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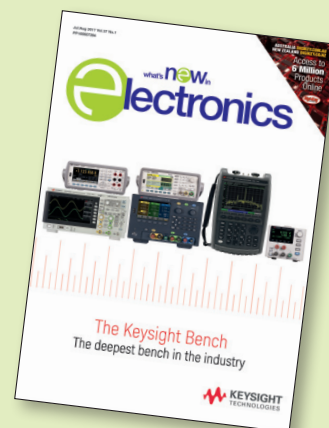
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THE PROS AND CONS OF COMPUTER- ON-MODULES

Alvin Tan, Country Manager Australia



Computer-on-modules are world-leading platforms for embedded system designs. What makes them so attractive and what are their limitations?

Studies from IHS Markit state that computer-on-modules are leading the global ranking of embedded form factors followed by standalone boards and VME/VPX solutions. They also forecast a growth of 8.6% CAGR during the period 2015–2020, which is impressive as market-leading technology is generally well established and market volume tends to be stable rather than dynamic. Similar studies from Research and Markets paint a much healthier growth perspective, forecasting that the global computer-on-module market will be growing at a CAGR of 17.97% during the period 2016–2020.

The large difference between these two forecasts may be caused by the highly uncertain market dynamics in the IoT segment, where these modules will get massively deployed. IHS Markit identifies the needs of industrial automation and Industry 4.0 as a major driver of growth in coming decades. So from a bird's-eye view of the market perspectives, there is no doubt that computer-on-modules are suitable candidates to evaluate for embedded system designs. But what makes them so attractive?

Made for customisation

Computer-on-modules are building blocks for custom system designs. Custom designs are quite often demanded in the embedded computing area as off-the-shelf motherboards cannot be used for all embedded applications. The available space may not be sufficient. Interface demands are almost always individual in terms of number, configuration and location on the boards. Also, a motherboard with expansion cards may just not offer the required resistance against mechanical or thermal stress.

All these individual demands lead to the question: shall I build my own design from scratch with all efforts and costs involved, or are there other options available that can help me design my dedicated system faster and more efficiently? Computer-on-modules were invented exactly to help with this 'build or buy' question and the intention to simplify the use of embedded processor technologies in customised designs.

Application-ready super components

Computer-on-modules are application-ready super components that offer engineers high design efficiency. One benefit for purchase departments is the fact that the bill of material is reduced from many components to a single module for the processing core — but this is only the smaller part of the efficiency gain. More important are the reduced efforts required to design-in the processor, RAM and high-speed interfaces on the one hand, and to build the entire board support package with all the necessary drivers, libraries and APIs on the other. All this work is already done and modules can be deployed nearly as simply as a new processor on a motherboard — but there is a huge difference between the switch of a processor and a computer-on-module.

Nearly endless scalability

Computer-on-modules offer nearly endless scalability. While a processor change can only be executed with pin-compatible processors that are generally only available within a certain processor generation, computer-on-modules can basically host all processors from all leading embedded processor vendors. One example is the update from the 5th generation of Intel Core processors to the 6th generation, where the grid array and memory interface changed. When leveraging a customised board, designers would have to redesign their PCB. With computer-on-modules, a switch between processor generations and vendors is much simpler and always possible. A new product generation can be launched just by switching the module.

Modules also make a design vendor-independent, with the benefit of higher design security. Another advantage of this scalability feature is that it extends the long-term availability of applications as when the seven- or 10-year product life cycle of an embedded processor ends, a successor is often available that can be used as a retrofit. If the design is based on modules, again only a switch of the module is required.

The benefits of standardisation

But this scalability can only be secured by interface standardisation. Computer-on-modules achieve this by standardising the footprints as well as the interface to the custom-designed carrier boards of the modules. While such standardisation can be a limiting factor that makes it necessary to have several specifications available to target all major applications, the benefits are tremendous.

Standardisation leads to highest design security as designers can rely on the future availability of modules with the same interfaces. They can also develop second source strategies and are not dependent on a single vendor. This benefits not only the design security but also provides commercial advantages due to competitive pricing. There is also greater room for module vendors to offer more services in an attempt to separate themselves from competitors by improved support of customers' demands.

Standardisation further delivers the capabilities to offer a broad ecosystem of commercially available accessories, ranging from heat spreaders and carrier boards to cable sets and housings. This makes it easy to purchase components from third parties so that NRE costs are reduced to a minimum. Finally, a large community of designers working with the form factor ensures continuous standard improvements.

Suitable where no other form factor fits

Having said all this, computer-on-modules are really only suitable if no other embedded form factor fits. Engineers consequently need to check the specifications and market trends of other embedded form factors before choosing a module approach. As the forecast from IHS indicates, checking the availability of standalone boards which directly fit the application is most important.



STANDARDISATION LEADS TO HIGHEST DESIGN SECURITY AS DESIGNERS CAN RELY ON THE FUTURE AVAILABILITY OF MODULES WITH THE SAME INTERFACES.

The relevant form factors in this growth cluster are the Mini-ITX and Pico-ITX boards, as well as the new eNUC standard, as they offer small form factors perfectly suited for space-constrained embedded system designs. In the market segment of passive backplane-based systems, only VME/VPX shows good growth perspectives — due to intensified spending in the military market — while CompactPCI and xTCA technologies are declining.

Unsuitable for ultrahigh-volume productions

Engineers also need to check whether a full custom design might fit better in the end. This is always the case in ultrahigh-volume productions, where every single component is a cost factor to be considered for economising. While the connector of a module may cost only \$1, when you've got 10 pieces this adds up to \$10 and the mounting of the module is a cost factor too. So when it comes to very high-volume productions, the breakeven point between a COM/carrier concept as opposed to a full custom design needs to be determined.

Calculating this breakeven point is complex, as R&D costs and investments in future upgrades also need to be taken into account. Module vendors can help OEMs with these calculations, as in most cases they also offer embedded design and manufacturing services for full custom boards where they can often re-use the layouts of the carrier board designs manufactured for the evaluation of the boards.

Spoilt for choice

After having evaluated these options and finding that a computer-on-module approach fits best, engineers need to evaluate the right computer-on-module standard as a final step. Today's state-of-the-art technologies include the specifications from two worldwide standardisation bodies: the PCI Industrial Computer Manufacturers Group (PICMG) hosting the COM Express standard and the Standardization Group for Embedded Technologies e.V. (SGET), which is responsible for Qseven and SMARC.

COM Express

The COM Express standard defines a family of different module sizes and pinout types covering a broad range of designs from low-power small form factor devices up to powerful embedded servers. COM Express sizes include:

- Mini (84 x 55 mm)
- Basic (95 x 125 mm)
- Compact (95 x 95 mm)
- Extended (110 x 155 mm)

COM Express Type 7

PICMG's COM Express Type 7 specification is tailored for modular server designs, which are being deployed at the edge of the IoT and Industry 4.0 applications as cloud and fog servers, or in cloudlets at the edge of the carriers' base stations for high-bandwidth mobile communications. What is most interesting from a feature set point of view is the support of up to 4x 10 GbE bandwidth and up to 32x high-speed PCIe for high-performance storage, and dedicated >>

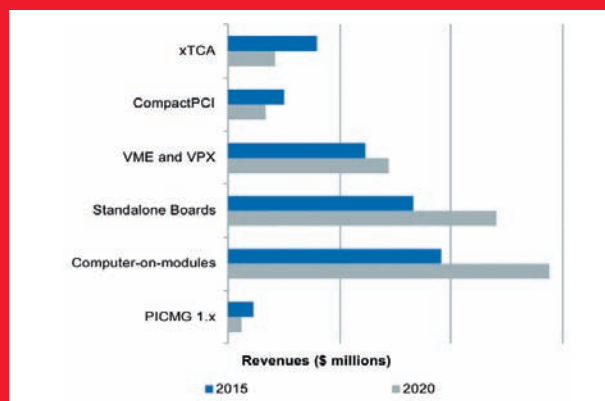


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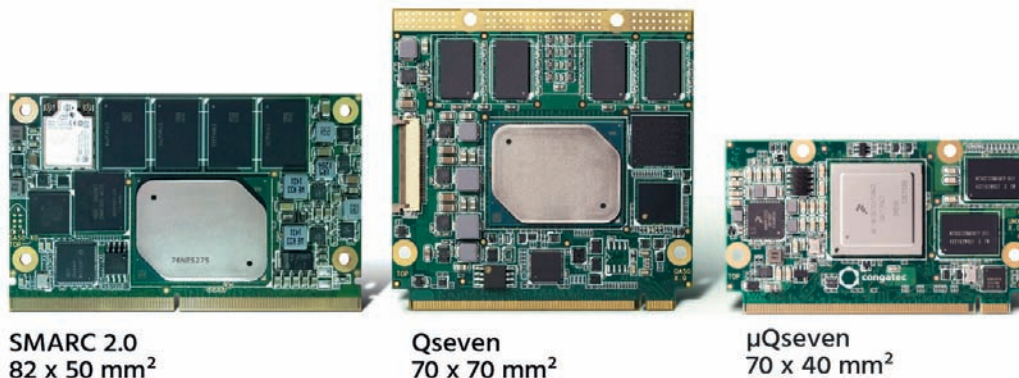
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COM Express footprints.



SMARC 2.0
82 x 50 mm²

Qseven
70 x 70 mm²

μQseven
70 x 40 mm²

interfaces supported by 440 signal pins to the carrier board. Target processors that can be found on the basic sized 95 x 125 mm modules include the Intel Xeon D processors and the upcoming successors from both x86 server processor vendors, Intel and AMD. Larger modules are possible as well, as COM Express already specifies the Extended format measuring 110 x 155 mm.

COM Express Type 6

The established PICMG COM Express Type 6 specification is state of the art for the high-end sector of embedded computer systems with implemented processors ranging from Intel Core, Pentium and Celeron to the AMD Embedded R-Series. These modules measure 95 x 125 mm (Basic) or 95 x 95 mm (Compact), provide 440 pins to the carrier board and offer a comprehensive set of state-of-the-art computer interfaces with everything needed to build powerful PLCs, HMIs, shop floor systems or SCADA workstations in control rooms. Further application areas are high-end digital signage systems, high-end gaming machines and complex kiosk systems.

COM Express Type 10

PICMG's small form factor COM Express Type 10 rounds off the set of COM Express specifications. It comes with the credit card sized Mini form factor. These modules measure only 55 x 84 mm, offer 220 pins and are dedicated for low-power x86 SoC processors such as Intel Atom and Celeron as well as AMD G-Series processors. Thanks to the unified connector technology and design guides used within the entire PICMG COM Express ecosystem, developers can re-use as many features as possible. Designers have one standard they can leverage to scale their designs on the basis of COM Express, from Mini Type 10 modules with Intel Atom processors up to Intel Xeon D processors for the server segment.

Qseven and SMARC

Engineers that are targeting not only x86 but also ARM-based designs are best served with Qseven or SMARC 2.0 modules as they incorporate both processor architectures. The difference between Qseven and SMARC 2.0 can quite easily be explained. On the connector side, Qseven offers 230 pins and SMARC 2.0 offers 314 pins. SMARC is more orientated towards feature rich multimedia applications, whereas Qseven offers more I/Os as required by the deeply embedded and industrial arena.

All the other benefits are comparable. Both standards enable slimmer designs compared to COM Express because of their flat edge connectors. Both have reliable connector vendors: the Qseven connector is currently supported by three and the SMARC 2.0 connector by two vendors. So for all those who have criticised Qseven in the past for only having one connector vendor, it needs to be underlined that this vendor bottleneck has now not only disappeared but changed to a slight advantage compared to SMARC 2.0.

The difference in the number of interfaces between Qseven and SMARC 2.0 is also kind of a price indicator: Qseven is designed for less complex designs and SMARC for the high-end of small form factor applications that demand credit card-sized modules. In general, any decision therefore depends on what the task of an embedded system will be.

Conclusion

The benefits of computer-on-modules are so substantial that a majority of embedded system designs are already using these application-ready building blocks. As the number of IoT and Industry 4.0 applications multiplies, many new designs are forecast to be also based on computer-on-modules and the new class of server-on-modules for

edge computing. Identifying the best form factor is the next major step within the design evaluation process where module vendors can help. As long as they offer all the relevant form factors, they can provide better consultancy as well as better options to migrate from one form factor to the other.

When choosing the right vendor, it is key to have a look at the BSPs, firmware and communication middleware, as they are getting more and more important in a connected world. This does not mean that the vendor should complement its offerings with an entire cloud for the system because it will never meet the needs of a customer entirely. It is more important to have a closer look at what is offered on the board and module level itself. For example, is the board management controller proprietary? Then take care as it could prove to be a dead end. Better to choose open, non-proprietary APIs because openness and standards are the fundament for most efficient and simplified re-use of existing engineering efforts. Check that integration support is offered for ARM and x86, because it is better to get one engineer who supports both architectures for a unified product family instead of two different engineers with two different product lines. This also requires unified APIs.

Finally, check the provided documentation. It is better to have more pages of content instead of only the bare minimum. And think also about relying on local manufacturing capacities wherever you or your customer reside. This will not only allow you or your customer to buy local but can also help with potential government trade restrictions. Fab-less board-level vendors such as congatec, with subsidiaries all over the world, can offer you all these advantages.

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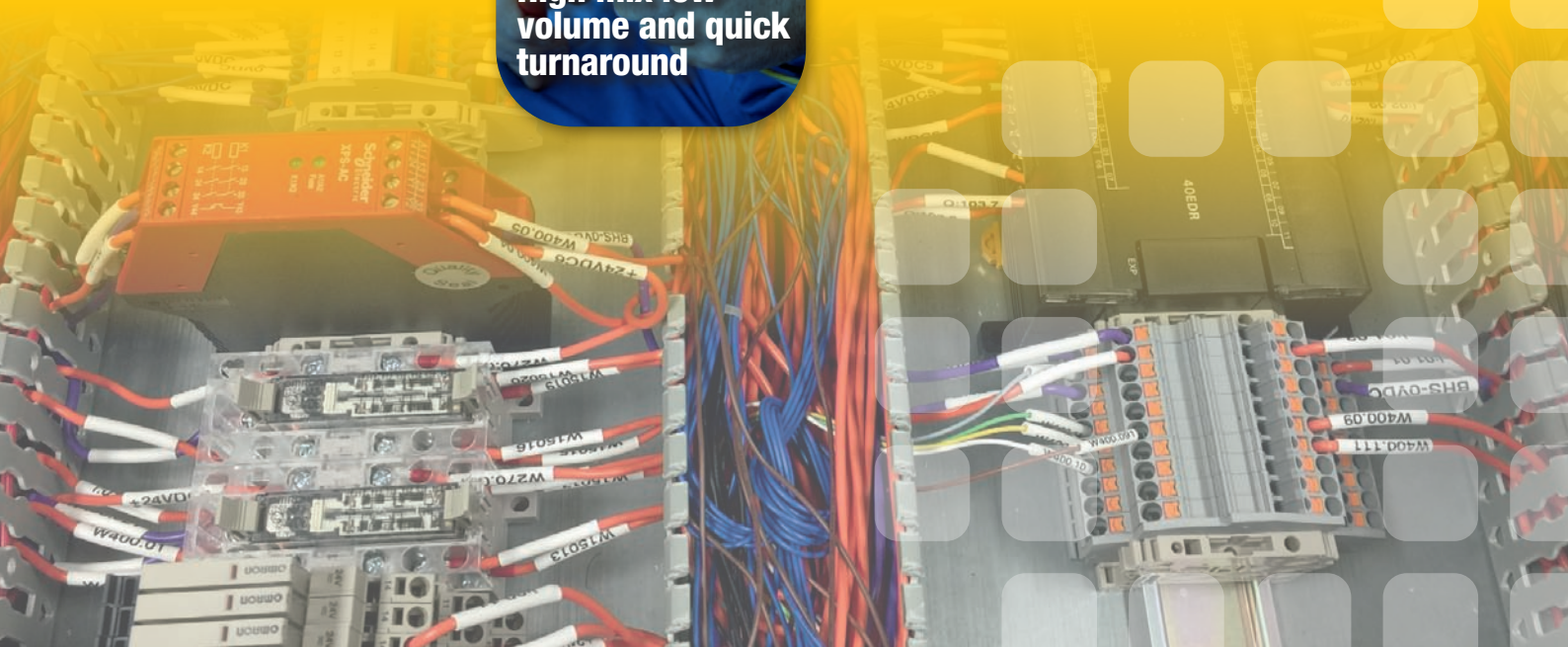
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LASER LIGHT COULD 'REPROGRAM' MATERIALS

Professor Christopher Barner-Kowollik has been awarded an Australian Laureate Fellowship and Australian Research Council funding of more than \$3 million to investigate how monochromatic light provided by lasers could be used to program and reprogram coatings and materials to make them adaptable and adjustable to their specific environment.

A world-leading soft matter nanotechnologist based at the Queensland University of Technology (QUT), Professor Barner-Kowollik said his research is focused on real-world applications of the use of light in soft matter nanotechnology.

"An example of this would be the developing of a coating whose mechanical properties could be adjusted to make it more flexible by simply shining light on it in certain areas and then using a different light wavelength to harden it again," he said.

"This could be how car scratches are healed in the future and how the sensitive parts of electronic devices are fitted and removed — by programming and then reprogramming coatings with light of different wavelengths to make them either hard or flexible."

According to Professor Barner-Kowollik, it is estimated that 10% of all goods will be 3D printed by 2030. The ability to use the same ink to produce not just multiple products, but products of varying material just by changing wavelengths would thus be a game changer.

"One of the Holy Grails of 3D laser lithography is to be able to write 3D structures with nanometre resolution using visible light as this has the potential to revolutionise the fabrication of computer chips," he said.

He said the use of light-driven technology would have a vast array of applications, noting that in Australia, where light is an abundant yet underused resource, specific filters could be developed to enable light's power to be harvested for chemical transformations.

STMICROELECTRONICS LIGHTS UP VIVID SYDNEY 2017

Semiconductor company STMicroelectronics collaborated with Australian-based artists to create an exhibit called 'Light of Thoughts' for Vivid Sydney 2017.

Assembled by 270 acrylic cubes, the Light of Thoughts installation is built as a giant 'brain' in a pixel form that reacts and projects different animations and illuminations based on hand movements. Adjacent to the brain is a control stand that uses two ST time-of-flight proximity sensors to respond to hand gestures made by participants.

Wiping down at the control point activates and triggers changes to animations and illumination inside the brain, representing 'thoughts'. Alternatively, waving upward recalls thoughts from the original animation. Through the evening, as thoughts multiply, the audio and visual effects become faster and stronger. The Light of Thoughts project records all interactive data in real time via the cloud for traffic analysis.

Making all this possible is ST's 32-bit STM32F7 microcontroller inside the installation. This high-performance microcontroller powers the wireless multisensor board and the audio/video/lighting control board, which is based on the STM32 Open Development Environment (ODE). The STM32 ODE provides an open, flexible and easy way to develop innovative devices and whole solutions for IoT applications.



POWER AND SECURE YOUR DEVICES AS YOU WALK

Researchers from CSIRO's Data61 are using a person's gait — ie, the way they walk — to power wearable devices. Their technology also has the potential to be used as an authentication method which could replace passwords, PINs and fingerprints.

Sensors called accelerometers can currently be used to capture an individual's gait in terms of motion and velocity; however, this reduces the battery life of wearable devices. The CSIRO researchers have overcome this by combining gait recognition with a technique called kinetic energy harvesting (KEH), which translates a person's motion into electrical energy.

"By applying both techniques we have developed a way to achieve two goals at once — powering devices and the ability to verify a person's identity using a wearable device by capturing the energy generated from the way they walk," said Data61 researcher Sara Khalifa.

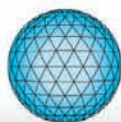
Gait authentication was tested in a trial on 20 users, whose gaits were captured in different settings and environments. The trial showed that KEH-Gait can achieve an authentication accuracy of 95% and reduce energy consumption by 78%, compared to conventional accelerometer-based authentication techniques.

The system was also tested against 'attackers' who attempted to imitate an individual's motions. Only 13 out of 100 imposters were wrongfully accepted by the system as genuine users.

Professor Dali Kafaar, leader of Data61's Networks Research Group, said there are benefits to the new approach compared to passwords, PINs, signatures and fingerprints.

"Firstly, it is convenient because as we walk around each day our gait can be sampled continuously and verified without us having to manually adjust anything," Professor Kafaar said.

"Secondly, it's more secure than passwords because the way we walk is difficult to mimic. Since the KEH-Gait keeps authenticating the user continuously, it collects a significant amount of information about our movements, making it difficult to imitate or hack."



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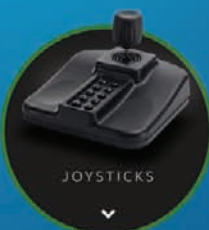
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NANOALLOYS REDUCE THE NEED FOR PLATINUM IN FUEL CELLS

European researchers have shown that it is possible to significantly reduce the need for platinum in fuel cells through the development of a new type of nanocatalyst. Their technology could be the breakthrough the fuel cell car industry has been waiting for and is apparently suitable for mass production.

Even though there have been fuel cell cars for about 50 years, they have not yet made a commercial breakthrough. Part of the reason for this is that the catalysts in today's fuel cells require large amounts of platinum, which is one of the world's most expensive metals.

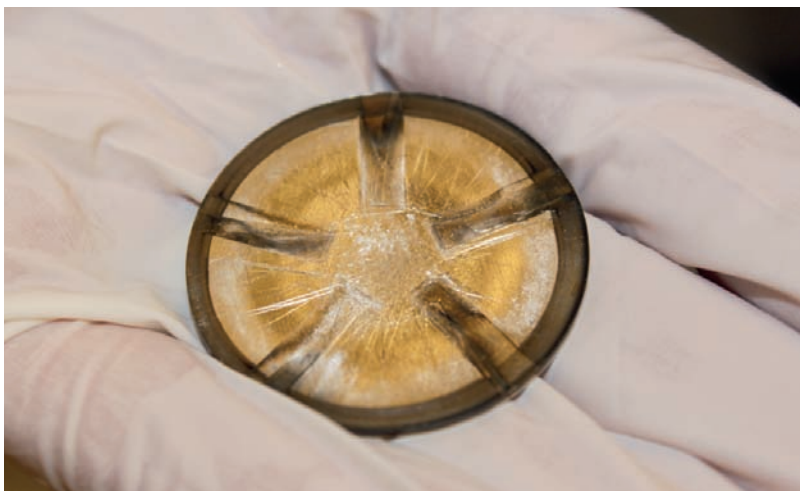
Previous research has shown that it is possible to mix platinum with other metals, such as yttrium, to reduce the amount of platinum in a fuel cell. Unfortunately, no-one has yet managed to create alloys with these metals in nanoparticle form in a manner that can be used for large-scale production. The major problem has been that yttrium oxidises instead of forming an alloy with the platinum.

This problem has now been solved by a research team led by Sweden's Chalmers University of Technology by combining the metals in a vacuum chamber using a technique called sputtering. The result of their research, published in the journal *Advanced Materials*, is a nanometre-thin film of a new alloy that enables mass-produced platinum and yttrium fuel cell catalysts.

"A nano solution is needed to mass-produce resource-efficient catalysts for fuel cells," said Björn Wickman, a corresponding author on the study. "With our method, only one-tenth as much platinum is needed for the most demanding reactions. This can reduce the amount of platinum required for a fuel cell by about 70%."

If this level of efficiency is possible to achieve in a fuel cell, the amount of required platinum would be comparable to what is used in an ordinary car catalytic converter. "Hopefully," said Wickman, "this will allow fuel cells to replace fossil fuels and also be a complement to battery-powered cars."

To use the new material, today's fuel cells need to change slightly, but doing so creates incredible opportunities. As explained by Chalmers researcher Niklas Lindahl, also a corresponding author on the study, "Fuel cells convert chemical energy into electrical energy using hydrogen and oxygen — with water as the only product. They have huge potential for sustainable energy solutions in transport, portable electronics and energy."



Pure platinum with thin fixed foils of yttrium has been used to create the new nanoalloys that are 10 times as effective as pure platinum in fuel cells.

SYDNEY STUDENTS WIN PRESTIGIOUS ROBOTICS AWARD



For the first time ever, a team from Australia has been announced as the winner of the Chairman's Award at the 2017 *FIRST* Championship held in Houston, Texas.

FIRST (For Inspiration and Recognition of Science and Technology) was founded to inspire young people's interest and participation in science and technology. The *FIRST* Robotics Competition (FRC), held earlier this year, brings together students and mentors to build robots that perform in a competitive environment against teams from all over the world.

Thunder Down Under, hosted by Macquarie University and comprising students from more than 40 high schools across Sydney, is the first Australian team to win the Chairman's Award — the highest honour given at the FRC Championship, recognising the team that best represents a model for other teams to emulate and best embodies the purpose and goals of *FIRST*. The award is presented according to the contribution of the overall team, not just the robot, in recognition of what the team has achieved over an extended period of time.

"This is like Australia winning the America's Cup all over again!" said Professor Michael Heimlich from Macquarie University. "Nobody expected a team outside of North America to win it and we didn't just win it, according to the judges, the team 'changed the paradigm'. It is a very exciting achievement."

Heimlich has worked with Thunder Down Under since it was established eight years ago, in which time the team has created an innovative program for STEM outreach in 200 rural and remote Indigenous communities. The program has since been adapted for the inner city, even reaching homeless kids, and its impact is now felt in 12 countries in almost every continent around the world.

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STRETCHABLE ELECTRONICS

EVERYTHING YOU NEED TO KNOW

Dr Khasha Ghaffarzadeh, Research Director

Stretchable electronics is a term that conceals great diversity. Indeed, it is an umbrella term that refers to a whole host of emerging electronic materials, components and devices that exhibit some degree of mechanical stretchability.

Stretchable electronics has been in the making for more than a decade, but up to now it has been mostly a solution looking for a problem. Recent analysis by IDTechEx Research, however, finds that this is about to change. In its new report 'Stretchable and Conformable Electronics 2017–2027', IDTechEx Research finds that the market for stretchable electronics will reach at least \$600m by 2027.

Stretchable interconnects are the first to market

Connectors are a simple essential component in all electronic systems. Their simplicity means that they can be made stretchable. This is in contrast to complex multilayer interfacial devices like transistors whose stretchable versions are commercially years away despite numerous laboratory proof-of-concept results or prototypes. Indeed, they can even be the only stretchable component in stretchable systems made using the rigid island-stretchable interconnect approach.

A variety of approaches have been developed to produce stretchable interconnects. In one approach, PCBs are made stretchable. Here, ICs and other rigid electronic components are mounted on a standard PCB 'island'. These islands are then interconnected using thinned meandering PBC lines, introducing stretchability. PCB manufacturers are now using this approach to manufacture stretchable PCBs; indeed, our team has seen numerous such companies all over the world prototyping samples and seeking ways to speed up the production process without compromising yield or circuit complexity. In parallel, manufacturers are also developing ways to further thin PCBs or develop novel materials to create stretchable and/or conformable PCBs.

In another approach, cables are arranged in a specific way to impart stretchability. Here, stretching does not change the total length of the wire and thus causes no resistance change. Note that this approach often requires introducing a separate distinct cable onto the e-textile systems, and while robust it is not structurally embedded. Note that conductive cables are themselves not intrinsically stretchable. Many approaches are, however, being developed, most at the early-stage prototyping level, to create truly stretchable conductive fibres/yarns.

Conductive inks

Yet another approach is based on stretchable conductive inks. This approach enables the use of post-production processes steps such as transfer or screen printing to introduce the stretchable interconnect onto the textile. It therefore requires no alternation to standard textile production lines. It can also be used in stretchable circuits, particularly acting as stretchable interconnects on long stretchable substrates for use in, for example, medical electronics.

This approach is trendy all around the world: while only three years ago only two or three companies offered such inks, now most players have either launched a product or demonstrated capability. The application pipeline is also gathering momentum with many products in late-stage prototyping phases and some even in the early commercial phase sales.

Stretchable conductive inks are still a young technology. Indeed, performance progress is highly visible when tracking the last few generations of inks launched by any given company in quick succession. Stretchable inks today can tolerate higher elongation levels and suffer less resistance change. These improvements have been



SOME STRETCHABLE COMPONENTS WILL BECOME SUCCESS STORIES IN THE SHORT TO MEDIUM TERM, WHEREAS OTHERS WILL REMAIN LARGELY AN ACADEMIC CURIOSITY.

achieved thanks to changes in resins, binders and even at times filler size distribution.

There is still a long way to go though. Currently, the printed lines are encapsulated using a material such as TPU. This is not an elegant solution and the encapsulant is not ideal, suffering issues with comfort, breathability, etc. Direct on-textile printing remains a long-term challenge as numerous textile substrates exist each with different properties and almost none offering a good printing surface.

Critically, the market requirements are not yet fully known, and may even remain diverse and fragmented. For example, today suppliers receive enquiries for conductivity and stretchability levels at opposite ends of the performance spectrum. This is an opportunity for competent suppliers to offer customised solutions before slightly more standard product groups emerge. In fact, the ability to address varying cost-performance needs represents an opportunity for the entire category of ink-based stretchable interconnects compared to its rivals.

In-mould application to take off after years of false starts

An expanding toolkit of materials compatible with in-mould electronics (IME) is also being developed. These materials need to withstand thermoforming and moulding conditions, including a one-off elongation event. Conductive inks and adhesives were the first IME-compatible materials, but the choice is now expanding to include transparent conductive films, sensors, actuators and so on. We expect 2017 to be the year when IME applications hit the market after years of false starts.

In IME, functional and graphical inks are printed on a flat sheet then formed into a 3D shape. Consequently, the inks will have to withstand a one-off elongation event (30–50% original length). While similar to the previously discussed stretchable inks, IME inks have different requirements: (a) they experience a one-off elongation,

(b) they need to adhere well to the substrates used (eg, polycarbonate) and (c) they must be compatible with the stack of other materials used in IME, eg, layers graphical, insulating, transparent conducting and other inks.

Stretch sensors find their niche

Stretch sensors are finding use in a diverse array of applications. In fact, the industry is now in the brainstorming phase and we have already witnessed the identification of several promising niche applications beyond electronic textiles and robotic arms. These sensors come in a variety of formats and are based on different principles of operations.

Long tail of innovation in stretchable electronics

There is a long tail of innovation on all types of stretchable electronic devices, including batteries, energy harvesters, displays, transistors, photovoltaics and so on. Many such devices are still in the early proof-of-concept phase and device complexity often suggests prolonged development times. Nonetheless, they will, soon or later, form a part of this emerging frontier of electronics.

This new technological frontier is thus on the cusp of growth, becoming at least a \$600m market by 2027. The industry, however, cannot be painted with a broad brush and success will be in the detail. As the report reveals, some stretchable components will become success stories in the short to medium term, whereas others will remain largely an academic curiosity. The report also reveals that stretchable electronics will deliver compelling, at times enabling, value in some application sectors, while remaining an immature technology against many other options in other sectors. *This story is based on two articles written by Dr Khasha Ghafarzadeh for the IDTechEx website, produced here with permission.*

IDTechEx
www.idtechex.com/

ULTRASMALL DC MOTORS

maxon motor's 6 and 8 mm DC servo motors have been released, with a wide range of motor customisations possible.

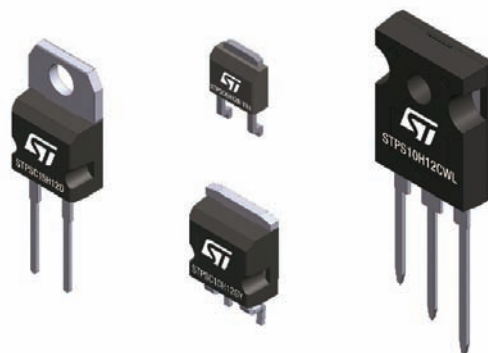
Completely configured by the end user, the micro DC motor features online motor design and fully automated construction. Without human interference, a tiny microdrive can be tailored to the application via an online tool — from the shaft length, diameter and flat features to the mounting method, gearhead reduction, winding characteristics, cable length and connector type — all direct from the motor design portal to the automated manufacturing line.

The product has laser-welded steel construction, dual stainless ball bearings and integral strain relief on a motor with a 6 mm outer diameter. Reaching over 17,000 rpm at low noise levels and torque levels to 200 mNm, the 6 and 8 mm servo gear motors are power dense.

The ultrasmall DC servo motors have linear control characteristics and zero magnetic detent (cogging), making them suitable for applications such as micro pumps, medical and laboratory dosing devices and robotics.

maxon motor Australia Pty Ltd

www.maxonmotor.com.au



1200 V SILICON-CARBIDE DIODES

A full range of 2–40 A 1200 V silicon-carbide (SiC) JBS (junction barrier Schottky) diodes from STMicroelectronics enables a range of applications to benefit from the high switching efficiency, fast recovery and consistent temperature characteristics of SiC technology.

ST's SiC-diode manufacturing process creates robust devices with good forward voltage (lowest VF), giving circuit designers the freedom to achieve high efficiency using diodes with a low current rating. This makes SiC technology accessible for applications such as solar inverters, industrial motor drives, home appliances and power adapters.

At the same time, performance-oriented applications that demand SiC for high efficiency, low weight, small size or good thermal properties can extend these advantages using the 1200 V SiC diodes. The higher efficiency margin provided by their lower forward voltage drop (VF) delivers benefits for automotive equipment such as onboard battery chargers and charging stations for plug-in hybrid or electric vehicles. Overall robust electrical performance is suitable for telecom and server power supplies, high-power industrial switched-mode power supplies and motor drives, uninterruptible power supplies and large solar inverters. Achieving the lowest VF also helps reduce operating temperature and extend application lifetime.

STMicroelectronics Pty Ltd

www.st.com

BUCK REGULATOR

The PI3526-00-LGIZ is the latest addition to Vicor's Cool-Power ZVS buck regulator portfolio with a 48 V (30–60 Vin) input. The PI352x is a higher current offering to the existing PI354x portfolio, enabling scalable power options for 48 V Direct to Point of Load (PoL) applications. The PI3526-00-LGIZ is a 12 V output regulator, supplying up to 18 A, packaged in a 10 x 14 mm LGA SiP package.

The PI352x portfolio delivers twice the power of the PI354x regulators in a 40% larger package. PI3526-00-LGIZ requires only an output inductor and minimal passives for a design that consumes less than 740 mm² of PCB real estate. Designed to be easily paralleled in combinations of up to three regulators, the product can be scaled to support applications with even higher load currents.

The range addresses the growing need for 48 V Direct to PoL solutions in lighting, communications, automotive equipment and data centre applications. The regulators are focused on high power density and high efficiency while being simple to use.

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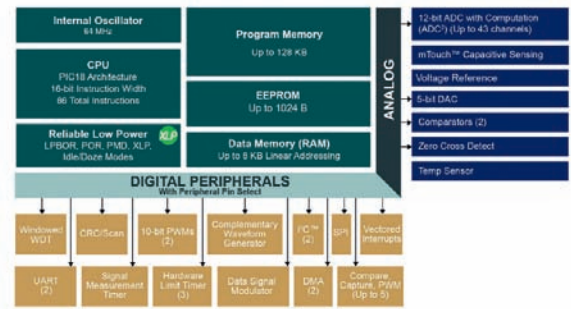
CONTROLLERS

The Microchip PIC18F K42 controllers have core independent peripherals (CIPs), high-resolution analog, on-chip direct memory access (DMA) and vectored interrupts for fast processing.

The DMA controller enables data transfers between memory space and peripherals without core processing unit (CPU) involvement, improving system performance and lowering power consumption. When interrupts are required, vectored interrupts provide faster response times with fixed latency reducing software overhead. Code development is also simplified with the user-friendly MPLAB code configurator, making the product well suited to applications and markets including touch sensing, automotive, industrial control, Internet of Things (IoT), medical and whitegoods.

The product has up to 128 KB Flash and 8 KB RAM. CIPs simplify the implementation of common system functions like sensor interface, signal generation, power conversion, motor control, safety management and system communications. The product features a 12-bit ADC with computation which automates analog signal analysis for real-time system response. The MCUs also include configurable logic cells, low power modes to reduce power consumption and improved serial communications including UART with support for asynchronous systems, DMX, DALI and LIN protocols along with higher speed, standalone I²C and SPI.

Microchip Technology Hong Kong
www.microchip.com



PANEL PC

IEI Integration's range of AFL3-W15C-ULT3 panel PCs is powered by the Intel Skylake ULT platform. The PC features a 15" wide screen monitor that is available with a 5-wire resistive touch screen with a serial interface or projected capacitive touch screen with a USB interface.

The product is powered by the Intel 6th generation of iCore and Celeron processors. The Celeron version of the AFL3 is the Celeron E3955U processor, while the i5 version is equipped with the i5-6300U processor.

The device has a variety of storage options available, including 1x 2.5" SATA hard drive bay, 1x M.2 M PCIe and 1x mSATA slot. Both the M.2 and mSATA offer a fast method of storage with a data transfer rate of up to 10 GBps, making them suitable when quick performance is desired.

The optional E-Windows technology is a modular way of adding flexible functions for a variety of devices, including extra GbE LAN ports, COM ports and even 3G capabilities. The E-Windows Technology enables easy replacement of modules so they can be swapped out with different modules, enabling changes to be made to meet the needs of a variety of applications.

Other features include a 9–30 V wide range DC power input, selectable AT/ATX power mode, built-in speakers and an IP64-compliant front panel. IEI One Key Recovery allows the user to create rapid OS back-up and recovery (suggested with over 4 GB storage capacity).

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

AROMATIC-FREE ACRYLIC COATING RANGE

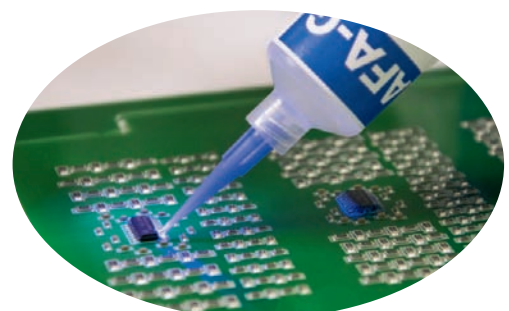
The Electrolube AFA-G aromatic-free acrylic coating range is more viscous than a standard coating, designed for use as a permanent masking or damming material.

It either prevents capillary action around components such as connectors, or as a mask between the 'coat' and 'no-coat' areas of the PCB. This product is suitable for critical areas of the PCB where extra thickness of coating may be beneficial. The acrylic coating works alongside other AFA coatings and is suitable for covering sharp edges, which may otherwise be missed by less viscous material during the coating process.

The product has been carefully developed without the use of hazardous aromatic solvents, such as Xylene and Toluene, making it less harmful to the environment and the operator. The properties of the acrylic coating product are much the same as the AFA coating range, which includes being free of aromatic solvents, a wide operating temperature range, a UV trace to aid inspection, fast touch-dry time at room temperature, good adhesion to most substrates and protection against humidity and salt mist.

The RoSH-2 compliant product is available in a 35 mL syringe with LuerLock-adaptor and can be applied by hand as well as with automatic dispensing equipment.

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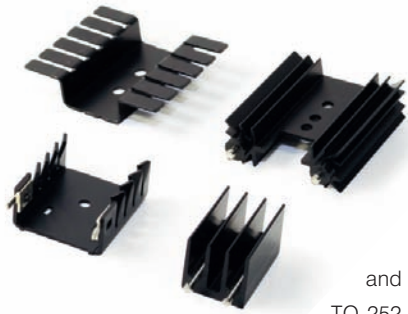
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EXTRUDED AND STAMPED ALUMINIUM HEAT SINKS

CUI's Thermal Management Group has announced an expansion to its existing portfolio of Peltier devices and DC fans with the addition of a heat sink product line.

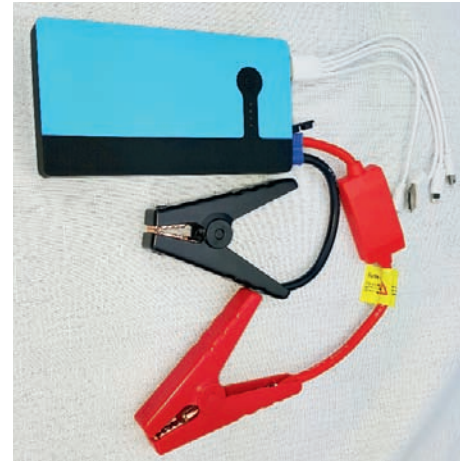
The aluminium heat sinks, available in both extruded and stamped versions, are compatible with TO-218, TO-220, TO-252 and TO-263 transistor packages. Designed to improve the heat dissipation of low- and high-power board-level applications, the stampings and extrusions are conveniently measured under four conditions for thermal resistance, making it easy to select the optimal heat sink for natural convection or forced air cooled systems.

The extruded and stamped heat sinks offer tin-plated or black anodised material finishes and are available with or without solder pins in vertical or horizontal orientations. Thermal resistances measured at 75°C ΔT in natural convection environments are as low as 4.49°C/W, while power dissipation ratings measure up to 16.7 W at 75°C ΔT in natural convection.

CUI also offers a range of custom heat sink capabilities. With alternative production methods such as forging and die casting as well as extrusions and stampings, the company can create virtually any shape or profile to fit specific design needs. A variety of additional materials and finishes are available, including clear and colour anodisation, chromate powder coating, and nickel or zinc plating. Hole punching for custom mounting patterns is also an option.

Digi-Key Electronics

www.digikey.com



JUMPSTART POWERBANK

Premier Batteries' jumpstart powerbank will start a car wherever it is. This means there is no need to look for jumper leads and another vehicle to help, just simply connect to the battery and start.

The product is compact and so will easily fit in the glove box. It comes with a 240 V charger and an adapter to charge from the cigarette lighter socket. It can also charge mobile phones.

Premier Batteries Pty Ltd

www.premierbatteries.com.au

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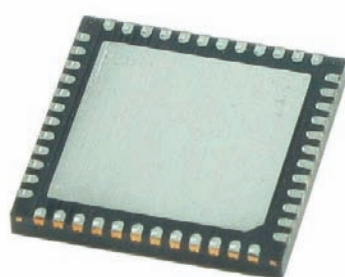
KlikR is a simple and small Bluetooth tile that turns any iOS or Android smartphone or tablet into a remote control for nearly all home infrared-controlled devices, such as TVs, DVD players, cable boxes and even air conditioners. The user simply needs to stick the tile onto or next to the IR-controlled device and download the KlikRnext app which, using its own database, learns the remote control codes of the devices in the home room by room.

The product comes equipped with voice control, so users can give commands directly to their smartphones such as 'Turn on the TV' or 'Change the channel'. The product also has optional smart pausing and muting.

If the product has multiple users, the set-up can be shared with a QR code from the application's home screen. Furthermore, all set-up and devices are backed up on the cloud in case the user loses or changes their phone.

Soanar Limited

www.soanar.com



WIRELESS MCUs

Silicon Labs' EZR32 wireless MCUs deliver an ARM Cortex-M4 or Cortex-M3 microcontroller (MCU) combined with a sub-GHz RF transceiver. The combination of a low-energy wireless solution integrated into an energy-efficient 32-bit MCU is suitable for battery-powered applications.

The wireless MCUs are pin-compatible devices that scale with 64/128/256 kB of flash and support the EZRadio or EZRadioPRO transceivers. The MCUs also feature a low-energy sensor interface (LESENSE) and an AES accelerator with 128/256-bit keys.

Applications include energy, gas, water and smart metering; health and fitness; consumer electronics; alarm and security systems; and building and home automation.

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UMT-H: COMPACT, HIGH-PERFORMANCE FUSE IS OPTIMAL FOR INTRINSICALLY SAFE APPLICATIONS

SCHURTER's Universal Modular fuse, UMT-H, offers a 1500 A breaking capacity at rated voltages of 277 VAC / 250 VDC. The compact, high performance fuse now has VDE approval in addition to UL approval. This time-lag fuse provides overcurrent and short circuit protection in various industrial control applications, including intrinsically safe applications.

The "intrinsic safety" method is one of the most common techniques used for achieving safety protection with lower voltage or power equipment. This method restricts the available electrical and thermal energy in a system so that ignition of a hazardous atmosphere (such as explosive gas, dust, or electrical arcing) cannot occur. The UMT-H's high breaking capacity of 1500 A, plus the >10 mm spacing between end caps, combined with the ability to be impermeable to conformal coating makes the fuse suitable for use in such intrinsically safe applications.

The UMT-H fuse is available in a total of 19 rated currents between 160 mA and 10 A at voltages up to 277 VAC and 250 VDC. The UMT-H measures at 5.3 x 16 mm, which is a smaller alternative to the classic cylindrically-shaped cartridge fuses (e.g. 5 x 20 mm). The smaller footprint saves valuable board space, allowing for further downsizing of equipment. With its square design, the UMT-H is also suited for more cost-effective, automated assembly. The high breaking capacity fuse meets the IEC 60127-7/1, UL 248-14 and CSA C22.2 standards along with its VDE and UL approvals. Additional applications include power supplies, electromobility, medical and telecommunication applications as well as 277 VAC utility-connected equipment.

Features and benefits:

- Certification according to IEC 60127-7/1, UL 248-14, CSA C22.2 no. 248.14
- High breaking capacity (H) of 1500 A at rated voltage
- High rated voltages up to 277 VAC / 250 VDC
- 19 rated currents from 160 mA to 10 A
- Time-lag (T) characteristics
- Optimal suited for automated assembling because of square design
- Suitable for intrinsically safe applications

Applications:

- Primary protection on SMD PCBs
- Industrial electronics
- Sensors
- Power supplies
- Explosion protection (IEC 60079-11)
- Medical applications
- Telecommunication applications

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, EMC 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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WIRELESS SENSOR NODES

Advantech has announced its WISE-4000 product family of wireless sensor nodes. By leveraging Wi-Fi, mobile network and LoRa low-power wide-area network (LPWAN) technology, Advantech has developed three types of nodes.

The WISE-4200 series offer diverse configuration options, such as an embedded temperature and humidity sensor or digital input integrated with an RS-485 I/O interface.

Users can easily collect required data via a single node without additional development or assembly. The nodes are suitable for environmental monitoring and management applications in factories, pipelines, data centres and cold chain warehouses.

The WISE-4400 series nodes are IP65 rated for protection from dust, oil and water ingress, making them suitable for operation in harsh industrial environments. The WISE-4470 model is equipped with 3G mobile network technology for data transmissions and features a built-in antenna that offers enhanced connectivity for more flexible installation. The IP65-rated protection ensures stable data collection and transmission operations for food and beverage production lines that require frequent cleaning or CNC processing plants with high oil and dust accumulation.

The WISE-4600 series nodes are solar powered and designed for wide-area outdoor applications. WISE-4610 supports LoRa networks and offers low power consumption and long-distance data transmissions, as well as optional GPS capabilities for locating and tracking functions. In addition to a rechargeable solar battery, the nodes support a wide input power voltage of 10–50 V.

The nodes series support both MQTT and REST communication protocols, ensuring easy integration with upper-level management systems and cloud platforms. Because additional devices are not required to serve as a data gateway, users can save on hardware costs and benefit from simplified IoT application architecture.

Advantech Australia Pty Ltd

www.advantech.net.au

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The PIC16F15386 product family is the most powerful launching point into the 8-bit PIC® MCU portfolio. The scalable family offers up to 28 KB Flash and 2 KB RAM with high levels of Core Independent Peripheral (CIP) integration to perform system functions outside the core while consuming as little power as possible.

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 - Additional I/Os and ADC channels
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 - System flexibility
 - Configurable memory storage
- Device information area:
 - Unique ID and factory calibrations
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- MPLAB Xpress IDE including MPLAB Code Configurator (MCC)



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HOW TO MASTER

POWER DENSITY FOR MOTOR DRIVES

Stefan Hopfe* and Stefan Häuser*

Reducing system cost by maximising the output power density is one of the major demands on power modules today, especially in cost-sensitive market segments like motor drive applications.

One key to more power is optimising the thermal resistance layer between the chip and heatsink. SEMIKRON has several options to achieve the highest possible power density to increase the output current capability by more than 30%, while using the same physical chipset and power module size.

SEMIKRON's MiniSKiiP series has become a standard for compact motor drives of low to medium power. The baseplate-less modules are available in a range of 4 to 400 A with blocking voltages up to 1700 V in six-pack, CIB topologies, with the rectifier, brake chopper and inverter as well as half bridges with separate rectifier modules. MiniSKiiP provides an advantage through its scalability over the full power range and its one/two-screw mounting concept: in just one mounting process, a complete subsystem can be assembled with the power module, heatsink, power PCB with DC bus capacitors, line and motor connection terminals, and current sensors. Another advantage of MiniSKiiP is the high quality level: every single module leaving the factory is 100% electrically tested during production.

More than 30 million MiniSKiiP modules have been sold, most powering motor drives all over the world while helping to build more compact solutions. But how can costs be further optimised? The answer is by improving the power density through reducing the thermal impedance of the power system.

The biggest portion of the thermal resistance from chip to heatsink ($R_{th(j-s)}$) is taken up by the thermal interface material (TIM or thermal

grease), with an approximately 50% share. Thus it makes sense to focus on improving that layer first.

The main task of the TIM is the thermal interconnection of two surfaces by smoothing out the module's bottom and the heatsink's roughness with a minimum layer thickness. Figure 1 shows how the

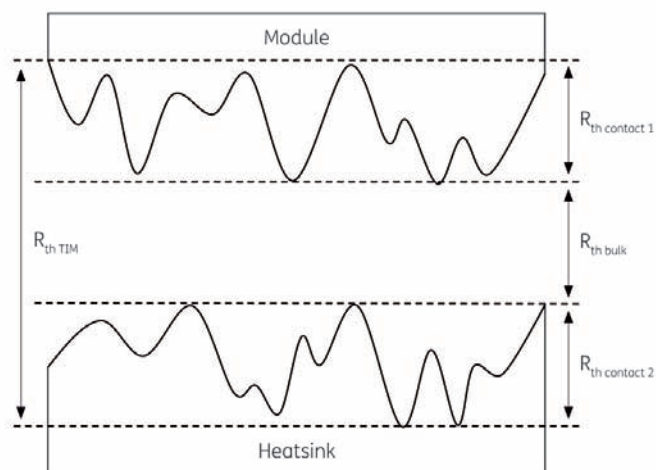


Figure 1: $R_{th,TIM}$ composition layers.

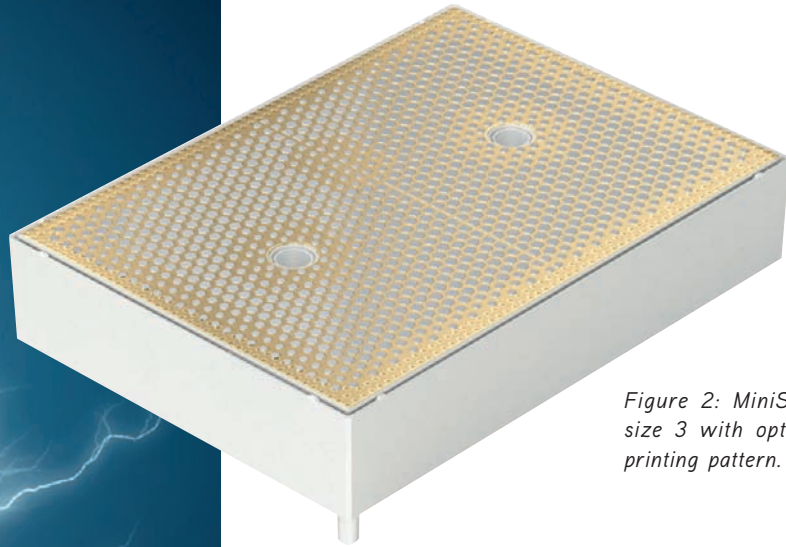


Figure 2: MiniSKiiP housing size 3 with optimised HPTP printing pattern.

different composition layers contribute with single resistance values to the overall thermal resistance of the TIM layer, $R_{th,TIM}$.

Various ranges of TIMs on the market promise a state-of-the-art thermal performance, and the majority of users pay attention to the datasheet value for the thermal conductivity only. But in fact, this value is only relevant for the thermal resistance of the bulk layer $R_{th,bulk}$.

As an example, pads and foils often provide a high thermal conductivity in the vertical direction and the materials are usually stiff compared to pastes, meaning they are not able to sufficiently fill the roughness and bending in micrometre range. So even though the thermal conductivity of TIM materials can be high, and thus the thermal bulk resistance $R_{th,bulk}$ low, the total thermal resistance for the TIM layer will not be optimal due to increased contact resistances $R_{th,contact}$.

Why does one paste perform better than another and surely better than a thermal pad? The answer is in the composition of the TIM with its two main components: the filling material (particles) as the thermally conductive material and the matrix as a carrier material, responsible for the wettability. For the $R_{th,bulk}$ the filling degree is the most important factor, while the thermal conductivity of the single particle has less impact. The filling degree describes the volume of conductive material inside a compound. However, the $R_{th,contact}$ of the contact layers close to the metal surfaces is mainly defined by the particle size and the size distribution of these particles.

Therefore, for an optimum overall thermal resistance $R_{th,TIM}$ the filling degree, particle size, particle size distribution and, with less importance, thermal conductivity of the particles have to be optimised. SEMIKRON has done this with its High Performance Thermal Paste (HPTP).

The correlation of filling degree and overall performance is also visible for the HPTP: the data sheet value for the thermal conductivity is average while the thermal performance when applied to the power module is superior, as discovered through a comprehensive benchmark test SEMIKRON performed.

Beside these factors, the power module and its mounting conditions also have a significant influence on the HPTP performance. An optimisation of the thickness and distribution of the thermal paste therefore has to be achieved for every power module type.

SEMIKRON has been printing TIM on power modules for more than 20 years, with more than 10 million pre-printed power modules in the field. SEMIKRON HPTP is available on several power modules; Figure 2 shows the bottom side of a MiniSKiiP with an optimised printing pattern. Every pre-printed module undergoes a comprehensive qualification program ensuring the long-time stability and performance of the TIM in the application as well as the shelf life before mounting. Along with industrial applications, more challenging requirements are also fulfilled, ie, automotive standards.

The second biggest portion of the overall $R_{th(j-s)}$ is the ceramic material, and here optimisation also makes sense. Alternatives to aluminium oxide (Al_2O_3) direct bonded copper (DBC) substrates used today are widely available. Considering thermal and mechanical parameters silicon nitride (Si_3N_4) AMB (active metal brazing) ceramics represents an ideal candidate, having four times higher thermal conductivity and significantly higher figures for the main mechanical characteristics when compared to Al_2O_3 : eg, the bending strength value is 650 MPa compared to Al_2O_3 's 450 MPa and the fracture toughness is at least 7 $MPa/(m^{-1})$ compared to 4.2 $MPa/(m^{-1})$. The brazing process also guarantees higher durability of the copper/ceramic joint, thus improved durability against thermal cycling.

With new materials used for optimisation, new qualification and testing specifications are also required. The AMB production process of Si_3N_4 substrates requires a brazing metallisation layer, which usually includes silver too.

Silver can migrate under the influence of humidity and an electric field generated by a high DC voltage — both conditions that commonly occur in power modules. This silver migration would result in a visible change of the substrate surface: a dendritic appearance of the migrating silver in the isolation trenches (see Figure 3). The standard test 'High Voltage High Humidity, High Temperature Reverse Bias' (HV-H3TRB) will stimulate this effect.

To confirm that this effect has no negative impact on the product within the lifetime of the application, a newly introduced 'accelerated

THERMAL RESISTANCE

Figure 3: An example of dendrites in the substrate's isolation trenches.

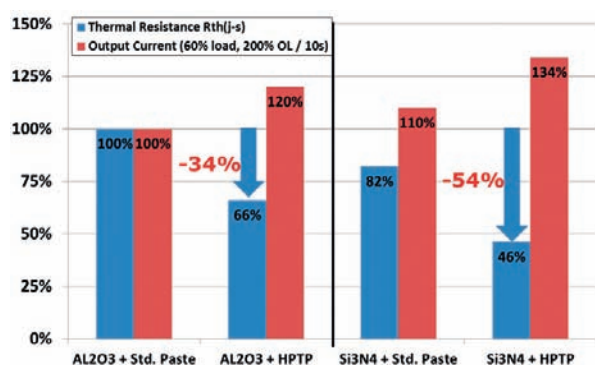
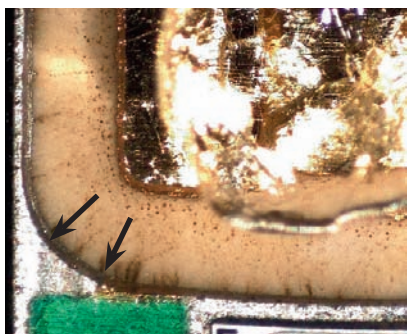


Figure 4: Application benefits of HPTP and Si3N4 substrate in a motor drive application (200% overload/10 s).

lifetime' test has been performed. This test reproduces real working conditions and is used to ensure reliability. The power modules are operated under climatic change, alternating between -15 and 85°C and a relative humidity of 10% and 85% with 10 cycles and 12 hours per cycle. The modules are supplied with 540 VDC bus voltage and switch with 1 kHz of carrier frequency, without failure.

Figure 4 shows the benefits regarding $R_{th(j-s)}$ and output current capability. Based on a MiniSKiiP housing size 3 with six-pack topology, a typical motor drive application has been simulated. Just replacing the standard TIM with HPTP on the existing module using Al_2O_3 substrate, the $R_{th(j-s)}$ is reduced by 34%. Considering a standard motor drive application operating 4 kHz with an overload of 200% for 10 s, the result is a remarkable 20% higher output current at the same junction operation temperatures.

If the Al_2O_3 substrate is additionally replaced with Si_3N_4 using the HPTP, the $R_{th(j-s)}$ is reduced by as much as 54% boosting the output power and therefore power density of the module by 34%.

We can see that the combination of state-of-the-art thermal interface material and substrate technology within the power modules boosts the output performance of a motor drive's application drastically. And all of this without compromising the lifetime of the module.

*Stefan Hopfe is Product Manager Thermal Interface Materials, SEMIKRON Elektronik.

^Stefan Häuser is Senior Manager Product Marketing International, SEMIKRON Elektronik.

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ELECTRONEX 2017

CONNECTING THE ELECTRONICS INDUSTRY

6-7 September 2017 at Melbourne Park Function Centre, Melbourne

Australia's dedicated trade event for the electronics industry returns to Melbourne in September.

Electronex — The Electronics Design and Assembly Expo is being held from 6-7 September at Melbourne Park Function Centre. With over 90 exhibitors and a technical conference, plus free seminars featuring leading international and local industry experts, this is a must-see event for decision-makers and engineers designing or working with electronics. Attendees can pre-register for free at www.electronex.com.au.

Electronex was launched in 2010 to provide professionals across an array of industry sectors with the opportunity to learn about the latest technology developments for systems integration, design and production electronics. Last year's event in Sydney attracted over 1200 electronics design professionals, including electronic and electrical engineers, technicians and management, along with OEM, scientific, IT and communications professionals, defence, government and service technicians.

This year's event continues to reflect the move towards niche and specialised manufacturing applications in the electronics sector and will also cater for the increasing demand from visitors for contract manufacturing solutions. There will be around 20 new companies at the event, which reinforces the continued demand from local manufacturers and for specialist applications that recognise the expertise and quality that is available from Australian-based suppliers.

The SMCBA Electronics Design & Manufacture Conference, founded in 1988, 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. A series of free seminars with overviews on key industry topics will also be held on the show floor throughout the two-day event and the program can be viewed on the show website.

This year's conference program comprises six main workshops, to be conducted by internationally renowned speakers Vern Solberg and Phil Zarrow, and a series of training and certification courses. The conference offers engineers, designers, technicians and managers the opportunity to hear from international experts and includes the following topics:

- Best Practices for Improving Manufacturing Productivity (Phil Zarrow)
- Flexible and Rigid Flex Circuits — Design, Assembly and Quality Assessment (Vern Solberg)
- The 'Deadly Sins' of SMT Assembly (Phil Zarrow)
- Embedding Passive and Active Components: PCB Design and Assembly Process Fundamentals (Vern Solberg)
- Implementing Advanced 'Leading Edge' and 'Bleeding Edge' SMT Component Technology (Phil Zarrow)
- Design and Assembly Process Implementation for Flip-Chip, Wafer Level and 3D Semiconductor Package Technologies (Vern Solberg)

People involved in electronics manufacturing can enrol to be trained and certified in a range of IPC programs by SMCBA Master IPC Trainers Ken Galvin and Mike Ross: ESD Control for Electronics Assembly; Handling Moisture Sensitive Devices; Foreign Object Debris (FOD) Prevention in Electronics Assembly; and Stockroom Materials — Storage and Distribution.

Full conference details can be seen at www.smcba.asn.au/conference or contact Andrew Pollock at the SMCBA on (03) 9571 2200.

Australasian Exhibitions and Events Pty Ltd
www.electronex.com.au

STAND A12 TRIPLE-OUTPUT PROGRAMMABLE DC POWER SUPPLIES

Keysight Technologies has announced the E36300 Series triple-output programmable DC power supplies. The 80 and 160 W devices feature good performance, a large colour display, an intuitive user interface and modern device connections via LAN (LXI, USB and optional GPIB).

The series' low 'normal mode' noise specifications assure quality power for precision circuitry applications. In addition, the power supplies are acoustically quiet. Each model provides line/load regulation of 0.01%, fast transient response time of less than 50 μ s, low-range current measurement and overvoltage, overcurrent and overtemperature protection to prevent damage to the device under test.



Other features include the simultaneous display of all three colour-coded channels on a 4.3" colour LCD screen; output stability under extreme dynamic load conditions; and data logging plus output sequencing and coupling.

Keysight's BenchVue software supports the series, enabling control of power supplies to set parameters and status alerts, visualise power output, and log changing voltage and current over time. The included test flow capabilities let users quickly automate power-supply set-ups and measurements into test sequences.

Keysight Technologies Australia Pty Ltd
www.keysight.com

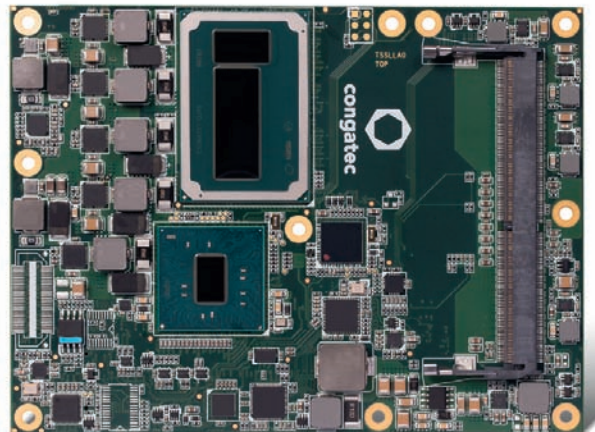
STAND A1 COMPUTER-ON-MODULE

The congatec conga-TS175 computer-on-module is equipped with the high-end dual chip versions of the Intel Xeon and Gen 7 Intel Core processors. It is suitable for module-based, high-end embedded computers and modular industrial workstations that need to process massive workloads.

Application areas for the high-end COM Express Type 6 server-on-modules can be found everywhere where data-intensive streams need to be processed and displayed in real time. Target markets include big data processing embedded clouds, edge and fog servers, medical imaging systems, video surveillance and vision-based quality control, simulation equipment, host systems for virtualised control technology, vision systems in industrial control rooms and other plant-wide supervision systems or high-end professional gaming and digital signage.

The modules feature Intel HD630 graphics supporting up to three independent displays with up to 4k at 60 Hz via DisplayPort 1.4 and HDMI 2.0, both with HDCP 2.2, and eDP 1.4 support. Additionally, the modules also offer dual-channel LVDS and VGA for legacy displays.

Congatec Australia Pty Ltd
www.congatec.com



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STAND A23 MULTIFUNCTION CALIBRATOR

Fluke Calibration's 5730A multifunction electrical calibrator can be used to calibrate a wide range of digital multimeters, up to long-scale 8.5-digit DMMs, as well as RF voltmeters when equipped with the wideband option.

The product is said to feature improved specifications that will help users increase test uncertainty ratios (TURs) and increase test confidence. The improved specifications will also reduce the need to guardband, giving users confidence and peace of mind in their calibrations.

Emona Instruments Pty Ltd
www.emona.com.au

STAND C5 LOW-PROFILE MODULAR POWER SYSTEM

The Keysight N6702A modular power system is useful when it comes to automatic test equipment (ATE) systems in research and development, design validation and manufacturing. Available for rent from TechRentals, the portable power supply unit is an important component of every test system within industries including aerospace, defence, consumer electronics, computers, communications, semiconductor and automotive electronics.

Most ATE systems are complex and require multiple power sources. The N6702A comes with built-in measurement of voltage and current to simplify the design of an ATE system. The 4-slot modular power system will accept one to four N6700 series DC power modules in any combination, allowing users to mix and match power and performance levels.

The product is a 1200 W, 1 U-high, multiple-output programmable DC power supply system. It enables test system integrators to optimise performance and power. Users can select from over 20 different DC power modules, ranging from 20–300 W and with basic to high-precision capabilities. The instrument offers fast command processing time, LXI Class C compliance and GPIB, LAN and USB interfaces standard.

TechRentals
www.techrentals.com.au



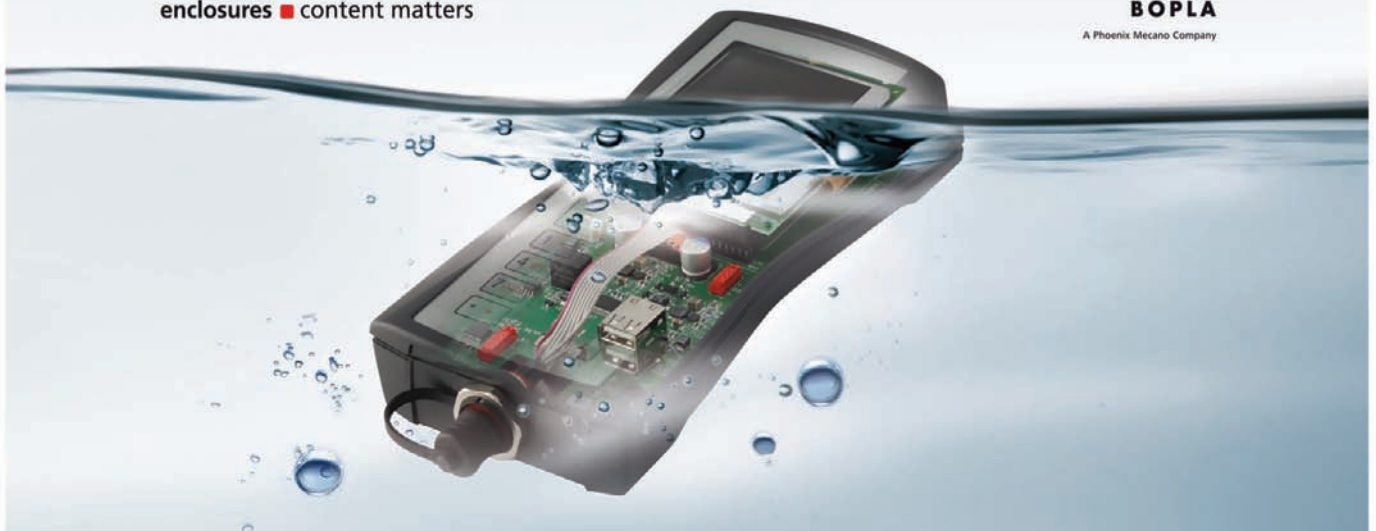
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STAND B6 ENGINEERED ENCLOSURE SOLUTIONS

ERNTEC offers both standard enclosures and engineered solutions for user applications. The company can modify an existing enclosure; design and manufacture a metal housing from scratch; and tool a bespoke metal or plastic enclosure.

The solutions resolve issues surrounding ease of installation/usage as well as environmental requirements. ERNTEC has experience with designs to suit many environments, including earthing, EMI/RFI, IP rating, thermal dissipation, shock and vibration, and corrosion protection.

The company understands that finish and appearance are important, and so starts with a clear understanding of the requirement and workmanship needed to control finish quality. ERNTEC has in-house paint facilities and a full-colour digital printer suitable for durable labelling on metal and plastic.

Assistance with IP, AS, Mil-Spec, safety, labelling and documentation is provided, ensuring the enclosures adhere to the standards. The company can also advise and assist with special packaging for safe transit, with examples including re-usable cardboard boxes, pallets and crates, and impact-resistant solutions.

ERNTEC Pty Ltd
www.erntec.net



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STAND B40 ELECTRONICS CONTRACT MANUFACTURING SERVICE

LEACH provides turnkey electronics contract manufacturing services including R&D, supply chain management, SMT and TH assembly, manual and AOI testing, IC programming, function test, cable or mechanical assembly, transport and logistic services.

The company's manufacturing plant is equipped with fully automatic printing machines, automatic high-speed SMT machines, full automatic multifunction mounters, reflow soldering ovens, automatic preheat and other processing equipment for electronic products.

LEACH strictly complies with international standards for the production of products in line with RoHS standards. In quality control, the company is ISO9001:2008 and ISO13485 accredited.

With 18 years of know-how in electronics turnkey manufacturing, LEACH assists its customers in solving potential problems at stages from design, to components purchasing, to manufacturing and finally logistics. The company is particularly experienced in EMS for complex circuit boards used in industrial control, telecommunication, energy, medical instruments and so on.

LEACH (SZ) Co., Ltd
www.leach-pcba.com

STAND C38 LPG ELECTRONICS MANUFACTURING

Peel Instruments (trading name Gas Sensors Australia) is an Australian designer of specialised electronics for the LPG automotive industry. Utilising a high-quality surface-mount machine to manufacture its products, the company designs and engineers its products locally.

The company can provide technical assistance in the development, engineering and design phase; assist with prototyping for development of the engineer's schematics; provide technical assistance in gas sensor technology and specific sensors required according to target gas; and assist in the design phase for PCBs from the engineer's schematic.

The company also offers consultancy and training in areas of the project with regards to PCB circuit design (Gerber files etc), PCB layout, component suitability ratings and circuit ratings.

Peel Instruments
www.peelinstruments.com.au

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STAND B14 POWER SUPPLY

Mornsun has announced its HO1 series power supply, offering high-voltage output to address applications of portable devices with ultrasonic technology as well as electrostatic printing, high voltage bias, industrial control, the medical chemical industry, scientific experiments etc.

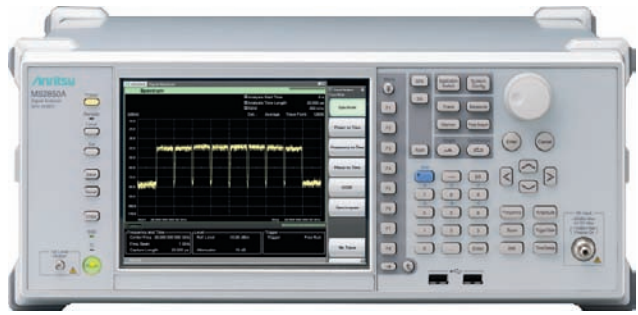
The series offers 12 V fixed input voltage, 0–600 V continuous output with linear adjustable function, an operating temperature from -40 to +85°C and output short circuit and overcurrent protections. Applications include but are not limited to ultrasonoscopes, photomultiplier tubes (PMTs), avalanche photodiodes, solid-state detectors, EO lens, piezo devices and capacitor charging fields.

Adjustable output voltages of 200–1200 V (0–200, 0–600, 0–800, 0–1000 and 0–1200 V are optional) are available, depending on different requirements.

Mornsun products are distributed in ANZ by DLPC and in Victoria by Fairmont Marketing.

DLPC Pty Ltd

www.dlpc.com.au



STAND B1 HIGH-PERFORMANCE SIGNAL ANALYSER FOR 5G AND WIDEBAND SIGNAL MEASUREMENT

Anritsu has announced the release of its high-performance Spectrum Analyzer/Signal Analyzer MS2850A targeting development and commercial production of 5G mobile communications systems.

The product is said to be the first mid-range signal analyser to offer 1 GHz analysis bandwidth and supports the evaluation of 5G multicarrier signals. Installing the 5G measurement software packages leverages the device's high dynamic range and good flatness performance to cut measurement times using all-at-once measurements of a typical 800 MHz modulation bandwidth to be used in 5G (eg, eight 100 MHz bandwidth carriers).

The signal analyser supports transmitter performance tests for wireless communications equipment during development and manufacturing; the 32 and 44.5 GHz measurement frequency models have an analysis bandwidth of 255 MHz, which can be extended as an option up to 1 GHz. Noise figure (NF) and phase noise measurement functions can also be installed in both models.

The 5G measurement software packages support measurement of 5G uplink and downlink signal frequency error, power, EVM, etc using CP-OFDM modulation. Additionally, downlink measurements evaluate multicarriers all at once.

The product supports all previous cellular technologies, such as LTE, W-CDMA, TD-SCDMA and GSM. It also offers futureproof support for the 5G NR standards now being defined by 3GPP.

Anritsu Pty Ltd

www.anritsu.com



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STAND A4 FLEXIBLE CABLE

Sometimes a right-angle connector is too large or does not have the required performance. To bend the coax-cable is normally not an option. The Storm Flex flexible cable provides a solution.

The product has an ultrahigh-strength, multilayer outer braid that protects the inner core. If users bend direct behind the connector they will not see any change in the return loss or an increase in the insert loss.

The standard version of the product is available up to 50 GHz with 2.4 mm SMA, GPO, GGPO and N connectors. The temperature range is -55 to 125°C.

Delta Gamma Consultant
www.delta-gamma.com



STAND B10 VECTOR SIGNAL TRANSCIVER

NI's second-generation PXIe-5840 vector signal transceiver features the flexibility of software-defined radio architecture and RF instrument class performance.

With the combination of an RF signal generator, RF signal analyser and user-programmable FPGA, all in a single 2-slot PXI Express module, the product is an innovative RF test, measurement and prototyping solution. The product's small size and tight synchronisation allow for up to 8x8 multiple input, multiple output (MIMO) configuration in a single 18-slot chassis.

It offers 1 GHz of instantaneous bandwidth for digital predistortion (DPD) test and wideband signals such as radar, LTE-Advanced Pro and 5G. Systems can measure 802.11ac with an error vector magnitude (EVM) performance of -50 dB. Measurement speeds are up to 10x faster than traditional instrumentation using FPGA-based measurement acceleration and highly optimised measurement software.

National Instruments Australia Pty Ltd
www.ni.com



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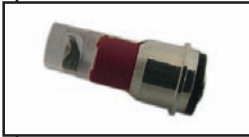
MAKING LIGHT WORK FOR YOU

122 SERIES



- Diffused LED
- Standard Intensity LED
- Suitable for auto insertion
- Range of LED colour and voltage options
- Conforms to UL94 V-0 Flammability Rating
- Reverse polarity option

202 SERIES



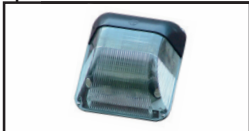
- Direct replacement for French Style T1 Midget Flange SX3s
- Water clear lens
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- Centre contact Anode as standard
- Reverse polarity options available
- Pack Quantity = 20 Pieces

528 SERIES



- Ø13.0mm mounting
- Stainless steel housing
- Sealed to IP67 – weatherproof
- Coloured diffused lens
- Internal potting
- Reverse protection diode fitted in all voltage models
- Range of LED colour options
- Range of voltage options
- Pack Quantity = 10 Pieces

742 SERIES



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ElectroneX 2017



STAND B30 ENTRY-LEVEL OSCILLOSCOPE

Oscilloscopes are a key tool used by engineers, technicians, hobbyists and students to troubleshoot and test electronics since these instruments enable them to observe and measure electronic signals. Rohde & Schwarz's R&S RTB2000 entry-level oscilloscope is suitable for education, R&D and manufacturing.

The oscilloscope offers touchscreen operation as well as 10-bit vertical resolution. 10-bit ADC, 10 Msample memory and a 10.1" touch screen combined with smart operating concepts make the digital oscilloscope suitable for university and laboratories, for troubleshooting embedded designs during development and for production and service departments.

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

STAND A27 PRESS-FIT STANDARD MODULE

Employing solder-free mounting technology, the 17 mm-high SEMiX product

family is designed to maximise the efficiency of users' mounting processes. The SEMiX 6 features the connection of all the terminals in a single production step, featuring state-of-the-art press-fit pin technology for the power and auxiliary terminals.

The product is available as a rectifier module for up to 2200 V, offering good power density and environmental robustness. With junction temperatures of up to 175°C, the technology delivers high performance and minimal power losses. This makes it suitable for achieving compact inverter systems on a single PCB basis.

The package features a robust baseplate solution combined with a full press-fit concept for all the electric terminals, creating a platform for all-in-one PCB inverter solutions. The package is suitable for a broad range of applications, including AC inverter drives, UPS systems and renewable energy systems.

Semikron Pty Ltd
www.semikron.com.au



PANEL APPEAL

LIGHTING THE WAY TO GOOD DESIGN

©Freelimages.com/Tristan Benninghofen

The design of professional and consumer electronics front panel indicator lights is a key part of the user experience of the equipment. It's the first thing users see when they switch on, and the reliability, accuracy and helpfulness of the messages these indicators convey will have a big impact on the way users interact with the system. Michael Finn* and Adrian Rawlinson^ review the most recent developments in the technologies for bringing light to the front panel.

Where front panel status indicators are concerned, designers have available numerous options: LED, neon, incandescent or halogen. Another approach is to use light pipes, which can deliver light reliably to front panels over long distances, when conditions preclude the fitting of indicators directly to the front panel — corrosive or flammable atmospheres, or where restrictions apply with regard to static discharge or EMI, are examples.

LED panel indicators are becoming increasingly popular because they have the advantages of long life span, low energy consumption, minimal heat generation and superior reliability. They are also more durable and shock resistant, and have faster turn on/off speed than other types of illumination. Although specific design considerations may vary, typically, a standard LED panel mount indicator contains an LED light source, housing and wire leads. The connectors and mounting hardware are often added as an option to enhance the design and ease installation — and there are lots of options to choose from.

In addition to the popular green, red, amber, yellow, orange, blue or white single-colour LEDs, bicolour indicators are available. Red and green are most commonly used, and by lighting up both LED chips, it creates yellow or orange-yellow as a third mixing colour.

What lens option you choose will be central to the visual performance of the LED. LED lenses are typically available as 'clear', 'tinted' and 'diffused', with sizes ranging from 3 up to 25 mm. Viewing angles will vary from 10 to 130°, depending on application requirements. A wide viewing angle means that the indication is more likely to be visible wherever the operator is standing, but narrower viewing angles will ensure a brighter indication.

Different LED housings are designed to match the panel profile or give a better aesthetic appearance. Again, there are quite a few indicator housing materials to choose from, including a variety of plastics (nylon, polycarbonate, etc) and metals (stainless steel, copper, anodised aluminium, etc), all of which can be IP67 protected, depending on the environmental conditions.

If the front panel is adjacent to the PCB, the panel indicator can be soldered directly to it, but if this is not the case, a wire lead will be needed to power the LED. The most common wire leads used are UL approved wires of gauges 16, 24 and 26 AWG.

The mounting methods are either push-through type or secured via a lock washer and nut. The nut is attached from the rear of the panel to secure the indicator — an arrangement typically used when the panel is subject to vibration. Connector options are either factory standard or customer specific and are generally designed to make installation convenient and easy.

Flexible light pipes

Flexible light pipes deliver light remotely from a PCB to the panel user interface via an optical core. Transmission distances can be as much as 100 m with minimum attenuation, as opposed to copper wire-based connections, which would introduce considerable resistance over this distance.

Since the optical media is non-conductive, the PCB-located LEDs are fully protected against induced currents and any EMI effects associated with lengthy PCB-to-panel wiring. Moreover, this arrangement is a safer alternative to panel-located LEDs where flammable vapours and gases may be present in the vicinity of the panel.

A flexible light pipe assembly typically contains a lens cap, an optical core and an adapter for the core attachment. The adapters are located on the PCB directly over the LED, and their styles vary depending on requirements for right angle, vertical mounting and so on.

The lens cap can be inserted from the front or rear of the panel and attached directly to the adapter to complete the set-up. There

is a lot to choose from in terms of lens size and style, but an IP67 rated housing, made either of polycarbonate or metal, provides a more robust format that is dustproof and watertight, and therefore better suited to harsh industrial environments.

As to the optical core, the typical sizes are 2 mm (1 mm core) and 3 mm (2 mm core). Special 2 mm (1.5 mm core) and 3 mm extra flex (2 mm core) materials are available from Bivar for users who need increased brightness over regular 1 mm core and an easier bending characteristic than the 3 mm. The optical core can be trimmed to any length with no precise core cutting technique needed, and is easily routed via multiple bends if necessary.

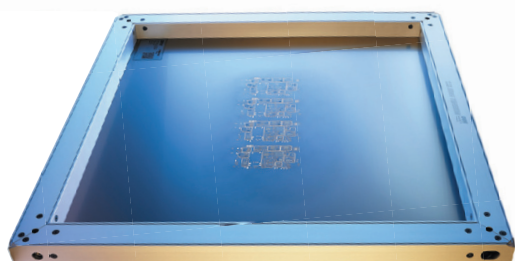
The product types and installation systems described above are all available from manufacturers Bivar and Marl, two companies that have formed an international optoelectronics partnership operating across three continents.

The companies can provide semicustomised configurations on a short lead time based on components from their large combined standard product offering. The LEDs supplied by the partnership operate from 8–48 V AC/DC supplies, thus avoiding the need for AC-to-DC power conversion and removing polarity reversal concerns.

**Michael Finn is Vice President of Sales and Marketing at Bivar.*

^Adrian Rawlinson is Managing Director of Marl International.

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STAND B11 ENCLOSURES FOR INDUSTRY 4.0

ROLEC has incorporated the requirements of the Internet of Things (IoT) and Industry 4.0 into its current range of enclosures.

Because many controls are used in outdoor applications and are exposed to a wide variety of weather conditions (moisture, heat, cold, wind, etc), the highest possible ingress protection is crucial. The aluCASE enclosure corresponds to the protection class IP69K depending on the design. The covers do not have to be opened by the user when mounting on the wall or on machinery. This makes external mounting feet unnecessary — the design forms a compact unit.

Another example is aluPLUS: here the enclosure can even be replaced in the rain because of the high ingress protection provided by the sealing system of the enclosure that does not have to be opened when mounting.

An alternative to the cube-shaped enclosures is the aluDISC variant with its cylindrical design, which corresponds to protection class IP66 or IP67 (according to EN 60529). Its cast aluminium body is robust and is produced in light grey; special colours are also available.

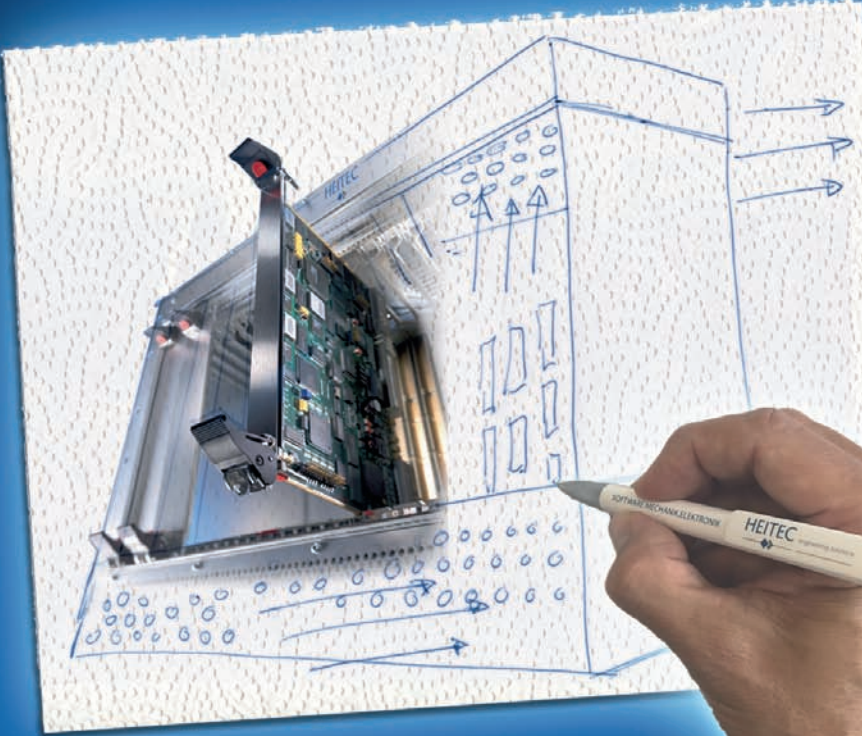
Mobility is another typical challenge of the modern industrial age. One solution is the mobilCASE enclosure, which is variable in length due to its aluminium profile construction. Robust end caps made of die-cast aluminium protect the enclosure and its built-in components in mobile field applications.

The company also offers a wide range of plastic enclosures, allowing for the supply of tailor-made products for any desired use and size. An example of this is the starCASE enclosure, in which functionality and aesthetics form a convincing coherence. The lid holders also function as hinges, while stylish design covers cover the fixing screws. Mounting channels allow the enclosure to be mounted with closed covers, without the need for external fastening feet.

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STAND B26 ARBITRARY WAVEFORM GENERATOR

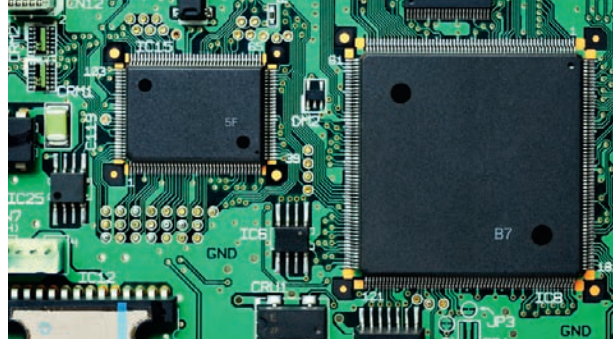
Tektronix's AWG5200 Arbitrary Waveform Generator (AWG) offers high signal fidelity and scalability to meet demanding signal generation needs in advanced research, electronic test, and radar and electronic warfare (EW) system design and test.

It offers an impressive set of capabilities all in one instrument, including a 10 GS/s sample rate, 16-bit resolution and up to eight channels per unit along with support for multiple unit synchronisation. It includes a flexible waveform generation plug-in suite with comprehensive coverage for a wide variety of standards and digital modulation techniques. It is suitable for complex multisignal environments.

At the heart of the instruments are high-performance digital-analog converters (DACs) that offer a mix of speed and resolution within a fully integrated product package. With its powerful DAC cores, the AWG can directly generate highly detailed RF/EW signals or the complex pulse trains used in advanced research.

**Vicom Australia
Pty Ltd**

www.vicom.com.au



STAND A15 PCB ASSEMBLY SERVICE

QualiEco Circuits has launched a 24 h turnaround service for PCB assembly using its in-house facility. Overnight delivery to all major cities of Australia is now possible once PCB, components and stencil are ready for assembly. The company is already offering express turnaround for PCB manufacturing from its offshore plant.

Circuits provides good-quality electronic manufacturing services and solutions for rigid PCBs (up to 32 layers), flexible PCBs (single- and multilayer), rigid-flexible PCBs (single- and multilayer) and metal core PCBs (single- and multilayer). The company offers express services in all product categories, with various customised delivery solutions for all customers. Users can choose from fast to semifast and normal delivery options based on their budget and urgency. The company also offers technical support and high attention to detail.

QualiEco Circuits Pty Ltd

www.qualiecocircuits.com.au

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Stand B15
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STAND C9 RF POWER AMPLIFIERS

Tomco Technologies specialises in the manufacture and design of RF amplifiers and associated RF hardware. Tomco RF power amplifiers are all solid-state products covering frequencies from 10 kHz to 1.3 GHz, at power levels from 50 to 500 kW. The company's product range includes economical benchtop RF power modules, broad and narrowband solutions and heavy-duty models for industrial users.

The company has delivered its amplifier systems to users all over the world in a range of technically demanding applications. Key markets include nuclear magnetic resonance (NMR), radar, ultrasonics, particle accelerators, plasma systems, HF/VHF communications, and test and measurement.

The company's amplifiers feature rugged technology and its design team can offer customised solutions built to users' specifications. Options include a range of communication protocols (including USB and Ethernet) and LCD power meters, all designed to meet the needs of the end user.

Tomco Technologies Pty Ltd

www.tomco.com.au



STAND C4 LOW-PRESSURE INJECTION MOULDING MACHINE

The Beta 300 2T benchtop moulding machine builds on the standard Beta 300 machine by increasing the clamping force from 1.2 to 2 t. This allows for the moulding of larger parts on a compact benchtop machine.

The machine processes the Technomelt range of materials to encapsulate and overmould various electronics, protecting them from environmental factors such as moisture, dust and vibration. This technology is used within the electronics industry to protect PCBAs, mould cables and connectors by bridging the gap between traditional potting and standard injection moulding.

The product has touch-screen operation, two temperature heating zones, safety light curtains, dual-hand operation, in-built ejection and a melt-on-demand tank for efficient material processing.

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STAND A24 HD DIGITAL MICROSCOPE

The EVO Cam is a high-performance digital system with full-HD (1080p/60 fps) live video imaging used predominantly for quality control, testing, inspection and documentation. The scope simplifies precision magnification tasks, allowing users to focus on the details as well as effortlessly capturing images direct to USB memory stick.

Users can capture full-HD images without the need of a PC. Live imaging is captured at the touch of a button, allowing for high levels of detail. The product features 30:1 optical zoom with magnification up to 300x.

The optical performance makes the product a powerful imaging solution with a range of objective lens options to ensure good results for any application. Simplicity minimises training requirements, making the product a flexible tool for multiple users or for use in production environments.

The microscope makes it simple to view whole samples or the smallest detail at the touch of a button. The optional 360° rotating viewer provides an angled all-round view of the subject. High-quality stand options have been built for precision and stability.

Hawker Richardson

www.hawker-richardson.com.au

STAND C7 3D PRINTERS

Robo 3D's 3D printers were developed in conjunction with Outerspace Design as printers that are fun and easy to use. The product format uses a monocoque construction to keep the size and weight down so the user can move the printer between home, school and office while still providing a large print volume.

Designed for a plug-and-print user experience, it only takes a few minutes to set up out of the box. The full-colour display screen and Wi-Fi enabled iPhone app make it simple to monitor and operate the printer, while a wide variety of compatible filament materials provides a high level of design freedom.

Both printers offer high-speed, high-resolution 3D printing from a self-levelling platform for trouble-free results. The R2 also features a built-in onboard camera and optional extra head module for dual extrusion.

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STAND A30 POLE MOUNTING KITS

Sealed enclosures are designed for indoor or outdoor installation, and they will normally have holes positioned outside the sealed area to enable the enclosure to be attached directly to flat surfaces without compromising the environmental protection. In response to the need for small electronic monitoring and control systems to be installed in an increasingly wide variety of locations, Hammond Electronics has introduced an initial five sizes of its Pole Mounting Kit, which enable three sealed enclosure families to be attached to round, square or rectangular poles with diameters from 38 to 381 mm. The corrosion-resistant stainless steel kits are said to reduce installation time and secure the enclosure against twisting once installed.

The initial range of kits is sized to fit the 1554/1555 IP67 ABS and polycarbonate range, the 1590Z IP66 heavy duty die-cast aluminium family and the 1590ZGRP IP65 glass-reinforced polyester range. The kits enable a total of 93 different sizes and styles across the three families to be pole mounted. Each kit consists of two brackets, two clamps and mounting hardware, all in stainless steel.

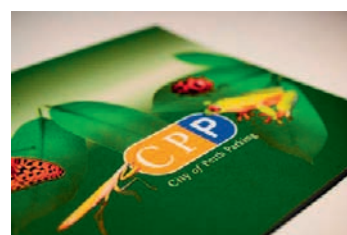
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STAND C40 HYBRID DECALS

Hundreds of colours, individualised information, varied shapes, barcoding and Q-coding are all possible for graphics and membrane switch solutions with Sun Industries. Traditional limitations on industrial printing are not relevant due to the company's investment in technology and R&D.

By incorporating digital processes into its graphics manufacturing, the company is able to offer full customisation of users' decals with durability characteristics. Turnaround times are fast and run work is short.

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STAND B2 PCB MOUNT CIRCULAR CONNECTORS

VGL – Allied Connectors has introduced custom-designed miniature circular connectors that incorporate

a range of insert profiles to accommodate PCB tails.

The connectors offer a flexible design with PCB tails manufactured at custom lengths. This makes them suitable for applications requiring PCB boards to be mounted directly onto a ruggedised connector, offering a compact and high-density solution.

The connectors are manufactured to MIL-DTL-26482, MIL-DTL-5015 and MIL-DTL-D38999 specifications with jam-nut and square flange shell styles. The shell material is offered in aluminium, stainless steel and nickel-aluminium bronze, in addition to conductive and non-conductive plating finishes with ROHS compliance.

Connector insert configurations are available from 2 to 128 pins with 16, 20 and 22D gauge contacts. For square flange connector shell styles, hermetic glass to metal sealing is available in 27 insert layouts.

VGL Allied Connectors
www.alliedconnectors.com

STAND B34 DIGITAL MICROSCOPES

Ash Technologies designs and delivers digital vision and measurement solutions, designed and executed with beauty and simplicity. The company's products have been designed to aid with inspection and rework tasks undertaken by electronic technicians, each providing over 200 mm of focal length/working range.

The Omni Digital Microscope delivers full HD live video image quality at 60 fps. It offers a powerful suite of measurement features, including full image capture, with no need for an additional PC.

The Inspec HD 1080p Digital Microscope offers detailed inspection with a dynamic range of magnification levels and integrated LED illumination. Its versatile design makes it compatible with a wide range of mounting options. There is no need for an additional PC.

The Ion 4.3" Handheld Digital Microscope is comfortable to hold and highly intuitive to use, as the product has been designed to replicate the look and feel of an optical magnifier. Its portability makes it suitable for field work and, combined with measurement grids and image capture, enhances the capability and efficiency of decision-making for inspection operators and technicians.

Oritech Pty Ltd
www.oritech.com.au



STAND B16 MANUFACTURING SERVICES

The Bright Group (TBG), headquartered in Sydney, is a multinational group servicing the needs of global original equipment manufacturers (OEMs) with design, manufacturing, assembly and component distribution.

TBG's various divisions offer clients value-add services, with an emphasis on developing beneficial partnerships rather than client/supplier relationships. The company is well placed to serve the OEM industry's needs from early engineering involvement to finished design for manufacture.

Its capabilities include: engineering support/project management; wiring harnesses; plastics/MDF CNC; sheet metal fabrication; graphic/artwork in-house printing; R&D and engineering; and full turn-key cabinet builds across industries including gaming, traffic control, medical and energy storage.

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STAND B18 SOLDERING STATION

Metcal soldering stations feature SmartHeat technology, which senses thermal load and instantly delivers power on demand directly to the joint. The embedded, self-regulating heater delivers the right amount of power based on the requirements of the solder joint. This provides a fast, safe and repeatable process with no calibration required.

The intermetallic compound thickness is critical in the formation of a solder joint. Metcal's Connection Validation (CV) evaluates the quality of the solder joint by calculating the intermetallic compound formation and provides closed loop feedback to the operator. This feedback is provided via the LED light ring integrated in the handpiece. It takes the risk associated with the variables involved in the soldering activity and removes the success and failure determination of a good solder joint out of the hands of the operator.

CV complements the skill of the operator to judge the quality of a solder joint by introducing an objective method of evaluating solder joint quality. This systemic and objective approach provides repeatability and a measureable standard to the soldering process.

Mektronics Co Pty Ltd
www.mektronics.com.au



STAND A26 POWER SUPPLIES

WAGO's EPSITRON ECO Power series offer a series of DIN-rail-mount power supplies for standard 24 VDC applications. The integration of push-in CAGE CLAMP and lever-actuated termination technology makes the ECO models not only fast for installation but also maintenance-free and tool-free.

The connection terminal allows the termination larger conductor cross-sections — even those with ferrules. In addition, the power supplies have a three-phase input ranging from 400 to 480 VAC and supply 24 VDC at the output at 20 A (787-2742) and 40 A (787-2744), with an adjustable output voltage up to 28 VDC. A DC OK contact is also available for output monitoring.

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Hetech

www.hetech.com.au



STAND C17 RASPBERRY Pi ACCESSORIES

Pi Desktop is a set of Pi accessories which can convert Raspberry Pi 1/2/3 to a real computer.

The accessories include a cap board and an attractive box. The user can plug the cap board into the 40-pin I/O connector of Pi, install a high-capacity solid-state drive (SSD) on the cap board and put Pi and cap board into a box. The Raspberry Pi then becomes a real computer that has all of features of a PC, such as Ethernet, Wi-Fi, Bluetooth, a hard disk and a real-time clock. Users can link the Pi Desktop to a display through the HDMI interface.

The product features an intelligent and safe power controller. Users don't have to remove the power adapter from Pi board; they just simply push a button to turn the power on or off like a desktop or laptop.

SSD expansion allows users to install an mSATA SSD (up to 1 TB) onto the Raspberry Pi, while the RTC will provide an independent time for any application on the Pi. The heat sink will cool down the CPU of the Pi and the enclosure will both protect Pi Board and convert a PCBA into a real electronics product.

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HEAT-RESISTANT TRANSDUCERS DEVELOPED

Researchers at the Fraunhofer Institute for Silicate Research ISC have successfully realised piezo sensors for high-temperature applications. Unlike conventional sensors, the transducers can continuously monitor components that are as hot as 900°C.

If a component such as a steam pipe in a coal-fired power station has a crack, corrosion or other flaw, repairing it is imperative. Ultrasonic sensors mounted externally can detect flaws like these, but only when the component does not heat up to more than around 200°C. Above that temperature, conventional piezoelectric materials can no longer determine pressure, force, voltage or acceleration or act as a gas sensor. Furthermore, at these temperatures any plastic encapsulations that are not heat resistant will fail.

The challenge for the Fraunhofer researchers lay in constructing standard piezoelectric crystals that can withstand long-term use as sound transducers on hot components. Especially problematic is the adhesive that coats the sensors and attaches them to the component: it can't withstand very high temperatures.

"That's why we use glass solder as both a glue and a housing material," said Dr Bernhard Brunner, head of the Application Technology department at Fraunhofer ISC's Center Smart Materials. This means the glass belonging to this group of adhesives must withstand not only heat, but also the several hundred degrees difference between the ambient temperature in the room and the operating temperature of the component.

While the steel in the component expands significantly when it is heated, the dimensions of the crystal change only marginally. The glass solder in which the sensor is embedded has to endure these

deformations without shattering. To this end, the researchers coat the sensor with multiple layers consisting of different glass solders that are perfectly compatible with each other as well as with the component's material specifications. To ensure that the electric signalling lines do not corrode in high temperatures, the feed lines are made of precious metals such as platinum.

The resulting transducers work the same as other piezo sensors. First they are mounted externally on the component, eg, a hot steel pipe. When an alternating voltage is applied to the piezoelectric crystal, it mechanically deforms and sends an ultrasonic wave into the material. After the sound wave, the sensor switches to receive and detects the signal reflected by the component.

In most cases, the sensor receives the same original signal it sent. However, if the component is cracked or has a corroded spot, the defect alters the reflected signal and indicates the defect's location. When several transducers are used that serve as transmitter and receiver, the location of the flaw can be pinpointed exactly to within a few millimetres. Depending on the component's material, the sensor's range covers a few metres.

The ultrasonic sensors have already been implemented at temperatures of up to 600°C. Additionally, the sensors remain stable over long periods — at least two years in any use case — and for many applications, researchers expect a service life of several decades.



PANEL INDICATOR LED

Mar's 651 Series is a 12.7 mm mounting panel indicator LED featuring a black anodised aluminium housing and colour diffused lens with a wide viewing angle.

Sealed to IP67, with an internal reverse protection diode fitted in all voltage models, the series is a durable panel lamp suitable for high-vibration applications. It is available in a range of voltage and colour options.

Aerospace & Defence Products

www.aerospacedefenceproducts.com.au

SWITCHED-MODE POWER SUPPLY

RECOM's RAC150-G series is a switched-mode power supply (SMPS) with high power density designed for applications operating with limited airflow. Under natural convection, the SMPS provides 125 W at +50°C from a compact 4" x 2" open-frame package and even up to 122 W in an aluminium case; under forced air cooling, a constant output of up to 150 W is achieved.

Ensuring the SMPS's long service life at such a high power density requires overcoming a number of design challenges, such as placing the SMD semiconductors on the board in such a way as to dissipate excess heat through copper surfaces acting as heat sinks on the board and through an aluminium base plate via heat-conducting pads.

The power supplies operate at input voltages between 90 and 264 VAC at temperature ranging from -30 to +70°C. Modules with 12, 24 and 48 V outputs come with short-circuit and overvoltage protection, as well as efficiency of 91%. The SMPS modules are IEC/EN/UL 60950-1 and IEC/EN/UL62368-1 certified, and comply with the RoHS directive and EN55022/24 Class B for electromagnetic compatibility.

The modules come with a three-year warranty.

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PLASTIC CIRCUIT BOARD HARDWARE

Hi-Q Components stocks a large range of nylon 6/6 components commonly used in circuit board manufacturing. Nylon 6/6 is suitable for circuit board applications due to its chemical resistance, electrical insulation and high tensile strength.

The company's range of nylon 6/6 spaces, commonly used for securing printed circuit boards, is versatile and stocked in a large choice of sizes. Self-retaining, threaded and standard clearance are amongst the range, in sizes ranging from 2 to 23 mm ID in a wide choice of different lengths.

A common choice for circuit board applications is threaded spacers. Available with metric and imperial threads, they are a versatile option and are easy to remove. They are a ridged quick way of securing PCBs.

Also of interest is the company's range of PCB supports, stocked in a large range of sizes with a variety of different mounting options including screw-mount, slide-mount, rivet-mount, adhesive-mount and double-end types.

The company's adhesive mount supports are another appropriate choice, as no panel hole is required. They are available in a variety of different sizes and styles, including an edge support type to solve awkward mounting problems.

Hi-Q Electronics Ltd

www.hiq.co.nz

SPECTRUM ANALYSER AND RECORDER

The Spectran V5 X is a portable USB real-time spectrum analyser and recorder that operates from 1 Hz to 20 GHz. It is now available in 6, 12, 16 and 20 GHz options.

The analyser has a real-time bandwidth of up to 175 MHz and a fast sweep mode, enabling it to scan 20 GHz in less than 20 ms. It is suitable for making fast measurements and can also be used for spectrum monitoring, interference hunting, EMC testing or Wi-Fi and wireless network measurements.

The package includes Aaronia's RTSA Suite real-time software, offering powerful analysis features. Simply connect the V5 via USB to a suitable PC/laptop to transform the device into a fully featured benchtop spectrum analyser.

Clarke & Severn Electronics

www.clarke.com.au

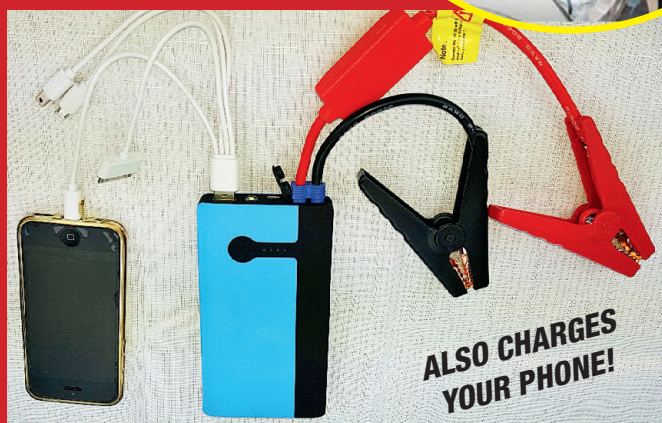


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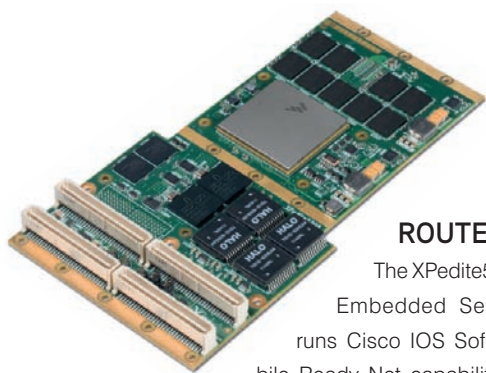
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When combined with UHF, VHF, Wi-Fi and other radio platforms, the combination can create mobile ad hoc networks (MANETs) without requiring a connection to central infrastructure for military and emergency response. It extends the Cisco enterprise infrastructure beyond the reach of traditional fixed-network infrastructure for oil and gas, mining, smart grid, heavy construction, transportation, homeland security and public safety applications.

The router offers high performance, four Gigabit Ethernet interfaces and a rich Cisco IOS Software feature set suitable for the most size, weight and power (SWaP)-constrained applications. To meet the needs of demanding mobile and embedded networking applications, the ESR provides onboard hardware encryption to offload encryption processing, radio-aware routing (RAR) with support for the latest Dynamic Link Exchange Protocol (DLEP), support for IPv6, integrated threat control with integrated Cisco IOS firewalls and intrusion prevention system (IPS) and quality of service (QoS).

The product uses the same Cisco IOS that IT staff in the military, energy, public safety and other industries are already trained on, enabling these organisations to expand their network to personnel, equipment, facilities and vehicles at the edge of the network without any additional training. It is a conduction- or air-cooled XMC/PMC router card that can plug into existing sockets or be used in standalone applications.

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AIR QUALITY EVALUATION BOARDS

The Amphenol Advanced Sensors Telaire AAS-AQS-UNO air quality evaluation boards help engineers evaluate air quality sensors.

The boards support Bluetooth low energy 4.0 and a 128 × 64 OLED screen, and feature reserved interfaces for temperature and humidity sensors, carbon dioxide sensors and dust sensors. The boards are compatible with the Arduino UNO R3 microcontroller and use the Arduino integrated development environment (IDE) to help designers speed evaluation and development of the sensors.

Both boards in the series include an Arduino-compatible board preloaded with software, the AAS-AQS-UNO sensor evaluation board, USB cable, OLED screen and SM-PWM-01C dust sensor. The RH-CO2 kit also includes a T9602 temperature and humidity sensor and T6713 carbon dioxide sensor.

Designers can configure the boards' serial output to send sensor data to a PC over a USB connection for recording and analysis in third-party software. Typical applications include rapid development of air quality sensor systems, intelligent apparel devices and low-power Internet of Things (IoT)-based Bluetooth modules.

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SMART EXOSKELETON SUPPORTS SENIORS

Image courtesy Hillary Sanctuary/EPFL

Wearable machines that enhance movement and endurance no longer belong to the realm of science fiction, with European researchers developing a smart exoskeleton that recognises loss of balance and prevents falling in elderly patients. Their study has been published in the journal *Scientific Reports*.

The work was led by scientists at Scuola Sant'Anna in Italy, who built a smart, lightweight and easy-to-personalise exoskeleton prototype which counteracts the loss of balance and promotes balance recovery after an accidental slip. While other wearable machines are typically used to assist or enhance regular movement, this is said to be the first to prevent an unexpected event like falling.

"We developed a closed-loop system based on the use of a wearable device, an exoskeleton, to detect the onset of falling and to generate support to have balance recovery and to reduce the probability of falling," said Professor Silvestro Micera.

Unlike the armoured suits one might expect from science-fiction movies, the lightweight exoskeleton is wearable from the waist down. It is equipped with motors at the hip and braces made out of carbon fibre. It was important to the researchers that the exoskeleton was non-intrusive and would not unnecessarily disturb the user, particularly when they are not falling.

The prototype requires only a few minutes to adapt to a given patient, which involves adjusting the size for a particular user and learning the user's gait. It was tested on 69-year-old Fulvio Bertelli, who was placed on a special treadmill that can artificially make him lose his balance and slip.

Once the system had established Bertelli's typical walking pattern, its algorithm is able to detect any deviations which may indicate the onset of a fall. When this happens, the motors push both of the thighs down, re-establishing Bertelli's stability at the hip.

"This novelty of this experiment is that for the first time, a human and an exoskeleton act together in real time, and the exoskeleton gives support to mitigate a risk of fall," said study co-author Professor Nicola Vitiello.

While the exoskeleton was designed to help the elderly by preventing fall-related injuries, it could also be used as an aid for the physically impaired, amputees and those suffering from neurological disorders. Study co-author Dr Vito Monaco also plans to generalise the results to show how humans and robots can seamlessly work as a single system.

"Our study revealed that a wearable robotic platform can effectively interact with humans during reactive motor responses, such as accidental slipping," Dr Monaco said. "These results open new perspectives for researchers who are expected to develop robotic platforms for enhancing human capabilities all day long."

The next steps involve making the exoskeleton more discrete and portable for use outside the laboratory, and to test its usability with end users in real-life environments.

"This work paves the way for imagining a completely new generation of exoskeletons that will actually be effective outside of research laboratories thanks to their ability to augment users' movement and make their mobility more stable and safe," said Professor Vitiello.

"To reach these goals, exoskeletons must be endowed with features, like the one proved in this study, that really take into account what users can experience in real-life unstructured environments."

TRANSPARENT THIN FILMS

WITH HIGH CONDUCTIVITY

US researchers have discovered a nanoscale-thin film material with what is said to be the highest ever conductivity in its class, in a breakthrough which could lead to smaller, faster and more powerful electronics. Their study has been published in the journal *Nature Communications*.

Currently, most of the transparent conductors in electronics use a chemical element called indium. The price of indium has generally gone up over the last two decades, which has added to the cost of current display technology.

As a result, there have been efforts to find alternative materials that work as well as, or even better than, indium-based transparent conductors. Now, researchers led by the University of Minnesota have found a solution.

The team developed a transparent conducting thin film using a novel synthesis method, in which they grew a BaSnO_3 thin film (a combination of barium, tin and oxygen called barium stannate) but replaced the elemental tin source with a chemical precursor of tin. This chemical precursor has radical properties that enhanced the chemical reactivity and greatly improved the metal oxide formation process. Both barium and tin are significantly cheaper than indium and are abundantly available.

"We were quite surprised at how well this unconventional approach worked the very first time we used the tin chemical precursor," said Abhinav Prakash from the University of Minnesota, the first author of the paper. "It was a big risk, but it was quite a big breakthrough for us."

The researchers noted that the material not only has a high conductivity, which helps electronics conduct more electricity and become more powerful, but it also has a wide bandgap, which means light can easily pass through it. In most cases, materials with wide bandgap usually have either low conductivity or poor transparency.

"The high conductivity and wide bandgap make this an ideal material for making optically transparent conducting films which could be used in a wide variety of electronic devices, including high-power electronics, electronic displays, touch screens and even solar cells in which light needs to pass through the device," said lead researcher Bharat Jalan, also from the University of Minnesota.

According to the researchers, the process enabled the creation of material with unprecedented control over thickness, composition and defect concentration. In fact, they said it was the structurally superior quality with improved defect concentration that allowed them to discover high conductivity in the material in the first place.

The process is also reproducible and scalable and should be suitable for a number of other material systems where the element is hard to oxidise, according to the researchers. Their next step is to continue to reduce the defects at the atomic scale.



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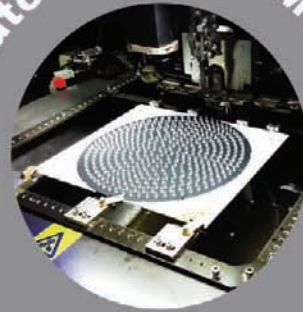


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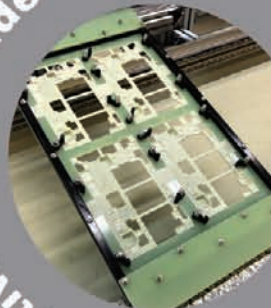
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