-bandwidth I/Os including 4x USB 3.1 Gen 2 (10 Gbps), 8x USB 2.0 and 1x PEG and 8 PCIe Gen 3.0 lanes for powerful system extensions including Intel Optane memory. All common Linux operating systems as well as the 64-bit versions of Microsoft Windows 10 and Windows 10 IoT are executable.

The modules feature with extended long-term availability of over 10 years, as well as enhanced security features including Intel Software Guard extensions, Trusted Execution Engine and Intel Platform Trust Technology. Their service package includes personal integration support, an extensive range of accessories, and standardised or customised carrier boards and systems.

Congatec Australia Pty Ltd

www.congatec.com

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SILVER-BASED FILMS

FOR FLEXIBLE SCREENS

Danish researchers have demonstrated the large-scale fabrication of a new type of transparent conductive electrode film based on nanopatterned silver, offering a high-performance and long-lasting option for use with flexible screens and electronics.

Smartphone touch screens and flat panel televisions use transparent electrodes to detect touch and to quickly switch the colour of each pixel. Most of today's transparent electrodes are made of indium tin oxide (ITO), which can exhibit up to 92% transparency — comparable to glass. Although highly transparent, ITO thin films must be processed carefully to achieve reproducible performance and are too brittle to use with flexible electronics or displays. Researchers are seeking alternatives to ITO because of these drawbacks.

The anti-corrosive nature of noble metals such as gold, silver and platinum makes them promising ITO alternatives for creating long-lasting, chemically resistant electrodes that could be used with flexible substrates. However, until now, noble metal transparent conductive films have suffered from high surface roughness, which can degrade performance because the interface between the film and other layers isn't flat. Transparent conductive films can also be made using carbon nanotubes, but these films don't currently exhibit high enough conductance for all applications and tend to also suffer from surface roughness due to the nanotubes stacking on top of each other.

Now, researchers from the University of Southern Denmark have used an approach called colloidal lithography to create transparent conductive silver thin films. They first created a masking layer, or template, by coating a 10 cm wafer with a single layer of evenly sized, close-packed plastic nanoparticles. The researchers placed these coated wafers into a plasma oven to shrink the size of all the particles evenly. When they deposited a thin film of silver onto the masking layer, the silver entered the spaces between the particles. They then dissolved the particles, leaving a precise pattern of honeycomb-like holes that allow light to pass through, producing an electrically conductive and optically transparent film.

"The approach we used for fabrication is highly reproducible and creates a chemically stable configuration with a tuneable trade-off between transparency and conductive properties," said Jes Linnet, first author on the study. "This means that if a device needs higher transparency but less conductivity, the film can be made to accommodate by changing the thickness of the film."

Writing in the journal *Optical Materials Express*, the researchers revealed that their large-scale fabrication method can be used to create silver transparent electrodes with as much as 80% transmittance while keeping electrical sheet resistance below 10Ω per square — about a tenth of what has been reported for carbon-nanotube-based films with the equivalent transparency. The lower the electrical resistance, the better the electrodes are at conducting an electrical charge.

"The most novel aspect of our work is that we accounted for both the transmission properties and the conductance properties of this thin film using theoretical analysis that correlated well with measured results," said Linnet. "Fabrication problems typically make it hard to get the best theoretical performance from a new material. We decided to report what we encountered experimentally and postulate remedies so that this information could be used in the future to avoid or minimise problems that may affect performance."

The researchers say that their findings show that colloidal lithography can be used to fabricate transparent conductive thin films that are chemically stable and could be useful for a variety of applications, including flexible screens and electronics. The silver-based films could also enable flexible solar cells for installation on windows, roofs and even personal devices.



Westwick-Farrow Media
A.B.N. 22 152 305 336

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

Editor
Lauren Davis
wnie@wfmedia.com.au

Publishing Director/MD Geoff Hird

Art Director/Production Manager
Julie Wright

Art/Production
Wendy Blume, 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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