



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

OUR INSIDER'S GUIDE
TO CHOOSING THE
RIGHT ENCLOSURE.

FROM THE SIZE OF A MATCH BOX.

TO THE SIZE OF A FRIDGE.

ERNTEC
ELECTRONICS TECHNOLOGIES



WE THINK
OUTSIDE
THE BOX.



In Stock & On Time

The World's Largest Selection of Electronic Components Available for Immediate Shipment



AUSTRALIA
DIGIKEY.COM.AU
1800 285 719

NEW ZEALAND
DIGIKEY.CO.NZ
800 449 837



7.7 MILLION+ PRODUCTS ONLINE | 800+ INDUSTRY-LEADING SUPPLIERS | 100% AUTHORIZED DISTRIBUTOR

*Australia: A shipping charge of \$24.00 AUD will be billed on all orders of less than \$60.00 AUD. A shipping charge of \$20.00 USD will be billed on all orders of less than \$50.00 USD. All orders are shipped via UPS, Federal Express, or DHL for delivery within 3-4 days (dependent on final destination). No handling fees. All prices are in Australian dollar or United States dollar. **New Zealand:** A shipping charge of \$26.00 (NZD) will be billed on all orders of less than \$66.00 (NZD). A shipping charge of \$20.00 USD will be billed on all orders of less than \$50.00 USD. All orders are shipped via UPS for delivery within 3-4 days (dependent on final destination). All prices are in New Zealand dollar or United States dollar. Digi-Key is an authorized distributor for all supplier partners. New product added daily. Digi-Key and Digi-Key Electronics are registered trademarks of Digi-Key Electronics in the U.S. and other countries. © 2019 Digi-Key Electronics, 701 Brooks Ave. South, Thief River Falls, MN 56701, USA

ECIA MEMBER
Supporting The Authorized Channel

CONTENTS

- 4 Top 10 considerations when specifying enclosures
- 12 Smart connected lighting and the IoT
- 21 New standards in speed and power
- 26 Essential approaches for SMT assembly process control
- 31 The positive outcomes of antistatic flooring
- 40 Faster internet with optical frequency combs
- 44 Australian researchers create artificial graphene
- 48 Getting the best performance from resin encapsulants
- 50 Self-healing electronic skin inspired by jellyfish



This magazine is FREE for industry professionals.

Subscribe: www.electronicsonline.net.au/subscribe

READ ONLINE!

Your copy of *What's New in Electronics* is available as an online eMag.

www.electronicsonline.net.au/magazine

COVER STORY



With many electronics projects, the enclosure is an afterthought. That's understandable, as the systems it houses are probably your pride and joy.

But leaving the enclosure till last can have serious implications for the form, function, reliability, aesthetics and total cost of ownership. So, here's how Erntec can help you avoid the risks and choose the right enclosure.

Basically, you have two options.

A standard enclosure made up from off-the-shelf components with allowance for minor modification; or

A custom enclosure that's designed and manufactured from scratch.

By drawing on our experience and asking all the right questions, we can soon resolve a solution that will not only meet your deadline but fit your purpose and demand minimal maintenance over the years.

Whilst our first inclination is always to find a standard part that requires only minimal changes, a custom enclosure might not be the expensive or lengthy option you'd imagine.

By working with a flexible manufacturer like Erntec, who'll think outside the box to help you source and customise — or design and manufacture — a suitable solution, you'll end up with an enclosure that not only protects your product, but also facilitates its function, from the size of a matchbox to the size of a fridge.

ERNTEC Pty Ltd
www.erntec.com.au



A hand holding a red umbrella over a sea of black umbrellas in the rain. The red umbrella is the only one of its color, standing out against a vast field of black umbrellas. The background is a dark, rainy sky with rain falling diagonally across the frame.

TOP 10 CONSIDERATIONS WHEN SPECIFYING ENCLOSURES

Pat Cookson

Your new industrial electronic product has been designed and the board components specified. It has been prototyped, either on a development board to check functionality and performance or laid out on a final PCB design. It has been debugged, tested, tweaked, tested again and finally signed off for production. So far, so good.

Now all that has to be done is to decide on the choice of enclosure for it. In the ideal world, the enclosure would have been selected far earlier in the process, so that, in particular, the size constraints of the PCB would be known. In the real world, the first question is normally "what size box do I need?"

We list below, based on our extensive experience as an enclosure manufacturer, the criteria that need to be considered when the enclosure is specified. These relate to standard or modified standard enclosures, which are normally the best choice for low/medium-volume applications. For consumer-facing products, where volumes are expected to be far higher, a fully custom enclosure is normally the best approach.

1. Size

How big is the PCB? Is it to be mounted horizontally or vertically? Many plastic enclosures have slots moulded into the sides of the enclosure for direct vertical mounting and PCB mounting bosses moulded into the top and base for horizontal mounting. Extruded aluminium enclosures will typically have full-length slots in the sides for horizontal PCB mounting. How much space, if any, does there need to be on the external surfaces for any indicators, switches, connectors, cable entries and similar components that are required? What height is required for board-mounted components or multiple horizontal boards?

2. Installed environment

Where will the product be used? Inside, outside or possibly both? For outside installation, UV stability is a potential issue for plastic enclosures. For mobile applications such as road and rail, is shock and vibration likely to be a concern? Will the ingress of dust and water be something to be considered (see Point 4)? Are there likely to be contaminants present — oils, chemicals and so on? Is resistance to impact damage a possible problem? If so, metal enclosures typically offer better resistance than plastic ones. Are particularly high or low temperatures expected?

3. Material

For small enclosures, the choice is typically between plastic, aluminium and GRP. The most widely used plastic materials are ABS and polycarbonate. Fire resistance is a consideration; the relevant standard is UL94, which specifies a vertical or horizontal burn. The more stringent test is the vertical burn test; material will be classified as V0, V1 or V2, where V0 is the highest performance. Polycarbonate or GRP would normally be specified for outdoor use because of their better resistance to UV embrittlement and colour fading than ABS.

Aluminium enclosures are either die-cast or extruded. Both are robust and give good impact resistance and are intrinsically electrically conductive, although painted or anodised finishes must not cover mating areas to preserve continuity throughout the enclosure. Some designs of extruded enclosures offer features such as multiple fins to significantly increase the surface area to improve heat dissipation. Die-cast aluminium housings are strong and robust; they do not corrode, are electrically conductive, have an intrinsically high level of electromagnetic attenuation and are easily machined. With a suitable gasket fitted between the lid and the base, environmental sealing to IP68 can be easily achieved. Such enclosures can be cast with relatively thin walls, although they will always be far heavier than the equivalent-sized plastic moulded one. For applications where protection against shock damage is important, where EMC is likely to be an issue or where high temperatures, dust or water are expected to be present, the die-cast enclosure is the ideal low-cost choice.

4. Environmental sealing

Sealing typically relies on a tongue and groove construction between the mating halves; for higher levels of sealing, a compressible gasket will also be used at the interface. The relevant international standard is IEC 60529. Typically, enclosures rated at IP54 are suitable for general-purpose use; for installation in environments where dust and water are likely to be present, IP66, 67 or 68 would normally be specified.

ENCLOSURES



IP rating	NEMA number
IP20	1
IP22	2
IP24	3R, 3RX
IP53	5
IP54	12, 12K, 13
IP55	3, 3X, 3S, 3SX
IP66	4, 4X
IP67	6
IP68	6P

The highest rating is IP69K, which gives protection against steam cleaning at high pressure. In North America, enclosures' environmental sealing is normally defined as a NEMA (National Electrical Manufacturers Association) number. NEMA ratings also require additional product features and tests (such as functionality under icing conditions, enclosures for hazardous areas, knock-outs for cable connections and others) not addressed by IP ratings.

5. Appearance/styling

Plastic enclosures offer a choice of opaque and translucent material in a variety of colours. They can also be moulded in a transparent material; styled lids with recesses for membrane keypads and displays are available. Die-cast aluminium enclosures can be painted in a variety of different finishes and colours; extruded ones can have a clear or coloured anodising finish.

6. EMC

In many applications EMC capability is of no interest, but in others it can be a design consideration. Plastic enclosures have one specific weakness: by virtue of the intrinsic properties of the material itself, plastic, unlike metal, offers no EMC attenuation. If EM radiation emitted by the housed electronics or their susceptibility to external fields is

a potential problem, the lack of screening could be an issue. Internal coatings in a variety of materials can be applied to the inner surfaces of a plastic enclosure to give different degrees of attenuation dependent on the project requirements. By offering different materials in a range of thicknesses, the most cost-effective and technically competent solution can be provided.

Metal enclosures, providing they are designed in such a way that electrical continuity is present between the top, base and removable panels and that any painted or anodised finish is purely for external decorative purposes, will provide a level of EMC likely to be more than sufficient for the majority of applications. A conductive gasket will be used to electrically link the two halves of the enclosure.

7. Fixings — captive screws/ material/tapped bushes vs direct into plastic

Enclosure panels and covers obviously have to be secured to their mating half. There are two main methods for plastic and die-cast enclosures. In the first, a self-tapping screw is secured directly into the material of the base; in the second, a machine screw mates with a threaded bush moulded into the base. A machine screw is preferable if repeated openings and closures are anticipated during the life of the equipment; a self-tapping screw is fine for 'close-and-forget' uses. A further refinement, normally only appropriate for machine screw closures, is the use of captive screws, which do away with the possibility of one of the screws being lost during opening.

8. Downloadable drawings and support materials

Any reputable enclosure manufacturer will provide a comprehensive library of technical information on its website. Typical download-

able resources should include dimensioned drawings to assist with the design and modification requirements, technical details and key product attributes.

9. Manufacturer modification capability

In order to make a standard enclosure suitable for a specific application, it will need to be modified. The best option is for the original manufacturer to provide a modified enclosure configured to the specific requirements of the project, so there is no need to over-order to allow for set-up and wastage quantities. Enclosure manufacturers will typically be able to provide milling, drilling, punching, engraving, screen printing, painting and EMC coatings for their range of standard products. Manufacturers of moulded enclosures can normally also offer enclosures moulded in custom colours to meet any applicable identifying requirements or corporate branding needs.

10. Manufacturer and distributor technical support/ standard product availability

Standard enclosures for the electronics and electrical industries are produced in a huge variety of sizes, styles and types by many specialist manufacturers. However, a standard enclosure will inevitably need to be modified to make it fit for purpose. Most manufacturers and distributors keep stocks of standard enclosures on the shelf and the modern trend is that distributors are now joining manufacturers in providing technical support to their customers, working with them at the design stage to help choose the most appropriate enclosure for the application.

Conclusions

A superficial glance at a moulded or die-cast enclosure may give the impression that it is a simple box, but in reality, it is the end result of a great deal of design effort and expertise that has been expended to create the most useful and feature-rich housing, suitable for a use in a wide variety of applications and environments. Work with the enclosure manufacturer from an early stage in the project design cycle to tap the wealth of experience behind a standard enclosure.

Hammond Electronics Pty Ltd
www.hammondmtg.com



STM32MP1

Multicore Microprocessor for Industrial and IoT applications

- Enable STM32 to access open source Linux and Android platforms
- Dual-core Arm® Cortex®-A7 operating at 650MHz to provide high performance
- Arm® Cortex® -M4 core with FPU operating at 209 MHz for power efficient real-time control
- Supports wide range of external DDR SDRAM and Flash memories
- Graphics capability with 3D GPU, MIPI-DSI, and LCD-TFT Controller
- Flexible architecture, allows a large of peripherals to be allocated to either Cortex-A or Cortex-M core
- OpenSTLinux Distribution, contains all essential building blocks
- 10 years longevity commitment
- Ideal companion Power Management IC STPMIC1



STMicroelectronics

Suite 703, 247 Coward Street, Mascot,
2020, NSW Australia
Tel: +61 2 9158 7200
Email: clifford.shi@st.com

Authorized Distributors

ARROW Electronics Australia Pty Ltd - Tel: +61 2 9737 4900
Future Electronics - Tel: +61 2 8064 0000
Avnet Electronics (Australia) Pty Ltd - Tel: 1300 791 695



©iStockphoto.com/design56

FUTURE BATTERY INDUSTRIES CRC COMING TO WA

Minister for Industry, Science and Technology Karen Andrews has announced the government's support for the Future Battery Industries Cooperative Research Centre (CRC) — an initiative that will help tackle industry-identified gaps in the battery industries value chain, support battery deployment and optimise battery waste recycling.

A national consortium of 58 industry, government and research partners, led by WA's Curtin University, led the bid to establish the \$135 million CRC. It will focus on three research programs where industry, government and researchers have joined together: battery industry development; the processing of minerals; metals and materials for batteries; and the development of a new battery storage system.

Curtin University Deputy Vice-Chancellor Research Professor Chris Moran said the news will ensure Australia capitalises on the significant opportunities presented by the battery boom, delivering an estimated \$2.5 billion benefit to the Australian economy over the next 15 years.

"This national consortium will also offer evidence-based advice to inform the development of government policies, rules and regulations to help guide the rapid transformation of energy systems driven by the expansion of renewables all over the world," Prof Moran said.

Future Battery Industries CRC Chair Tim Shanahan said the consortium has a six-year plan to address industry-identified gaps in the battery industries value chain.

"The national consortium ... aims to co-create the tools and technologies needed to ensure Australia is leading the way in the battery revolution from mining and processing to manufacture and deployment in households, communities and industry, and in the recycling of batteries," Shanahan said.

"The Future Battery Industries CRC will investigate opportunities for greater efficiencies in the extraction and refinement of battery minerals, including facilitating the steps beyond mining, and concentrate production to cathode production and the manufacture and testing of battery components and systems.

"The potential to promote the nation's premium-quality, ethically sourced and safe battery minerals and metals through forensic-accredited and traceable sources will also be investigated."

The CRC will fund 40 PhD students and undertake an education and training program with activities that will assist in building a workforce to support Australia's future battery industries. A vocational education and training sector engagement program will also be conducted and small and medium enterprise workshops will be held to enhance business capabilities and competitiveness.

The Australian Government has committed \$25 million to the Future Battery Industries CRC, to be paid over six years, while participants in the CRC will contribute more than \$110 million in cash and in kind. The WA Government seeded the bid with a combined \$6 million in provisional funding to support to establishment of the CRC in Perth.

GRAPHENE-BASED THIN FILM ABSORBS SOLAR ENERGY

Researchers at the University of Sydney, Swinburne University of Technology and the Australian National University (ANU) have developed a solar-absorbing, ultrathin film that has great potential for use in solar thermal energy harvesting. Described in the journal *Nature Photonics*, the 90 nm graphene metamaterial is 1000 times finer than a human hair and can be rapidly heated up to 160°C under natural sunlight in an open environment.

"The physical effect causing this outstanding absorption in such a thin layer is quite general and thereby opens up a lot of exciting applications," said Dr Bjorn Sturmborg, a lecturer at ANU.

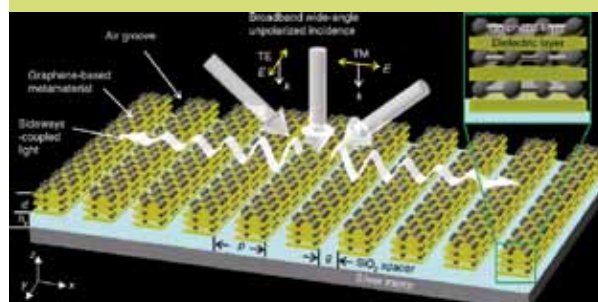
The researchers suggest that the material opens new avenues in thermophotovoltaics (the direct conversion of heat to electricity); solar seawater desalination; infrared lighting and heating; optical componentry (modulators and interconnects for communication devices); and photodetection. It could even lead to the development of 'invisible cloaking technology' through developing large-scale thin films enclosing the objects to be 'hidden'.

"Our cost-effective and scalable graphene absorber is promising for integrated, large-scale applications, such as energy harvesting, thermal emitters, optical interconnects, photodetectors and optical modulators," said Dr Han Lin, Senior Research Fellow at Swinburne's Centre for Micro-Photonics.

"Fabrication on a flexible substrate and the robustness stemming from graphene make it suitable for industrial use," added Dr Keng-Te Lin, also from Swinburne.

The researchers have developed a 2.5 x 5 cm working prototype to demonstrate the photothermal performance of the graphene-based metamaterial absorber. They have also proposed a scalable manufacture strategy to fabricate the proposed graphene-based absorber at low cost.

"In this work, the reduced graphene oxide layer and grating structures were coated with a solution and fabricated by a laser nanofabrication method, which are both scalable and low cost," said Professor Baohua Jia, Research Leader, Nanophotonic Solar Technology, in Swinburne's Centre for Micro-Photonics.



Schematic of the graphene-based metamaterial absorber. Source: Nature Photonics.

CABLE ASSEMBLY and BOX BUILD ASSEMBLY



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



High mix
low volume
and quick
turnaround

Electrical
box
assembly

Fully
automatic
cut, strip and
crimp
machines



AT AMPEC we specialise in manufacturing of
custom design cable assemblies as well as turnkey
electronic and electric product assemblies.



+61 2 8741 5000
sales@ampec.com.au | www.ampec.com.au

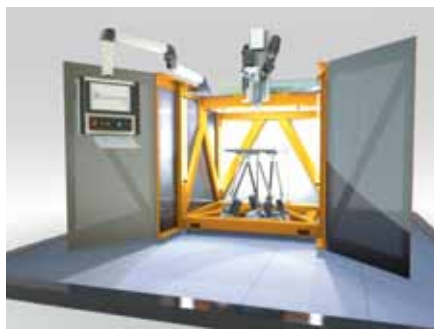


ULTRAFAST 3D PRINTER FOR HIGH-PERFORMANCE PLASTICS

Researchers at the Fraunhofer Institute for Machine Tools and Forming Technology IWU have developed Screw Extrusion Additive Manufacturing (SEAM) — a system and process that is eight times faster than conventional 3D printing.

3D printers that build small souvenirs layer by layer from melted plastic are often used at tradeshow, where it can take up to an hour to produce a pocket-sized souvenir. In comparison, the new system takes only 18 min to produce a plastic component that is 30 cm high, making it suitable for the additive manufacture of large-volume resilient plastic components. The printer achieves these ultrafast speeds “by combining machine tool technology with 3D printing”, explained Fraunhofer IWU’s Dr Martin Kausch.

To process the plastic, the researchers use a specially designed unit that melts the raw material and ejects it at a high output rate. This unit is installed above a construction platform that can be swivelled in six axes by using the motion system of a machine tool.



SEAM can accelerate the additive manufacture of plastic components eightfold over conventional processes. Image ©Fraunhofer IWU

The hot plastic is deposited in layers on the construction platform. The motion system of the machine ensures that the construction panel slides along under the nozzle in such a way that the previously programmed component shape is produced. The table can be moved at a speed of one metre per second in the X-, Y- and Z-axes and can also be tilted by up to 45°.

Every hour, up to 7 kg of plastic are pressed through the hot nozzle with a diameter of 1 mm; comparable 3D printing processes, such as fused deposition modelling (FDM) or fused filament modelling (FLM), usually achieve only 50 g of plastic per hour. Instead of expensive FLM filament, SEAM processes free-flowing, cost-effective standard plastic granulate into resilient, fibre-reinforced components that are several metres in size, allowing material costs to be reduced by a factor of 200. Researchers can also implement complex geometries without supporting structures and even print on existing injection-moulded components.

“As our construction platform can be swivelled, we are able to print on curved structures with a separately moving Z-axis,” Dr Kausch noted. “In tests, we were able to process a wide variety of plastics. They ranged from thermoplastic elastomers to high-performance plastics with a 50% content of carbon fibre. These plastics are materials that are particularly relevant to industry and cannot be processed with traditional 3D printers.”

CONSTRUCTION COMMENCES ON ROOM-TEMPERATURE QUANTUM DEVICE

Archer Exploration, a Sydney-based advanced materials business, has commenced its maiden quantum technology project, dubbed ¹²CQ, to build a carbon-based quantum computing device that operates at room temperature.

Quantum computers consist of a core device (chip) made from materials capable of processing quantum information (qubits) necessary to solve complex calculations. The majority of quantum computers are only able to operate at subzero temperatures, and while other devices use light or special materials which overcome the temperature challenge, these are difficult to integrate into modern electronics.

During his previous employment at the University of Sydney, Archer CEO Dr Mohammad Choucair invented the first material known to overcome both the limitations of subzero operating temperatures and electronic device integration for qubits. The conducting carbon material was able to process qubits at room temperature, with the potential to reduce the commercial barriers to quantum computing and make it globally accessible. The quantum chip incorporating these materials forms the subject of IP that was exclusively licensed from the university by Archer.

Chip prototypes are being built at the Research & Prototype Foundry Core Research Facility at the Sydney Nanoscience Hub by Archer’s Quantum Technology Manager, Dr Martin Fuechsle. Dr Fuechsle is internationally recognised in pioneering quantum device fabrication, having invented the world’s first single-atom transistor. He will assemble the atom-scale materials componentry while overcoming technical challenges in controlling, reducing or eliminating the technical risks associated with realising the 16 claims in the patent application.

“I’m excited to announce that we have started building the chip,” said Dr Choucair. “Key components of our commercialisation plan are now in place and we are in a unique position to strengthen quantum computing in Australia. Access to the Research & Prototype Foundry at the Sydney Nanoscience Hub provides us with the specialised world-class infrastructure, facilities, equipment and personnel we need to successfully build this potentially breakthrough quantum computing technology.”



Archer’s Quantum Technology Manager, Dr Martin Fuechsle, operating the electron-beam lithography instrumentation inside the cleanrooms of the Research & Prototype Foundry at the Sydney Nanoscience Hub.



©CSIRO, Navinda Kottege

DATA61 OPENS ROBOTICS INNOVATION CENTRE

Data61, the digital innovation arm of CSIRO, has announced its new Robotics Innovation Centre — a purpose-built research facility for robotics and autonomous systems.

Fred Pauling, leader of the Robotics and Autonomous Systems Group at Data61, said the Brisbane-based, 600 m² facility will enhance the group's world-class research capabilities, ranging from legged robots and 3D mapping through to unmanned aerial vehicles (UAVs) and unmanned ground vehicles (UGVs).

"The new centre expands our research infrastructure to develop highly autonomous robotics systems that can interact safely and seamlessly with humans and other dynamic agents in challenging indoor and outdoor environments," Pauling said.

"Our robots are already being used to safely inspect and create 3D maps of underground mines, monitor biodiversity in the Amazon Rainforest and navigate difficult terrain in emergency situations."

The centre houses what is claimed to be the biggest motion capture system in the Southern Hemisphere, used to validate data collected by robotics systems. It also features a 13 x 5 m pool for testing aquatic robots, a significant number of field-deployable UAVs and UGVs, legged robots, high-accuracy robot manipulators, sensors and telemetry systems.

Data61 CEO Adrian Turner said the centre is a national asset that combines internationally recognised robotics and machine learning research with deep domain expertise from CSIRO, providing collaboration opportunities for industry, government and academia. It includes dedicated mechanical and electronics engineering laboratories, several high-end rapid prototyping machines, large sheds for indoor systems testing, an open-air UAV flying area and outdoor testing areas including a forest and creek.

"Robotics and autonomous systems technologies, underpinned by machine learning and artificial intelligence, will unlock new value in all manner of sectors including manufacturing, agriculture, healthcare and mining," Turner said.

TRANSFER MULTISORT ELEKTRONIK GLOBAL DISTRIBUTOR OF ELECTRONIC COMPONENTS

- SEMICONDUCTORS
- EMBEDDED SYSTEMS
- OPTOELECTRONICS
- LIGHT SOURCES
- PASSIVES
- CONNECTORS
- RELAYS & CONTACTORS
- WIRES & CABLES
- MECHANICAL ELEMENTS
- AUTOMATION
- ROBOTICS
- WORKPLACE EQUIPMENT
- And many more...

SEE THE OFFER OF ALMOST 250,000
PRODUCTS AVAILABLE IN ONE PLACE

DELIVERY EVEN WITHIN 3 DAYS



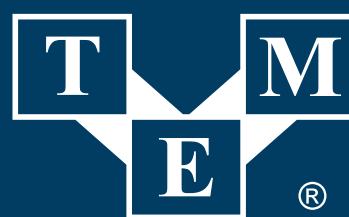
Check out the new spring TME offer!

Enter discount code

S P R I N G A U

in the correct field in your shopping cart
and get a discount of **up to 10%**
for products from the catalogue*!

* The special offer does not combine with other discounts
and does not apply to selected products and shipping costs.
Valid for orders placed on 23.05-23.07.19 via tme.eu by customers from Australia.



Electronic Components

Transfer Multisort Elektronik

Transfer Multisort Elektronik Sp. z o.o.
Ustronna 41, 93-350 Łódź, Poland
tel. +48 42 645 54 44, export@tme.eu

tme.eu

facebook.com/TME.eu
instagram.com/tme.eu
youtube.com/TMElectronicComponent






SMART CONNECTED LIGHTING AND THE IoT

*Paul Golata from Mouser Electronics**

Man is smart, so he has created devices that provide him with light. In cities, towns and villages throughout the world, man harnesses his own created-illumination devices to gleam light into the recesses of the darkness. Civilised society, a connected social order advancing cultural creation, employs these lighting devices in order to chase away the darkness and pave the way for a brighter future.



At one time, this source of light was through items like wax candles. However, the technological reality of the Internet of Things (IoT) now empowers smart connected lighting within a coordinated system. Hardwired and wireless systems allow secured data to connect lighting systems through a coordinated and intelligent approach. This article articulates how smart connected lighting is enabling a bright future.

Smart connected lighting

A season of change is underway. The IoT is dawning today as a revolution in technology. Smart sensor technology and radiofrequency (RF) wireless connectivity have combined to produce new methods to sense and collect data and get it onto the internet. IoT is enabling building automation utilised for industrial and personal (home) use. Automation within buildings and cities is taking advantage of human intelligence. Specifically, it is aiming to program electronic systems in a coordinated and integrated fashion to mimic or improve upon this human intelligence, thus providing an automated system with a level of 'smartness'.

In this case, smartness means the ability to meet and perform to an acceptable level of a desired aim or goal. The goal of these efforts is to produce more intelligent and robust systems, which will improve people's living conditions while lowering costs and decreasing negative environmental impacts.

Connected lighting systems consist of three key ingredients:

- A light source such as a light bulb or LED;
- A light fixture and electromechanical assembly to connect and secure the light source to its location; and
- A light switch or controller.

The past several years have seen a rapid movement from traditional lighting sources to light-emitting diodes (LEDs). The success of LED lighting adoption is a natural pathway for software-controlled, smart, digital, connected lighting systems. Where previously simple up/down or push-button on/off switches were employed, today IoT, coupled with electronically controlled lighting products, is enabling smart, connected lighting applications.

Smart connected lighting, deployed in smart buildings, takes advantage of multiple

electronic systems and platforms including motion sensors, integrating them with a variety of lighting control methods to provide solutions to suit virtually any lighting-control setting. Connected by means of the IoT and employing open and configurable infrastructures, data can be collected and utilised for intelligent decision-making and effective operations. Software's great flexibility and the simplicity of digital design and control provide advantages for smart lighting platforms. Leading electronic component vendors are presently developing LEDs, LED drivers, sensors, power electronics and various electronic control devices for smart lighting products. It is a discernible trend that these manufacturers are working to ensure that their products successfully integrate with or within designs in the building automation industry.

Automated lighting systems set up in this manner are called smart lighting. In the future, businesses and homeowners will increasingly take advantage of the leverage provided by connected lighting and the IoT. Smart lighting allows for autonomous and programmed control of illumination levels and colours and simultaneously identifies when traffic or building occupancy activities warrant adjustments, providing for a more optimised experience for users and owners. Regardless of whether it involves illumination lighting in offices, in homes or in street lights and lamps for traffic or pedestrians, automated smart lighting is found across the modern urban landscape. Smart lighting is fast becoming the mainstay of intelligent automated buildings in smart cities.

Wired and wireless

Smart and intelligent control of lighting systems requires solid and reliable connections. There are two primary networking methodologies that bring together smart connected lighting and IoT: wired and wireless. In addition, these two primary networking methodologies may be employed in various cooperating combinations, employing various communication methods and protocols such as Bluetooth mesh networking, and be limited only by the requirements of the application and the engineer's creativity.

A wired network relies on direct physical electrical connections between points in the network. A wireless network requires



SMART CONNECTED LIGHTING WITHIN THE IoT REQUIRES AN ENGINEER WHO UNDERSTANDS ACCEPTABLE SYSTEM DESIGN, SPEED, BANDWIDTH AND LOW-LATENCY CONNECTION SPECIFICATIONS.

no physical connection between devices, providing freedom from hard wiring. Wireless networks make it possible for devices within the network to roam untethered. There are advantages and disadvantages to both approaches. A smart design engineer will consider what is best for an entire application and may design a solution that takes advantage of both networking methodologies' respective strengths while mitigating against their respective deficiencies.

Smart connected lighting within the IoT requires an engineer who understands acceptable system design, speed, bandwidth and low-latency connection specifications. Hardwired systems offer top performance in these specific specification parameters yet require switches to be hardwired to lighting fixtures, thereby decreasing flexibility. The incorporation of wireless designs may sacrifice some of these specifications but provide configuration control and management options that cannot be accomplished within the limitations of hardwired designs. However, ongoing and dramatic improvements in RF wireless technology performance are providing wireless design options previously not conceivable or available.

Smart lighting controls and IoT often employ wireless mesh topologies, where there are redundant interconnections between network nodes. These so-called 'many-to-many' topologies offer exciting potential for smart lighting control — primarily because their redundant interconnections protect against single-point node failures while simultaneously offering low latency, high speeds and excellent efficiency. Zigbee and Bluetooth mesh are two popular protocols.

Zigbee and Bluetooth mesh

Low-powered and standards-based wireless sensor network (WSN) products may be incorporated to meet the demands of smart connected lighting applications. Mesh enabling systems are deployed worldwide, securely connecting a variety of smart devices to applications, delivering smarter, greener, more efficient solutions.

Zigbee, like Bluetooth, is a specification for communications in wireless personal area networks (WPANs). Designed to be

low cost, low power and low duty cycle, Zigbee technology is ideal for WSNs and other low-power networks that span potentially large distances. Zigbee builds upon the IEEE 802.15.4 standard but adds the mesh networking capability with multi-hop functionality and a routing protocol. Star as well as peer-to-peer (eg, mesh and cluster tree) networks are supported, making Zigbee dynamic, scalable and decentralised. Zigbee technology is not meant to compete with technologies such as Wi-Fi (IEEE 802.11) or Bluetooth (IEEE 802.15.1). Rather, Zigbee is designed for applications where the data transfer rate is much less important than power efficiency, network size and ad hoc routing capacity.

Bluetooth mesh networking (introduced in July 2017) is a protocol based upon Bluetooth Low Energy (BLE) that finds application in smart connected lighting and IoT. It employs a Bluetooth radio that can operate over a physical distance of approximately 100 to 1000 m. Being new to the scene, it is still seeking to demonstrate successful large-scale deployments, efficiency and effectiveness. A large assortment of talented persons and companies are working steadily to make improvements.

Data

In the IoT applications of tomorrow, the collection, storage and analysis of data will drive knowledge. The IoT will harness data-driven insights, which will assist business and personal decision-making. This trend will provide a host of new ways to perform and utilise smart connected lighting, including protecting and monitoring against power failures and blackouts as well as assisting with scheduling regular upkeep and maintaining the highest level of overall operational effectiveness. The demand for low-latency, real-time decision-making and response, which is imperceptible to humans (<0.05 s), will incite the incorporation of more sensors to collect data. This data will undergo analysis and processing in the 'smart' edge, providing new and greater insights and increasing the opportunity for new markets and value creation. Smart connected lighting works to bring data-based decision-making to reality.

Security

Data transmissions must remain under safeguards against adverse contingencies and situations. Reliable and secure connections are a must. Wired systems can be cut or tapped, and wireless systems might experience interference, droppage or access by suspect or nefarious methods. Smart connected lighting systems and the IoT use a multilayered approach for protection, applying safeguards at several different points throughout the system.

Key steps in this multilayered approach might include creating proper credentials and access authorisation passwords in an appropriately compliant and protected operating system (OS). Employment of appropriate protocols will empower the connection of devices while providing strong and robust performance and security under a wide variety of operating conditions. Every connected device should be monitored and be compliant with the appropriate firmware and software revisions to take advantage of up-to-the-moment protections and safeguards. Collected IoT data should be ingested and validated prior to consuming and processing it at lower-level stages and prior to higher-level processing to prevent ingress errors at the cloud or at higher-level data-processing sources.

Future

The IoT opens the door for smart lighting to be connected in a coordinated system. Hardwired and wireless systems allow secured data to connect lighting systems through a coordinated and intelligent approach. This smart connected lighting and the IoT are the technologies of our next and brighter season. Just think how far we have advanced since the days of fire, candlelight and Edison's light bulb!

**As a team member of Mouser Electronics since 2011, Paul Golata serves as a Senior Technical Content Specialist. He contributes to Mouser's success by driving strategic leadership and tactical execution, along with overall line and marketing directives for advanced technology-related products. He shares the newest and latest information with design engineers through the creation of unique and valuable technical content that facilitates and enhances Mouser Electronics as the preferred distributor of choice.*
www.mouser.com/applications/

Mouser Electronics
<https://au.mouser.com>



VISION SENSOR

Teledyne DALSA has announced its BOA Spot XL vision sensors for industrial automation and inspection. Designed for error proofing, identification, general inspection and robot guidance, the vision sensors deliver high performance and useful capabilities.

The all-in-one sensor comes with integrated LED lighting, lens cover and easy-to-use application software. Robust embedded vision tools include positioning, part locating, pattern matching, measuring, feature or defect detection, and identifying, including automatic reading of characters (OCR) based on a pre-trained AI inference network. Additional features include extensive image preprocessors and advanced calibration for image correction and system coordinate mapping.

Inspections using the vision sensors can be triggered by parts in motion or from a PLC after being moved into a stationary position. Compatible protocols, such as Ethernet/IP and PROFINET, provide standard languages for communicating with third-party equipment or the factory enterprise.

The vision sensors deliver the performance and capabilities of a sophisticated smart vision system, offering manufacturers the tools and integration flexibility for a wide range of automation and inspection applications. Thru- and surface-mounting options and a slim form factor lend automation and system developers the benefit of positioning the BOA Spot XL in tight places.

Adept Turnkey Solutions

www.adept.net.au

4-SOCKET SERVERS

Super Micro Computer (Supermicro) has released its SuperServer 2049U-TR4 4-socket servers, which support 2nd Gen Intel Xeon Scalable processors and Intel Optane DC persistent memory. The 2U server is designed to power demanding and intensive enterprise workloads for top cloud vendors in the industry.

The system is optimised to fully leverage the 2nd Gen Intel Xeon Scalable processors as well as Intel Optane DC persistent memory, providing up to 112 processor cores. In addition to powering the cloud, the stability and scalability of the server makes it a suitable building block for enterprise customers who are looking to migrate from their current mainframe infrastructure.

The multiprocessor servers are designed for enterprise mission-critical workloads such as real-time OLTP + OLAP, in-memory analytics, virtualisation and scale-up high performance computing (HPC). They are certified for a wide range of operating systems, including RedHat, SUSE, Ubuntu, VMWare and Windows.

Digicor Pty Ltd

www.digicor.com.au

Full speed ahead to 5G With the new force in spectrum analysis R&S FSV3000/FSVA3000

With the advent of 5G NR technology in R&D and production, engineers need test solutions that support 5G bandwidth and meet strict RF requirements. Rohde & Schwarz supports these users with a new signal and spectrum analyzer family.

- Up to 400 MHz analysis bandwidth
- All relevant 5G NR frequency bands up to 44 GHz
- Ultimate high-speed signal analysis

www.rohde-schwarz.com/product/FSV3000
sales.australia@rohde-schwarz.com



ROHDE & SCHWARZ



DEVICE COMMUNICATOR

The Emerson AMS Trex Device Communicator with HART & FFbus allows technicians to configure, isolate, diagnose and repair problems while devices continue to run using the Loop power function and onboard ammeter. It is available to rent from TechRentals.

The communicator features a 5.7" resistive touchscreen display for easy operation while wearing heavy gloves. The adjustable backlit screen can easily be changed to save power or adapt to dark environments.

The device includes Upgrade Studio to help keep the unit up to date with the latest software and apps, such as the Field Communicator app, the Loop Diagnostic app, the Fieldbus Diagnostic app, Valvelink Mobile and the Trex Help app. The apps assist users with troubleshooting, configuration and operation.

The communicator can be taken anywhere, even in hazardous areas. It meets global Intrinsic Safety requirements of ATEX, CSA (US/Canada), IECEx and FISCO.

TechRentals

www.techrentals.com.au



FANLESS EMBEDDED SYSTEM

The ITG-100-AL fanless embedded system, from iEi Integration, comes equipped in its bare bones form with standard I/O ports and supports a wide operating temperature of -20 to 60°C with air flow.

The standard I/O ports can be expanded on while still keeping the device's compact size with the convenient 'block layers' feature; additional layers with extra ports depending on the user's preferences can be added to expand the interface options and increase data storage space. These block layers include a choice between a 2.5" SATA HDD/SSD bay, a knockout-hole layer with selectable I/O interface or both at once.

The compact embedded system comes with a full-size PCIe Mini slot reserved for 3G/4G and a M.2 A-key slot reserved for Wi-Fi, in order to provide easily accessible function expansion options. Available in palm-sized dimensions of 137 x 102.8 x 36.2 mm or 137 x 102.8 x 56.2 mm, it comes with enough basic I/O options to be applied to a variety of fields, such as military applications, environments, industrial automation, traffic control and intelligent gateway usage in smart factories.

ICP Electronics Australia Pty Ltd

www.icp-australia.com.au



BUCK REGULATORS

Analog Devices LTM4626 and LTM4638 μ Module regulators offer a 12 or 15 A (respectively) step-down DC/DC regulator solution that incorporates a switching controller, power FETs, inductor and support components in a 6.25 mm² BGA package. Operating over an input voltage range of 3.1 to 20 V, both devices support an output voltage range of 0.6 to 5.5 V, set by a single external resistor.

The regulators support selectable discontinuous mode operation and output voltage tracking for supply rail sequencing. The devices' high switching frequency and current mode control enable a fast transient response to line and load changes without sacrificing stability. Additionally, the regulators include overvoltage, overcurrent and overtemperature protection.

The step-down switching mode regulators are designed to reduce solution size and deliver good power circuit performance in applications such as telecom, networking, industrial equipment, medical diagnostic equipment, data storage, and test and debug systems.

Mouser Electronics (Hong Kong) Ltd

www.mouser.com

WORLDWIDE CELLULAR OEM MODULE

Gemalto's PLS62-W is an industrial cellular module for global connectivity with multiband LTE Cat 1 and 2G/3G fallback.

As a Cat 1 device, the product has enough bandwidth to handle most router applications and is particularly suitable for kiosks, outdoor advertising, alarm systems and general industrial communication telemetry-type solutions. It works over 23 separate 4G and 3G bands, giving product designers a universal module, and is also fully compatible with Telstra 4GX 700 MHz Band 28 and Optus 4G Plus networks.

A powerful Java embedded system offers easy and fast application development, a broad choice of tools, high code re-usability, easy maintenance, a proven security concept and on-device debugging, as well as multithreading programming and program execution.

The industrial design facilitates an operating temperature range of -40 to +90°C. There is also an advanced power management system with an optimised sleep mode to preserve power and extend battery life.

The Gemalto PLS62W helps solve one of the most challenging situations faced by design engineers — ensuring their design will work on as many foreign cellular networks as possible with as few unique SKUs as possible. The module is also available as a Mini PCIe card and in form factors that are backwards compatible with previous 2G and 3G Gemalto modules, such as PH8-P.

ETM Pacific Pty Ltd

www.etmpacific.com



One-Stop Electronics Manufacturing Services from China
provide all you need to produce high quality PCBs and PCBAs

OUR COMPETENCES:

- Quickturn & Low Cost Prototype
- Custom PCB Fabrication up to 32-layer
- IPC 3 Electronic Assembly: SMT & THT assembly, SMD 01005 or larger, BGA 0.4mm pitch
- Full-scale Test and Inspection: FPT, ICT, AOI, X-ray, etc.
- Box Building, Molding & Punching
- Fully traceable Supply Chain Management



Pcbcart

www.pcbcart.com
sales@pcbcart.com

Web-on-a-chip technology helps create an AI scarecrow

A new electronics development platform that uses the internet to allow programming to be done directly onto a microchip is simplifying the creation of IoT and AI applications.

Developed by Adelaide-based company eLabtronics over the past five years, the 'runlinc' platform's development system and corresponding webpage are already on the Wi-Fi chip. This differentiates it from other electronic prototyping platforms, such as Arduino, and means programming can be done remotely through a Wi-Fi connection.

"It is a very disruptive technology — it is wireless — and one day there won't be any more cables needed for programming," said eLabtronics Technology Manager Miroslav Kostecki, the inventor of the technology.

"Normally you'd have to go to the computer, do the programming, create some sort of interface and put all the things in to create a server and put it on a chip, go back and forth and do the de-bugging.

"Our web server is already on the chip, so for the first time ever the programming is no longer done inside the computer — runlinc is basically a single webpage but it is sitting inside the Wi-Fi chip."

Recent benchmark testing of runlinc against Arduino asked a team of six postgraduate students to build a web page and create some buttons to control two LED lights. University of Adelaide student Alex Zhang said the task was completed in 30 minutes with six lines of code using runlinc, but with Arduino it took 30 hours and more than 120 lines of code to finish the project.

The platform has also been used in Internet of Things tests to complete employer hackathon tasks in record time.

Other early uses include DIY smart home kits and IoT-enabled sensing devices for farmers.

Now the technology has made its way all the way to the tiny South Asian country of Bhutan — the home of tech innovator Dupjay Pelzang, who was alerted to the technology by a colleague in Australia shortly after runlinc received global patent pending status in January.

Pelzang was taught runlinc by Kostecki over WhatsApp video conferences spanning six weeks and was the first person in Bhutan to master the platform. He is now using the technology to develop a prototype electronic scarecrow for the Bhutan Government that uses AI and IoT to scare off agricultural pests.

Bhutan only has a population of 800,000, more than half of whom work in agriculture. But many of its farmers are not happy about wild animals such as deer, monkeys, wild boars, porcupines and elephants destroying up to 70% of their annual harvest.

This presents a particular problem in Bhutan because of the Buddhist belief that all actions should bring the most help and least harm to other beings, which means agricultural pests cannot be physically harmed using traditional methods such as baits, traps and hunting. Electric fences have been used in some areas but are expensive, are not always effective against elephants, are considered inhumane by some and have resulted in a number of human electrocutions.

Using runlinc's technology, Pelzang's electronic scarecrow, which is designed to look like a tiger, uses a motion-activated camera to detect and photograph a wild animal in a crop zone. The image is then sent to Google for identification.

The scarecrow will be programmed to recognise five of the major pest animals: porcupine, monkeys, elephant, deer and wild pigs. Once a positive identification is made, the scarecrow determines its programmed response, with scare tactics ranging from loud noises, flashing lights and movements, depending on the target.

Pelzang said he aims to have the final prototype of the electronic scarecrow ready for a month-long field trial in July ahead a commercial launch. He said he aims to produce 100,000 government-subsidised scarecrows for Bhutanese farmers, but also plans for potential sales into nearby India, Afghanistan and Pakistan.

Meanwhile, eLabtronics CEO Dr Peng Choo said the company is in the process of applying for a Centre for Defence Industry Capability (CDIC) grant to teach runlinc to school students as young as eight years old as part of the Australian Government's focus on STEM education.

"The platforms at the moment are either too simple — like Lego — or too hard like Arduino," Dr Choo said.

"runlinc is so easy to use that even upper primary school students can get started, so can you imagine what it also does for industry when it's that easy?"

eLabtronics
www.elabtronics.com



An early design of the AI scarecrow.



BUCK-BOOST REGULATOR FOR BATTERY-POWERED IoT SYSTEMS

The RBB10 series is a 4 A non-isolated buck/boost regulator power module with a low profile for space-critical applications. It reaches an efficiency of up to 96%, which allows it to operate at full load in ambient temperatures as high as 85°C without forced air cooling.

The power modules can provide any voltage between 0.9 and 5.5 V from a wide range of input voltages. This makes it a suitable modular solution for many applications, such as Li-ion batteries, USB-powered stabilisers or supercapacitor regulators.

Transition from buck to boost mode is smooth without any interruption to the output. The six-sided shielded

package optimises EMC performance and thermal management. RECOM has also developed an evaluation board so that users will be able to quickly and easily test the modules.

RECOM Power GmbH
www.recom-power.com

DC-UPS POWER SUPPLY SYSTEMS

The Technology Dynamics CP-RK-BBU Series DC-UPS power supply systems are designed to provide clean, uninterrupted power to critical DC loads in the event of AC (utility) power loss.

The DC-UPS power supply provides backup power for a certain amount of time, depending on the load of the battery capacity. It is available in several power levels and configurations, which are designed for exact applications.

The DC-UPS is designed for harsh environments such as military and industrial-grade applications. It is a full-function DC-UPS battery backup system, complete with internal sealed lead-acid batteries. The rack mount system is rugged, efficient and suitable for critical systems where downtime cannot be tolerated. It contains a primary power supply, batteries and LVBD circuit.

It is available in 12, 24 and 48 VDC outputs with power levels to 3 kW. Standard run times include 10, 20 and 30 min on battery backup, depending on load requirements. Extended run times are available with additional battery racks. Options include extended temp operation, power factor correction, conformational coating, 400 Hz operation, chassis slides, analog or digital meters, MS connectors and more.

Metromatics Pty Ltd
www.metromatics.com.au



Visit Us: Stand D9
11-12 September, 2019
Melbourne, Australia



Superior resins engineered for challenging environments

In Encapsulation Resins our comprehensive range meets the increasing demands of the electronics industry. Whether it's epoxy, polyurethane or silicone resin systems, our products are designed to protect and insulate printed circuit boards (PCBs) and electronic components from the threats of harsh and challenging environments. Encapsulating the entire device in resin offers protection against moisture, vibration and rapid changes in temperature, thus offering superior performance under extreme conditions.

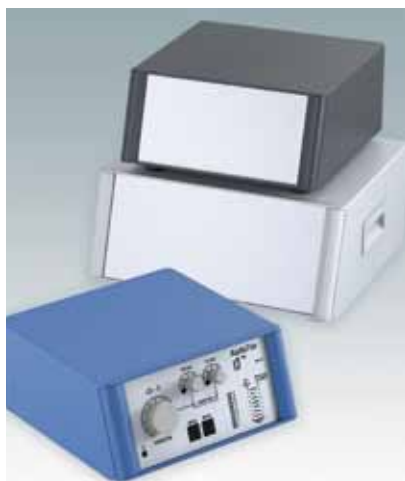
Whether for general purpose or tailored for individual requirements, every electro-chemical solution is within our spectrum. Our specialist approach to problems has established us as a key provider and developer to the technical electrical industry, both commercial and domestic.

Isn't it time you discovered how Electrolube can serve you?

+061 (0) 2 9938 1566
www.electrolube.com.au

ELECTROLUBE
THE SOLUTIONS PEOPLE

Electronic & General Purpose Cleaning	Conformal Coatings	Encapsulation Resins	Thermal Management Solutions	Contact Lubricants	Maintenance & Service Aids
---------------------------------------	--------------------	----------------------	------------------------------	--------------------	----------------------------



SLOPING FRONT INSTRUMENT ENCLOSURES

METCASE has launched a sloping front version of its TECHNOMET desktop instrument enclosures. TECHNOMET SL is designed for applications including medical and laboratory instruments, test and measurement, industrial control and communications.

TECHNOMET aluminium enclosures are engineered to fine tolerances. Diecast metal front and rear bezels fit flush in the case body — the SL model's front bezel is inclined at 18° for an optimal viewing angle of the controls, displays, etc. Extruded snap-on trims at front and rear cover all the front panel and case fixing screws. The rear panel screws are not covered for easier access.

The enclosure offers swift access to the PCBs. Its wraparound top cover slides over the chassis and is located on hook-profiled rails on the underside. A single PCB can be installed on four pre-fitted M3 pillars in the base, or multiple PCBs can slide in on clip-in anti-vibration guides (accessories).

The front and rear panels are recessed to protect switches, connectors, displays and keypads. The rear panel and base are vented. Alternative options (including non-vented panels) are available on request. All case panels are fitted with M4 earth studs for electrical continuity.

The enclosure is available in three standard sizes: 100 x 225 x 230 mm, 125 x 275 x 285 mm and 150 x 350 x 320 mm (which features side grip handles). Custom sizes are available on request. The enclosures are available in light grey or anthracite grey, and are supplied fully assembled including four modern anti-skid feet with tilt legs (which can further increase the viewing angle).

Accessories include front panels and snap-in PCB guides. Customising options include: bespoke sizes; custom front panels; CNC machining, fixings and inserts; custom colours and finishes; and digital printing of legends and logos.

ROLEC OKW Australia New Zealand P/L

www.metcase.com.au

Sales

Service

Calibration



Programmable
AC/DC
Power Supply

Programmable
AC/DC
Electronics Load



Upto 7.5GHz
Spectrum
Analyzer



triplepoint
CALIBRATIONS

www.triplepoint.com.au



SAFETY AIR GUN

EXAIR's Soft Grip Back Blow Safety Air Gun uses a small back blow nozzle to deliver a blast of air to effectively blow debris and liquids from inside small pipe or hose diameters, channels,

bores, holes, internal threads and other internal part features. The ergonomic design of the air gun keeps the operator's hand in a comfortable position so it can be employed for hours of continuous use without fatigue.

An array of holes on the Model 1004SS M4 Back Blow Air Nozzle provides a forceful back-facing 360° airflow to clear out coolant, chips and light oils from machining processes. The nozzle prevents chips from being blown further into a part, tube or pipe and eliminates any safety hazard created by blowing debris out the far end of a pipe or tube.

Air consumption is 4.5 SCFM at 80 PSIG with a low sound level of 75 dBA. The nozzle is manufactured to clean inside openings as small as 6 mm and up to 25 mm. It is constructed of type 316 stainless steel to provide durability and resistance to corrosion. The air gun with nozzle is OSHA and CE compliant.

Compressed Air Australia Pty Ltd

www.caasafety.com.au

NEW STANDARDS IN SPEED AND POWER

USB TYPE-C, USB PD AND USB 3.1 GEN 2



Bruce Rose, CUI Inc. for Digi-Key Electronics

'Faster, higher, stronger' goes the legendary Olympic hendiatrix, adapted now for the electronics industry as 'Faster, smaller, and easier to use': the rallying cry for a new standard in USB connectivity.

You may well have already seen a new generation of computing products in-store featuring the latest USB Type-C (USB-C) ports, a trend that is expected to increase significantly in the future due to USB-C's unique ability to transmit data, power and even audio over a single wired connection. According to market analyst ABI Research, we have already reached the tipping point for USB Type-C, with global shipments of smartphones equipped with this USB connector estimated to reach 830 million by 2021. At only 9 mm wide and 3.5 mm high, it is certainly smaller than its predecessors and allows equipment manufacturers to create even smaller devices. Its arrival on the scene is also perfectly timed to meet the requirements of emerging product groups, such as home automation, as well as IoT devices

such as smart sensors that fit seamlessly with this latest, smaller, less bulky connector package.

Ease of use

The cable for USB-C applications can be inserted by either end, and it can cope with the power required for a device such as a laptop, negating the need to carry around numerous cables for different uses.

This added versatility is facilitated with greater complexity inside the connector (Figure 1). To start with, it has more conductors. Unlike USB Type-A and Type-B connectors, which require four or five conductors, USB-C comprises 24 contacts which allow for bidirectional insertion, and support four power and ground pairs,



Figure 1: The USB-C connector specification is more exacting than the earlier standards. (Image source: CUI Inc.)

together with two signal pairs. In addition, its durability rating increases to 10,000 insertions, compared to 1500 for previous versions.

The power and ground pairs for USB-C are rated for voltages up to 20 V, as well as a current rating that is increased to provide an overall rating of 5 A, combining to transfer power up to 100 W across a single USB-C connection. What's more, each data-pin pair can manage data-transfer rates of up to 10 Gbps, meaning the connector has a total combined capability of 20 Gbps.

Latest USB-IF data and power specifications

The USB-IF's latest data and power specifications necessitate the significant increases in capability seen in USB-C, particularly within the USB Power Delivery (USB PD), USB 3.1 Gen 2 and recently finalised USB 3.2 high-speed data specifications:

- USB PD takes advantage of all four power and ground pairs to utilise the full 100 W power-transfer capability of USB-C.
- USB 3.1 Gen 2 utilises one set of data lanes to define a transfer rate of 10 Gbps.
- Likewise, USB 3.2 controls both sets of 10 Gbps data lanes to maintain transfers of up to 20 Gbps.

It is important, conceptually, to keep distinct the USB-C standard, which defines the physical connection only, from the USB PD and high-speed data (including USB 3.1 Gen 1/SuperSpeed and USB 3.1 Gen 2/SuperSpeed+, along with the USB 3.2) specifications.

For instance, even though the USB-C connector is designed to support the USB PD standard, a USB PD-compatible host controller is still necessary in order to negotiate and manage the power delivery to connected devices. In addition, the cable must be configured to support the standard.

There's more to USB PD than just an increase in power! It also facilitates bidirectional power delivery, giving users that much more flexibility in charging and powering their devices. On top of this, simultaneous power and data flow is now achievable due to USB PD's ability to perform power negotiation over the VBUS connec-

Specification	Max power	Max voltage	Max current
USB 2.0	2.5 W	5 V	500 mA
USB 3.0 and 3.1	4.5 W	5 V	900 mA
USB BC 1.2	7.5 W	5 V	1.5 A
USB Type-C 1.2	15 W	5 V	3 A
USB PD 3.0	100 W	20 V	5 A

Table 1: USB power delivery specifications.

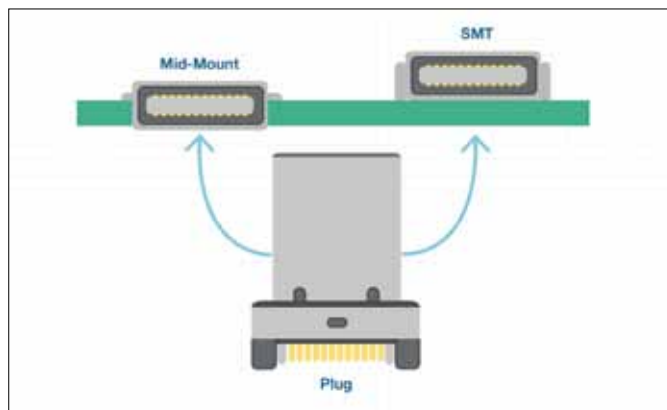


Figure 2: SMT and mid-mount USB-C connectors. (Image source: CUI Inc.)

tion rather than by using data connections. Table 1 shows how USB's transfer abilities have ramped up through recent generations.

When it comes to high-speed data specifications, USB 3.1 Gen 2 defines the data and power signals but does not specify the physical connection. This paves the way to be able to connect USB 3.1 Gen 2 equipment communicating up to 10 Gbps using legacy Type-A or Type-B connectors and cables, as long as these have sufficient current, voltage and signal integrity characteristics. By the same token, USB-C connectors can be utilised to supply legacy connection standards such as USB 2.0, using simple hardware adapters.

Making connections

Evidently, not all USB-C connectors or cable assemblies are created equal and superior quality products deliver greater performance, demonstrated as more reliable communication over longer cable lengths.

As well as taking into account the quality of materials and USB-C connectors selected for future products, designers have the option of two versions of Type-C receptacles (see Figure 2). Conventionally, standard SMT-mount receptacles are positioned on top of a PCB. However, this creates a situation where the total assembled height is the sum of the PCB thickness and the connector height. Alternatively, the mid-mount connector type can be fitted into a recess that has been machined into the PCB; while this allows for a lower overall assembly height, the mid-mount type does not allow for the opportunity to route signal traces under the connector.

Conclusion

USB Type-C connectors are rapidly gaining popularity in the consumer electronics world. To support this rising demand, electronic components manufacturer CUI offers a range of high-quality USB Type-C plugs and receptacles in both the SMT and the mid-mount types. These connectors are designed to support communication rates defined in USB 3.1 Gen 2 specifications, while serving designers' needs both now and in the future.

This piece was originally published in the Digi-Key Electronics Article Library and has been reproduced here with permission.

Digi-Key Electronics
www.digikey.com



SPECTRUM ANALYSERS

Rohde & Schwarz has launched two signal and spectrum analysers, the R&S FSV3000 and R&S FSVA3000, with different frequency models covering up to 44 GHz. Designed for high-speed performance in automated test systems, both devices interact with cloud-based processing.

The R&S FSV3000 is designed to help users set up complex measurements quickly and easily, with its high usability and measurement speed making it suitable for labs and production lines. It provides up to 200 MHz analysis bandwidth — enough to capture and analyse two 5G NR carriers at once.

The R&S FSVA3000, with up to 400 MHz analysis bandwidth, high dynamic range and phase noise of -120 dBc/Hz, meanwhile enables users to perform demanding measurement applications such as linearising power amplifiers, capturing short events and characterising frequency agile signals.

Both devices can measure EVM values better than 1% for a 100 MHz signal at 28 GHz. Together with the coverage of the 5G NR frequency bands up to 44 GHz, this makes them suitable for analysing 5G NR signals.

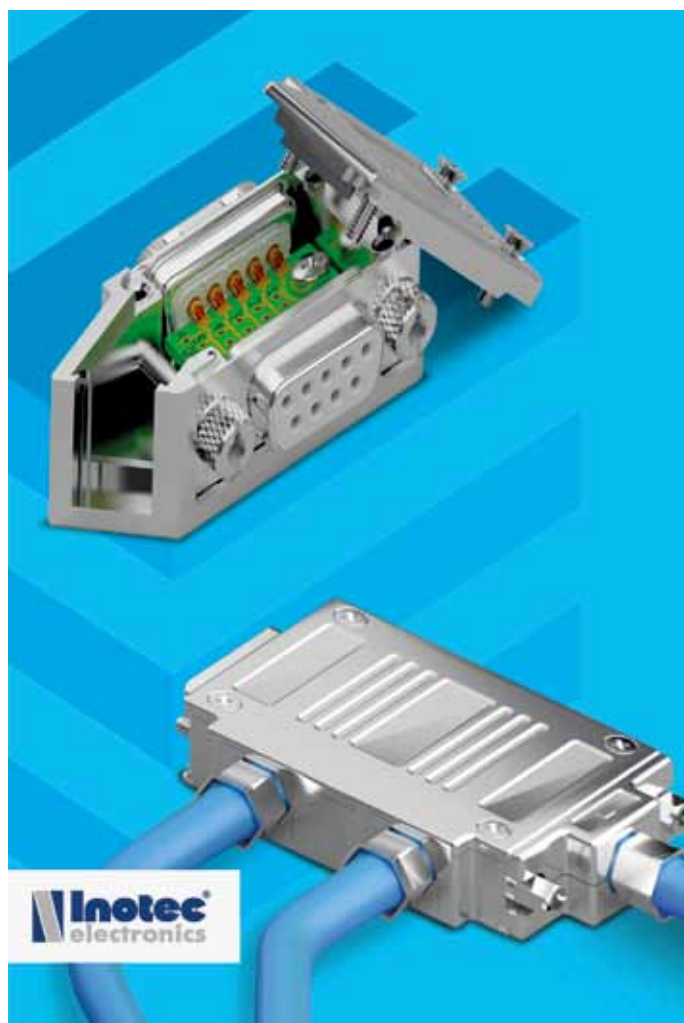
The spectrum analysers are designed to simplify troubleshooting rare events and set up complex measurements. With the event-based action GUI, whenever a predetermined event occurs the corresponding action, such as saving a screenshot or I/Q data, is performed.

Auto-measurements shorten the set-up time of the instrument itself. At the press of a button, parameters such as centre frequency, span and amplitude reference are automatically set based on the applied signal and, in the case of a pulse signal, the gate sweep parameters are set. For standard-compliant measurements, the auto-measurement feature selects the corresponding standard parameter table.

In scenarios with automated production lines with complex measurements, external computers can take over the control of the instruments via SCPI commands. The embedded SCPI recorder makes it easy to create executable scripts, since all manual input is translated into plain SCPI or into the syntax of common programming languages or tools.

The analysers provide a smart signal generator control that assists in RF measurement set-ups containing a signal generator from Rohde & Schwarz. Changes in the analyser settings are directly taken over by the generator, and the analyser can display the user interface of the generator so that users can operate the complete set-up from one screen.

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



WILL YOUR CONNECTIONS LET YOU DOWN?

Erntec presents Inotec: Germany's technological leader in EMI/RFI-shielding connectors, with the widest range of high-end, all-metal D-Sub adaptor hoods available. They're also screw-locked for a dependable interface between cable and end device in the harshest conditions. And the new DGA series is even more versatile, with applications including a junction box, diagnostic plug or mini-computer.

New M11 series adaptor hood.

- Extremely low-rise.
- Ideal as a space-saving diagnostic plug, piggy-back connector or gender changer.

New M30 series adaptor hood.

- Spacious interior.
- Accommodates complete circuits or complex cabling.

To make the connection, call Erntec in Australia or NZ, on +61 3 9756 4000, or email sales@erntec.com.au.

ERNTEC
ELECTRONICS TECHNOLOGIES



WE THINK
OUTSIDE
THE BOX.

DUAL-CORE WIRELESS MCUs

STM32WBx5 dual-core wireless microcontrollers (MCUs) from STMicroelectronics come with Bluetooth 5, OpenThread and ZigBee 3.0 connectivity combined with ultralow-power performance.

Fusing features of ST's STM32L4 Arm Cortex-M4 MCUs and in-house radio managed by a dedicated Cortex-M0+, the STM32WBx5 is power-conscious yet capable of concurrent wireless-protocol and real-time application execution. It is suitable for remote sensors, wearable trackers, building-automation controllers, computer peripherals, drones and other IoT devices.

Security features include Customer Key Storage (CKS), Public Key Authorization (PKA) and encryption engines for the radio MAC and upper layers. Security managed by the Cortex-M0+, including OTA secure firmware updates for application and radio stack, protects device integrity and intellectual property, ensuring easy, robust product management.

The MCUs have up to 1 MB of on-chip Flash and a Quad-SPI port for efficient connection to external memory, if needed. Additional features include crystal-less Full-Speed USB, a 32 MHz RF oscillator with trimming capacitors, a touch-sense controller, an LCD controller, analog peripherals and multiple timers and watchdogs. The balun for antenna connection is also integrated.

Leveraging ultralow-power technologies, the MCUs feature multiple power-saving modes including 13 nA Shutdown mode, adaptive voltage scaling and the adaptive real-time ART Accelerator to maximise energy efficiency and ensure long-lasting performance in self-powered applications. The integrated radio transmitter is optimised for high RF performance and low power consumption to maximise battery runtime.

The RF output power is programmable up to +6 dBm in 1 dB increments, and the MCU draws only 5.2 mA when transmitting at 0 dB. Receive sensitivity is -96 dBm for BLE communication at 1 Mbps. Designed for a link budget of 102 dB, the radio ensures robust communication over long connection distances and includes support for an external power amplifier.

STMicroelectronics Pty Ltd
www.st.com



WIRELESS CONNECTIVITY FOR MCUs

IoTize's line of TapNLink products for Bluetooth and NFC communication allow the user to take an existing MCU application that does not have wireless connectivity and add it using only two GPIO pins and without modifying the application's original firmware.

This approach is suitable for companies that are fast-tracking their wireless integration projects to meet users' changing expectations. The line is claimed to reduce design effort and risks by a factor of 10, speeding time to market of smartphone-based interfaces for product configuration, monitoring and control.

The line will help users including multinationals, SMEs and hobbyists bring a configurable solution to any project by adding Bluetooth and NFC communication to existing MCUs. Applications that would benefit from this instant wireless connectivity include factory machinery, control and monitoring, cable replacement, point-to-point data transfer, building automation, automated lighting, and inventory and tracking systems.

Digi-Key Electronics
www.digikey.com



DIGITAL I/O MODULE

The tZT-P4C4 ZigBee isolated digital I/O module, from ICP DAS, provides four channels for digital input and four channels for digital output, each of which features photocoupler isolation. It supports sink-type output with protection against short-circuiting and source-type

input. All input channels can be used as 16-bit counters. There are options for configuring power-on and safe digital output values, with 4 kV ESD protection and 3750 VDC intra-module isolation also provided.

Featuring the low power consumption of ZigBee modules, the series is capable of wireless communication of up to 300 m (LOS) standard transmission distance. Coupled with the product's dynamic mesh network, users can easily catch DIO data in difficult-to-wire environments.

The DIN-Rail mountable module supports AES-128 encryption for wireless communication (passive), RF channel 16-segment setting and the ZigBee repeater function. Other features include: ISM 2.4 GHz operating frequency; compliance with 2.4G IEEE 802.15.4/ZigBee 2007 Pro specifications; adjustable RF transmission output power; and GUI configuration software (Windows).

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



CORE ALIGNMENT FUSION SPLICER AND CLEAVER

The Fujikura FSM70S+ Core Alignment Fusion Splicer and Cleaver is suitable for various splicing needs, including applications with typical splice losses of 0.02 dB and 0.01 dB on single and multimode fibres respectively. It is available to rent from TechRentals.

The 70S+ Fusion Splicer enables simple manual operation with only four steps and automated tension test, wind and heater cover, 6 s ultra-fast splice time, 14 s heat time and 20,000 splicer result storage. It has Bluetooth connection capabilities and an automated wind protector.

The CT50 Cleaver accompanying the splicer is applicable for up to 12-fibre cleaving.

Its automatic cleaving blade rotates via wireless communication and has a blade life of up to 60,000 cleaves. It also has a wide cleaver opening angle, enabling easy fibre placement.

TechRentals

www.techrentals.com.au

DESIGN SOFTWARE

MathWorks has introduced Release 2019a of MATLAB and Simulink, containing important enhancements for artificial intelligence (AI), signal processing and static analysis along with more capabilities and bug fixes across all product families. The release enables engineers to quickly and effectively extend their AI skills, whether it's to develop controllers and decision-making systems using reinforcement learning, training deep learning models on NVIDIA DGX and cloud platforms, or applying deep learning to 3D data.

R2019a introduces the Reinforcement Learning Toolbox, further enhancing the MATLAB workflow for AI. The toolbox facilitates a type of machine learning that trains an 'agent' through repeated trial-and-error interactions with an environment to solve controls and decision-making problems. Enhancements have also been made to Computer Vision Toolbox, Data Acquisition Toolbox and Image Acquisition Toolbox.

Several signal processing and communications products are available to support wireless and electronics development, including Mixed-Signal Blockset, SerDes Toolbox and SoC Blockset. There have also been advances in the company's Polyspace static analysis family, including products that support enterprise-scale use for the design and development of safety- and business-critical software.

MathWorks Australia
au.mathworks.com

"Rigol offer Australia's Best Value DSOs"



**New
Lower
Prices!**

RIGOL DS-1000E Series

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

FROM \$379 ex GST



**FREE
OPTIONS
Bundle!**

RIGOL DS-1000Z Series

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

FROM \$579 ex GST



RIGOL DS-2000E/A Series

- ▶ 70MHz, 100MHz, 200MHz, 300MHz, 2 Ch
- ▶ 1GS/s & 2GS/s Real Time Sampling
- ▶ MSO & 25MHz In-Built Generator Versions

FROM \$912 ex GST



RIGOL DS-6000 Series

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

FROM \$8,461 ex GST

Buy on-line at www.emona.com.au/rigol

Sydney

Tel 02 9519 3933
Fax 02 9550 1378

email testinst@emona.com.au

Melbourne

Tel 03 9889 0427
Fax 03 9889 0715

Brisbane

Tel 07 3392 7170
Fax 07 3848 9046

Adelaide

Tel 08 8363 5733
Fax 08 8363 5799

Perth

Tel 08 9361 4200
Fax 08 9361 4300

web www.emona.com.au

EMONA



ESSENTIAL APPROACHES FOR SMT ASSEMBLY PROCESS CONTROL

No matter how SMT (surface mount technology) develops today, it's still core to essentially improving the quality and performance of assembled PCBs (printed circuit boards), which directly affects the reliability of electronic products. As far as an SMT assembly manufacturer is concerned, assembled product quality not only indicates the manufacturing standard of the factory, but also the capacity and potential of the electronics manufacturer.

To acquire top-quality assembled products, a rational and effective manufacturing quality process control plan has to be implemented together with the consideration of practical manufacturing. Therefore, process control for SMT assembly is playing a fundamental role in optimising the SMT assembly process. Effective process control is helpful in finding out any issue that may stop assembly manufacturing from smoothly running and minimising the failure rate of products, so that economic loss can be finally avoided due to disqualifications.

Although SMT assembly features a complicated PCBA process, its process control mainly occurs as part of the leading steps of the whole process; that is, printing, mounting and reflow soldering. So this article will talk about some approaches concerning those steps for SMT assembly process control. All the approaches are based on practical manufacturing experiences of the PCBCart factory.

Solder paste printing

IQC on PCB

IQC (incoming quality control) has to be carried out on each batch of PCBs even though they are fabricated under one roof.

The aspects to be inspected concerning PCBs prior to SMT printing include:

- checking whether deformation occurs in circuit boards;
- checking whether oxidation occurs in circuit board pads;

- checking whether scratches, disconnection or copper exposure occur on board surfaces;
- checking that the PCB surface is flat, smooth and uniform.

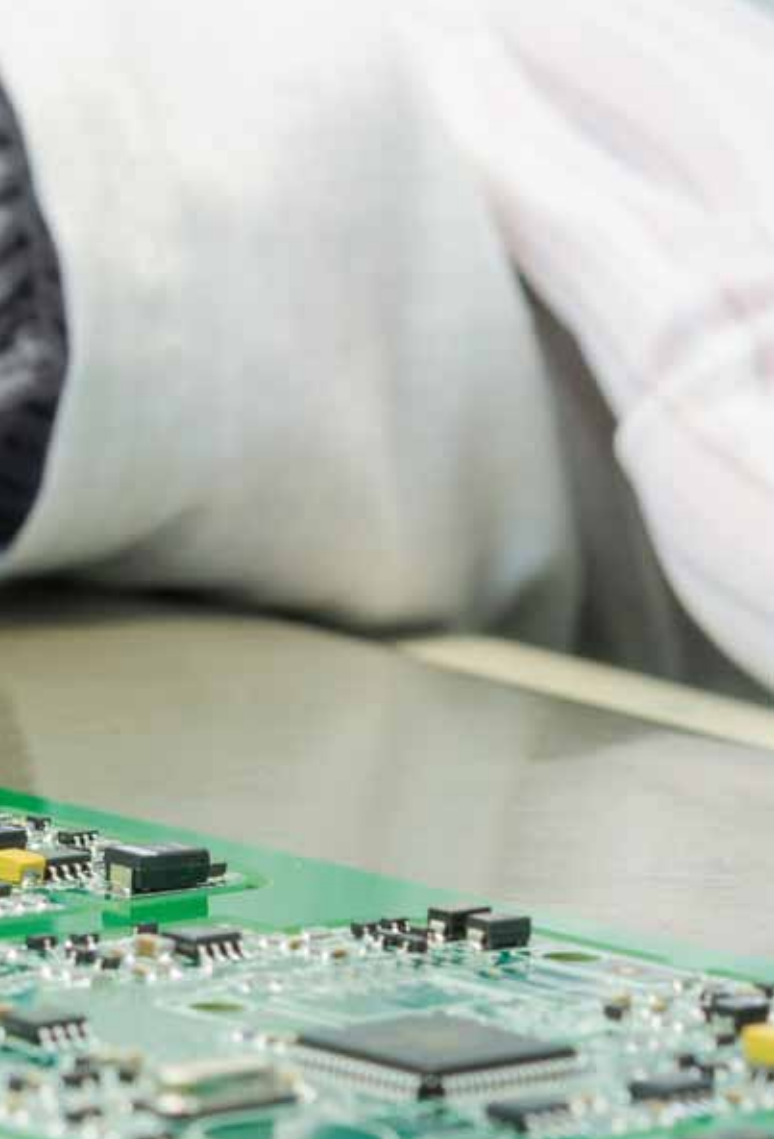
In the process of solder paste printing, the following aspects have to be taken into consideration to suitably deal with PCBs:

- Gloves have to be worn when catching circuit boards.
- Visual inspection should be implemented, with the distance between eyes and board being in the range of 30–45 cm and angle being in the range of 30–45°.
- Boards should be picked and placed with great care to avoid collision and falling, and they should never be stacked up or vertically placed to stop disconnection.
- Fiducial marks on board should be inspected to make sure complete matching occurs with location holes on stencil.

Application and administration of solder paste

In the process of solder paste application, the following regulations should be conformed to:

- The workshop environment should be controlled, with its temperature being approximately 25°C and relative humidity being in the range of 35–75%.
- Solder paste temporarily not in use should be far away from the manufacturing line in order to avoid using it mistakenly.
- If newly opened solder paste is used with 'old' solder paste, they should be mixed at a ratio of 3:1.



The storage of solder paste is similarly important and the following aspects should be noted:

- Validity of solder paste should be strictly monitored and expired solder paste mustn't be used.
- Solder paste should be kept in fridge when it is not used.

Process control measures during printing

To guarantee the quality of solder paste printing, the following process control measures should be observed:

- The printing part should be complete. If it is not, parameters should be modified on the circuit board, stencil and printing blade.
- Bridging mustn't be seen on printing.
- Printing thickness should be uniform. If it is not, the strength of the scraping blade should be modified.
- The pad has to be inspected to ensure whether a turned-down edge is available or not. If it is, stencil holes should be checked to ensure they are not blocked.
- The printing effect should be inspected to see whether deviation occurs or not. If there is deviation, the stencil location should be modified.

In addition, the stencil should be cleaned to stop flux from being dried on the stencil and blocking the stencil holes. When it comes to electronic products that have to strongly vibrate in practical application, solder paste thickness should be modified to guarantee solderability and reliability of products.

Chip mounting

As a key device in the SMT assembly manufacturing process, a chip mounter is capable of sticking SMDs (surface mount devices) to corresponding pads on PCBs. Therefore, high accuracy is required in this step, which is especially true for material supply, programming, testing and assembly.

Process control measures during chip mounting

- **Measure #1:** All SMDs have to be completely correct, which is compatible with design files.
- **Measure #2:** A control instruction signal and its editing procedure have to be implemented with high accuracy. Additionally, corresponding data has to conform to the chip mounter program manual.
- **Measure #3:** The assembly between SMDs and component supplier should be as accurate as possible to stop errors from repeatedly occurring.
- **Measure #4:** Debugging should be accurately implemented on the chip mounter before assembly manufacturing and defects have to be suitably dealt with during SMT assembly procedure.

Process control measures after chip mounting

Chip mounters feature a complicated structure, containing a transmission mechanism, servo system, recognition system, sensors, etc. Defects tend to be caused during SMT assembly process; their solutions are provided below.

- **Solution #1:** The working order and logical relationship between transmission parts of the chip mounter should be analysed.
- **Solution #2:** The location, link and extent of the defect in the process of SMT assembly running should be known and different defects can be classified and recognised through bizarre sounds.
- **Solution #3:** The operating process should be clarified prior to defects.
- **Solution #4:** Defect occurrence location should be clarified.

As high-precision electronic manufacturing equipment, a chip mounter has to load a huge amount of SMT assembly mounting. A maintenance schedule has to be made in order to keep the equipment in a good state in order to better run.

Reflow soldering

Reflow soldering aims to attach SMDs to a PCB board through heat convection. As the temperature rises, solder paste connecting components and pads begins to be melted. As the temperature cools down, the solder paste will be cured with components permanently stuck to the board.

Process control requirement for reflow soldering in SMT assembly include:

- Appropriate temperature curve for reflow soldering should be set and real-time test needs to be made.
- Soldering should be implemented in accordance with the soldering direction regulated in PCB design files.
- Vibration should be avoided in the process of soldering.

To testify the performance of reflow soldering, the following aspects can be used as a reference:

- The soldering part of the component should be complete.
- Soldering joints should feature a smooth surface.
- Solder joints should be in a semilunar shape.
- The surface of the circuit board should be free of soldering balls and residues.
- Bridging and pseudo soldering should not be available.

PCBCart
www.pcbcarts.com



CURVED TOUCH MONITORS

Advantech has introduced its first 43" UHD curved touch monitor, the CRV-430 series. The series features a bright 4K2K resolution screen capable of 10-point multitouch and displaying over 1 billion colours.

Within the series are two curvature options: J type (800 R) and C type (1500 R). Soon to be available in a 55" size, the CRV-430 series is built to an industrial-grade standard and is durable, comprising long-life parts and 4 mm-thick, 6H hardness protective glass. With a fully flush finish, the monitors have a contemporary look and are easy to clean.

The series offers multiple signal interfaces including VGA, HDMI 1.4, HDMI 2.0 and DisplayPort. It has been designed with TRIPTIC technology, which uses a powerful UHD scaler and custom firmware that is able to combine up to three separate video sources to fit onto customer-defined zones on the target display.

The series supports colour adjustment and gamma setting via OSD, improving the colour performance of the display on AD boards. Each CRV-430 unit is a plug-and-play device, compatible with all leading OS including Windows, Linux, Android, UNIX, iOS and more. LED strip customisation is also available to make the user's applications stand out.

The series provides a high-quality visual experience, making it an optimal solution for gaming and digital signage applications.

Advantech Australia Pty Ltd
www.advantech.net.au

VECTOR SIGNAL GENERATORS

Keysight Technologies' VXG micro-wave signal generators are designed to address demanding wideband millimetre-wave (mmWave) applications for 5G and satellite communications by decreasing test set-up complexity and reducing path losses introduced in over-the-air (OTA) test environments.

The microwave signal generators deliver an optimised 5G NR test system set-up leveraging dual-channel 44 GHz vector signal generation with up to 2 GHz RF modulation bandwidth, and phase-coherent capability in a single test instrument. They offer low OTA test system path loss, resulting from what is claimed to be the industry's highest output power versus error vector magnitude (EVM) and adjacent channel power ratio (ACPR) performance. They are also said to accelerate product development through integration with Keysight's PathWave Signal Generation, a software suite with access to a wide range of evolving standards-compliant 3GPP 5G NR signals for testing base stations, mobile terminal transmitters and receivers.

The VXG signal generators offer designers and manufacturers of wireless equipment a wide range of features, including high RF performance that optimises measurement integrity and minimises uncertainty for wide bandwidths at mmWave frequencies; a graphical user interface for 5G NR that delivers a streamlined experience when creating standard-compliant test signals; and a user-centric interface — multitouch and modular — that delivers identical performance while addressing the specific needs of R&D and manufacturing environments.

Keysight's 5G waveform generation and analysis testbed solution leverages the VXG micro-wave signal generator's enhanced capabilities for 5G development teams to efficiently validate designs across both frequency range 1 (FR1) and frequency range 2 (FR2) as defined by 3GPP. The testbed solution addresses the challenges of 5G NR conformance test.

Keysight Technologies Australia Pty Ltd
www.keysight.com



DIN RAIL ADAPTERS

The universal DIN rail adapters from Phoenix Contact offer a high level of flexibility in tight spaces. The single-piece housings snap into place on the DIN rail quickly and easily.

Versions with RJ45, SC simplex, LC duplex and MTP connections are available for data transmission with copper conductors and fibre-optic lines. Across a width of 18 mm, the DIN rail adapters provide space respectively for one connection module; one optional overall shielding braid; one security mounting frame for the RJ45 module (layer 1 security); and one terminal marking for marking the connection module.

Phoenix Contact Pty Ltd
www.phoenixcontact.com.au

HANDHELD SPECTRUM ANALYSER

Anritsu has introduced the Field Master Pro MS2090A RF handheld spectrum analyser. With high continuous frequency coverage up to 54 GHz, real-time spectrum analysis bandwidth up to 100 MHz and a ruggedised design to withstand the demands of field test, the product is suitable for a range of current and emerging field applications, including 5G, broadcast, regulatory compliance, aerospace/defence, satellite systems and radar.

A good test tool for the rollout of 5G New Radio (5G NR), the Field Master Pro MS2090A supports 5G NR demodulation, including cell ID, beam ID, RSRP/RSRQ, SINR and EVM in all 5G bands (sub-6 GHz and millimetre-wave).

3D indoor and outdoor coverage mapping for 5G NR allows wireless professionals deploying 5G NR to conduct more accurate measurements than conventional instruments using 2D data. This ensures 5G NR networks meet performance specifications both indoors and outside.

Real-time spectrum analysis spans up to 100 MHz are possible for interference monitoring in the cellular bands or full ISM band. A spectrogram display and low noise floor make it easy for field technicians and engineers to conduct RF spectrum monitoring and locate intermittent or interfering signals.

The high performance of the Field Master Pro MS2090A makes it suitable for general spectrum analysis applications. Integrated channel power and occupied bandwidth (OBW) measurements simplify the characterisation of common radio transmissions.

The large 10" colour touchscreen allows users to swipe and scan across the frequency range, or pinch and zoom to quickly view signals of interest.

Anritsu Pty Ltd
www.anritsu.com



WE'LL LOOK INTO EVERY ASPECT TO FULFIL YOUR VISION.

Some of our clients know precisely what they want in an enclosure. For everyone else, we invite you to bring the vision of what you're trying to achieve and we'll think outside the box to outperform your expectations.

If you think your electronics need a box, a rack, a package or an enclosure from the size of a matchbox to the size of a fridge, think Erntec.

Call us on +61 3 9756 4000
or email sales@erntec.com.au

ERNTEC
ELECTRONICS TECHNOLOGIES



WE THINK
OUTSIDE
THE BOX.



2-CHANNEL ISOLATION TRANSCEIVER FOR RS485

MORNSUN has announced the TDx22D485H-A series 2-channel 485 isolation transceiver module, to assist fast signal response in industries including power grid, industrial control, transportation and instrumentation. The main function of the series is to convert a logic level signal into isolated RS485 differential level signals.

The special integrated IC technology of the RS485 transceiver achieves isolation between the power supply and the signal lines isolation, enables RS485 communication and protects the bus all in one and the same module. The transceiver adopts MORNSUN's fixed input R3 technology by applying an independent oscillator instead of the Royer circuit, integrating internal discrete components. This is better suited to full dynamic load applications, according to the company, and is designed to increase the communication reliability of products.

Product advantages include: a high baud rate up to 120 Kbps; 2-channel isolation, supporting full-duplex communication mode; and highly integrated internal construction.

The product's isolated power supply withstands a test voltage of up to 3000 VDC. In addition, the product features an automatic switching function that no longer requires the need to pass through the node to send and receive control signals; this reduces design complexity. It can easily be embedded in the end-user's equipment, to achieve fully functional RS485 network connections.

Other features include: an integrated, high-efficiency isolated DC/DC converter; three-port isolation of 2.5 kVDC; an operating temperature range of -40 to +85°C; and ESD protection, complete EMC recommended circuit. The bus is able to support a maximum of 32 nodes.

DLPC Pty Ltd
www.dlpc.com.au



Who the #?!&*% is...

ELF electronics

- Operating since 1980.
- Contract manufacturer, UL compliant, with engineering capability.
- Your products may change but your contract manufacturer doesn't have to.

How to find a reliable contractor!

Team up with us for the long haul.

- We create a quality plan for every product we make for you.
- Contact us for a free quote.

1300 367 353 www.elfelectronics.com.au



POWER OVER ETHERNET SWITCHES

The SPIDER III range of switches from Hirschmann has expanded to include Power-over-Ethernet (PoE) options, enabling fast data transfer over long distances.

The PoE editions include PoE+ support as well as options for fibre ports in a single device. The units come with a power budget of 120 W, which includes up to 8 PoE+ ports each with a capacity of 30 W per port.

With Jumbo frames support for CCTV applications and DIN rail mounting support, the range can be powered by 12–57 VDC and can withstand harsh environmental conditions due to its IP30 metal enclosure. It is suitable for use across a variety of sectors and applications, especially automation environments that require reduced cabling.

Control Logic Pty Ltd
www.controllogic.com.au

THE POSITIVE OUTCOMES OF ANTISTATIC FLOORING



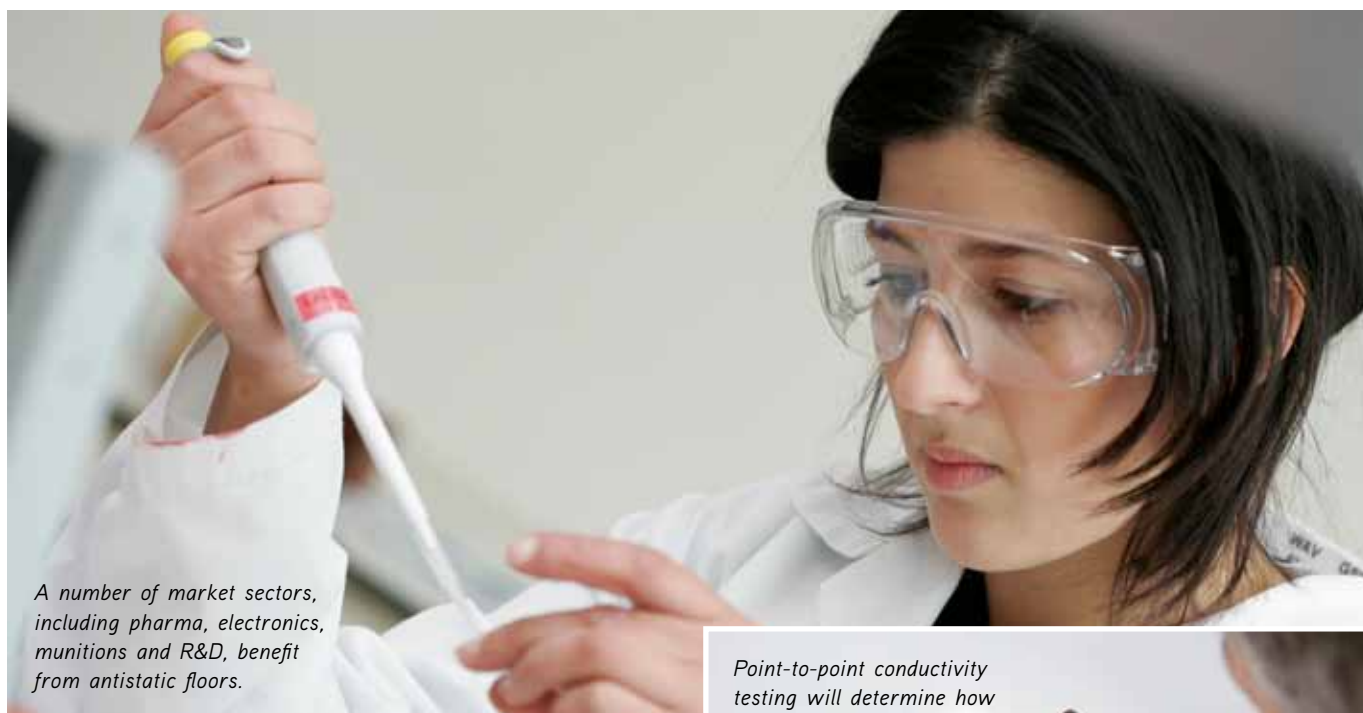
State-of-the-art technology can achieve incredible things — but only if each and every delicate component and piece of equipment is protected from a wide range of issues.

While viruses and physical impacts might seem like a more immediate threat, sensitive circuitry can just as easily be ruined by a single touch from one statically charged finger.

In fact, many components can be destroyed by a discharge of only 300 V; however, one person walking across the floor can quickly generate up to 3000 V! This voltage is built up through a process called triboelectric charging, which basically means that when someone moves on a floor they build up a negative charge and if the person is not insulated then this charge increases the more they move around.

If the charge is large enough, then when an earthed object nears the charged object the charge will jump through the air to go to earth. This results in a spark, which if a person is the earthing object will be experienced as a mild static shock; however, if it is a piece of equipment that the charge has gone through then it could just have been irrevocably damaged.

This obviously has significant implications for anywhere that relies on delicate computer equipment, such as data warehouses, R&D sites, clean rooms and laboratories. It's a particular problem for the electronics manufacturing industry, which loses significant sums of money every year in damaged goods and broken equipment.



A number of market sectors, including pharma, electronics, munitions and R&D, benefit from antistatic floors.

For some sectors, static electricity poses an even more dangerous risk — if there are any explosive substances, gases, vapours, fogs or dust present then a small electrostatic discharge can be an ignition source. This is often the case with environments such as munitions manufacturing, hyperbaric chambers, oil and gas facilities and military installations.

How an antistatic floor works

To avoid this problem, antistatic floor finishes can be installed that actively remove any charge being built up in a person and safely take it away to an appropriate earthing point.

Antistatic floors are ordered into categories depending on how quickly electricity can move through them, a property which is measured in ohms. Surfaces with the least resistance are defined as conductive, dissipative floors that allow electricity to flow through at a controlled speed and the most resistant floors are called insulative.

Antistatic floors work by incorporating specialist conductive materials that take away any charge a person has built up as soon as their foot comes into contact with the coating. This contact kicks off a chain reaction that results in the charge being safely removed down through the floor and away from the sensitive working environment.

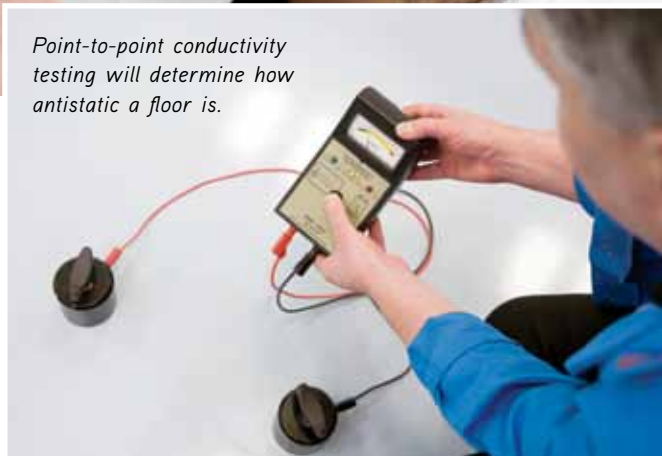
Next, the charge hits a conductive primer that has been filled with carbon to ensure a very low level of resistance. Finally, the charge goes into a copper tape buried under the floor coating which is connected to a safe earthing point.

It's important to bear in mind that this is an ideal scenario and in practice there may be more or fewer steps. For example, it is possible to create a floor that removes static charge without using copper tape; however, it won't be as conductive as a floor that does.

Some points about earthing points

One thing that the floor definitely needs is the earthing point — without this the floor cannot be considered antistatic, as charges that go into it will simply build up. In practice, an earthing point is usually a highly conductive metal rod driven deep into the building's slab; however, other options could include using the building's steel beams or using a plug socket.

Point-to-point conductivity testing will determine how antistatic a floor is.



Typically, one earthing point per 200 m² should be sufficient, but the exact requirements need to be specified by an electrical engineer to ensure that the resistance measurements are appropriate.

To determine if the floor is up to the task at hand, its electrical resistance should be tested at each stage of the application. The BS EN 61340-5-1 standard includes a method for determining the resistance of a floor through point-to-point conductivity testing. The result of this will determine whether the floor can be categorised as conductive, dissipative or insulative.

When testing the floor, it is best to move the contact points around to ensure that a footprint-sized space has been checked, as this is the practical contact area through which any charge held by a person will be transferred.

Making sure that a floor finish meets a site's antistatic needs requires an understanding of the location's operational activity, how the floor build-up works to remove this threat as well as the role that other factors such as testing and personnel clothing play.

To get a full picture of all of these factors and how they interact, it is important to talk through the flooring specification and materials with the manufacturer and contractor to ensure that the final coating will provide the required standard of conductivity.

To discuss a specific antistatic flooring project in more detail, get in touch with Flowcrete's expert team.

Flowcrete Australia
www.flowcrete.com

BRUSHLESS DC SERVOMOTOR

FAULHABER's 1645 ... BHS brushless DC servomotor features a short response time, high speed and large permissible radial load. It is a more compact version of the BHx series, measuring 45 mm long. The powerful BLDC motor is also characterised by low vibration and heat development.

The BHx series consists of gapless, brushless high-performance motors with 2-pole technology and a diameter of 16 mm. At 100,000 rpm, the 1645 ... BHS version is claimed to reach a higher speed than similar-size motors on the market. It also features high maximum radial load (18 N), power density (58.5 W) and torque (8 mNm). In combination with a suitable planetary gearhead, the motor is capable of delivering a high torque of 800 nNm at 12,000 rpm.

At 90% efficiency and with minimal heat development and vibration, the motor is energy efficient. Its short response time is due to low mechanical start time constant and rotor inertia values as well as its fast angular acceleration. In conjunction with the flat slope of the n/M characteristic curve (429 rpm/mNm), this yields the motor's optimal running behaviour, which is thus capable of keeping up with fluctuating output requirements with no delay.

Digital Hall sensors are built in. An integrated incremental sensor is optionally available. A wide range of connecting components is available for different applications, from speed and motion controller through to control and gearhead.

The motor's rugged, compact design and good performance data make it particularly suitable for demanding applications that offer little space. Typical uses are electric grippers, small handpieces, robotic systems, lab automation and mechatronic instruments of all types.

ERNTEC Pty Ltd

www.erntec.net



Microcontrollers That Do More for Real-Time Control Systems

Robust, Real-Time Control With the PIC18F Q10 Family

Designed to tackle any real-time control task you can invent, the PIC18F Q10 family of microcontrollers (MCUs) enables deterministic response time and hardware customization in applications ranging from power sequencing to process control monitoring. On-chip Core Independent Peripherals (CIPs) can be easily configured to automate control loops for a robust and reliable system response. This family of microcontrollers is well-suited for a broad range of applications including industrial control, consumer, automotive, capacitive touch sensing and Internet of Things (IoT). The Q10 family seamlessly integrates with Microchip's development ecosystem for a stress-free design experience that lets you focus on turning your ideas into reality.

Key Features

- Optimized for robust, real-time control applications
- Create custom application-specific logic functions
- Reduce CPU overhead with on-chip Core Independent Peripherals
- Rapid code development with MPLAB® Code Configurator



Contact Information

Microchip Technology Australia Email: aust_nz.inquiry@microchip.com Phone: +61 (2) 9868-6733

microchip.com/PIC18FQ10Family

The Microchip name and logo, the Microchip logo and MPLAB are registered trademarks of Microchip Technology Incorporated in the U.S.A. and other countries. All other trademarks are the property of their registered owners. © 2019 Microchip Technology Inc. All rights reserved.





MEMS CHIP

The STMMicroelectronics LIS2DTW12 combines a MEMS 3-axis accelerometer and a temperature sensor on a single die for use in space-constrained and battery-sensitive detectors such as shipping trackers, wearables and IoT endpoints. The sensing accuracy of 0.8°C offers precision comparable with standalone standard temperature sensors.

In addition to enhanced temperature compensation, the accelerometer benefits from flexibility, with 65 different user modes that enable developers to optimise power consumption and noise to meet application-specific requirements. It has user-selectable full-scale range up to $\pm 16g$ and measures acceleration with output data rates from 1.6 to 1600 Hz.

With a low package height of just 0.7 mm, the device allows extra battery capacity for long runtimes. Power-saving features let devices go even further between charges, and include a 50 nA power-down mode, multiple operating modes down to less than 1 μA , a dedicated internal engine for processing accelerometer signals and a large 32-level FIFO to reduce intervention from the main controller.

The product provides 16-bit accelerometer data and 12-bit temperature data through a high-speed I²C/SPI port and allows single data conversion on demand. The motion engine performs free-fall and wakeup detection, single/double-tap recognition, activity/inactivity, stationary/motion detection, portrait/landscape detection and 6D/4D orientation. ST's self-test capability is also built in to verify the sensor is functioning correctly.

The device is specified from -40 to +85°C and available now in the ultrathin 2 x 2 x 0.7 mm LGA-12 plastic land grid array package.

STMicroelectronics Pty Ltd
www.st.com



EMBEDDED CONTROLLER

Backplane Systems Technology has announced the arrival of the POC-500 series ultracompact embedded controller, with good I/O design, ruggedness and powerful CPU/GPU for versatile applications.

The POC-500 series is a set of next-generation ultracompact embedded controllers, offering high performance in a compact form factor. Featuring an AMD Ryzen Embedded V1000 4-core/ 8-thread processor, the POC-500 delivers up to three times the CPU performance of prior POC series models. As for GPU performance, it delivers 3.6 TFLOPS in FP16 — previously not achieved in an ultracompact form factor embedded controller, according to the company.

Continuing the DIN-rail mounting mechanical design trend of previous POC series models, the product offers a wealth of front-accessible I/O. Measuring 63 x 176 x 116 mm, it has 4x PoE+ ports, 4x USB 3.0 ports and 4x COM ports. All data ports come with a screw-lock mechanism so that cables are always secured.

The POC-500 series models are available in two CPU variants: the V1807B (45 W) variant is for high computing power demand, while the V1605B (15 W) variant is designed for rugged fanless operation.

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



BUCK REGULATOR

The PI358x series is the latest addition to the Vicor 48V ZVS Buck Regulator portfolio, offering a GQFN package option for the existing LGA and BGA system-in-package (SiP) products.

The product's ZVS topology enables 48 V direct-to-PoL without sacrificing performance. With step-down regulation from a higher

voltage source, engineers can deploy more efficient power distribution architectures, reduce I²R losses and eliminate inefficient intermediate conversion stages.

Operating from 30 to 60 V_{IN}, the device regulates an output voltage ranging from 2.2 to 14 V and delivers an output current delivery up to 10 A. Power delivery can be further increased by using single-wire current sharing without any additional components.

The series is designed for a wide range of applications leveraging higher voltage distribution, including telecom, network infrastructure, data centre, industrial, battery and lighting applications.

Vicor Corporation
www.vicorpower.com



EMI RECEIVER

Keysight Technologies has announced the addition of time domain scan (TDS) and real-time scan (RTS) capabilities to the Keysight N9048B PXE electromagnetic interference (EMI) receiver, enabling real-time measurements and diagnostics for fast electromagnetic compliance (EMC) certification.

EMC testing requires detailed and exacting methodologies to ensure that all emissions are properly measured. Long test times impact test facility availability and reduce the number of devices that can be certified. It's also easy to miss

intermittent disturbance signals with conventional scan mode, since long dwell time is required at each frequency. The TDS and RTS capabilities in the N9048B PXE EMI receiver enable independent compliance test laboratories, as well as in-house self-certification labs, to shorten overall test time and easily perform gapless signal capture and analysis, certifying that a product meets regulatory compliance standards.

Featuring three frequency ranges up to 26.5 GHz, the receiver delivers high-sensitivity performance allowing detection of small signals close to the noise level, common in radiated emissions measurements; full compliance with CISPR 16-1-1:2015 and MIL-STD-461G (2015), ensuring devices comply with worldwide and regional standards; TDS and accelerated TDS capabilities to meet dwell measurement requirements while reducing receiver scan and test time from multiple hours to seconds; and full signal visibility, where the RTS provides gapless signal capture and analysis in up to 350 MHz bandwidth and simultaneously displays the frequency domain, time domain and spectrogram, with three EMC detectors.

Keysight Technologies Australia Pty Ltd

www.keysight.com

NEW GENERATION PCB Prototyping Machines

- Integrated vacuum table and 20 tool change positions
- Full automatic operation
- Camera-controlled fiducial recognition and milling width monitoring
- Automatic copper and material thickness measurement

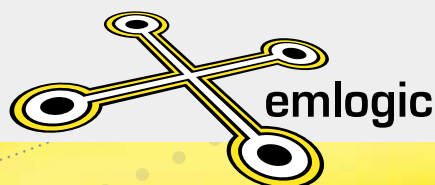


Call us today: **+61 2 9687 1880**

Embedded Logic Solutions Pty Ltd

✉ sales@emlogic.com.au

emlogic.com.au





DIGITAL MULTIMETERS

Fluke Calibration has introduced two long-scale precision digital multimeters, both of which offer long-term stability over a wide measurement range.

The 8588A Reference Multimeter, designed for calibration standards laboratories, is said to hold the industry's best one-year DC voltage accuracy and produces a stable 8.5-digit reading in one second. With more than 12 functions, the digitising multimeter helps consolidate a lab's cost of test into a single measurement instrument.

The 8558A 8.5-Digit Multimeter digitises five million readings per second, for high-resolution system automation in calibration labs and manufacturing test environments. It further supports a minimum of 100,000 readings per second at 4.5 digits across GPIB, USBTMC or Ethernet, and a 15 million reading data storage in the instrument memory, allowing full flexibility to make timely and correction decisions for system throughput and efficiency.

The instruments offer a straightforward, intuitive user interface and colour display with an easy-to-access configuration menu that makes it easy to train users. A graphical display allows easy visualisation of trends, histograms, complex waveforms and statistics. Repeatable system-specific tasks can be automated quickly and easily. Fast, high-resolution data capture delivers the quantity and quality of information needed for increased productivity and fast access to results and answers.

The products work with Fluke Calibration MET/CAL Calibration Software, in 8508A emulation mode, allowing increased throughput while ensuring calibrations are performed consistently every time. This powerful software documents calibration procedures, processes and results for ease in complying with ISO 17025 and similar quality standards.

Fluke Australia Pty Ltd
www.fluke.com.au

FRONT-END MODULE

Designed for Internet of Things (IoT) systems based on Wi-Fi 6, the QPF4528 front-end module (FEM) from Qorvo offers a compact form factor and integrated matching to minimise layout area in applications such as wireless routers, set-top boxes and access points.

The FEM integrates a 5 GHz power amplifier (PA), regulator, single-pole double-throw (SPDT) switch, low noise amplifier (LNA) with bypass mode, RF coupler and voltage power detector into a single device. The product is designed to boost linear power transmission without increasing power dissipation, enabling higher-performance Wi-Fi 6 (802.11ax) enterprise access points in smaller form factor designs.

The FEM allows up to 8x8 multiple-input multiple-output (MU-MIMO) in both conventional and Power over Ethernet (PoE) systems, which is said to enable fewer access points, enhanced capacity and efficiency, and improved speed across enterprise systems. The device is also optimised to solve thermal challenges in Wi-Fi equipment designed for MU-MIMO environments.

Mouser Electronics (Hong Kong) Ltd
www.mouser.com



We Stock 1000's of Plastic Parts for Industry

- Nylon Fasteners
- Screws & Nuts
- Washers & Spacers
- Rivets & Clips
- PCB Hardware
- Caps & Plugs
- Knobs & Handles
- Hole Pugs & Bushes
- LED Mounts & Light Pipes
- Cable Ties & Mounts



Available from Hi-Q Electronics Limited

sales@hiq.co.nz

NZ 0800 800 293

www.hiq.co.nz

Hi-Q[®]
components

FIRST 400 VDC COUPLER SYSTEM ACCORDING TO IEC

SCHURTER launches the first UL approved IECTS 62735-1 connector system, GS21 socket-outlet and GP21 plug. Rated up to 400 VDC, the connector system is designed to enable a worldwide standardized approach to DC power distribution in data centers.



The cost-intensive, failure-susceptible and wasteful transforming of AC to AC or AC to DC conversion can be avoided with a complete DC power architecture. From source to load, a DC architecture improves the overall quality of the power being supplied by virtue of its design. Problems with harmonics and harmonic distortions are eliminated. There is no longer the need for phase compensation, or coupling synchronization to different sources and networks, thereby increasing operational reliability and improving efficiency.

In the digital age, vast quantities of DC-powered devices are increasingly common. DC-powered consumer electronic devices, for instance, have enabled smaller designs with increased functionality, while reducing costs and increasing reliability. Similar demands are becoming prevalent in areas such as large-scale communication infrastructures, electric vehicle charging, and lighting to name a few. The emergence of industrialized demand for a worldwide common approach to DC power systems is therefore driving the establishment of standards.

Safety is key. The new IEC TS 62735-1 standard for DC power distribution requires a more complex design than traditional AC connector systems outlined in the IEC standard 60320. The DC connector systems must be designed considering the increased potential for arcing when disconnecting the DC power supply

under load. The next generation standard IEC TS 62735-2, for the development of a DC connector system rated up to 5.2 kW, will require additional structural elements, referred to as a safety interlock (cold switch). The GP21/GS21 has a permissible operating temperature range of -5°C to +105°C.

The GP21 rewirable plug accommodates a cable cross-section of between 0.75 mm²/18 AWG and 1.5 mm²/16 AWG. The GS21 socket-outlet offers mounting options for 1.5 mm or 2.0 mm panels. Terminals are quick connect 6.3 x 0.8 mm or PCB. Appliance-side DC components, according to IEC TS 63236, are also in development and expected to be released in 2021, when the standard is expected to be published.

To increase operational safety, SCHURTER will also be equipping its 2.6 kW coupler set with a cord retaining system. Appliance-side DC components, such as inlets and cord connectors, are being standardized in IEC TS 63236. This standard is currently in the draft phase.

For more information, view the product video:

<https://www.youtube.com/watch?v=LK4ClrAATfo&t=13s>

SCHURTER (S) PTE LTD
www.schurter.sg

SCHURTER
ELECTRONIC COMPONENTS

FREE EXHIBITION ENTRY



**COMMS 2019
CONNECT**

Events for critical communications users and industry

SYDNEY

ROSEHILL GARDENS | 12-13 JUNE 2019



Public Safety | Transportation | Utilities | Government | Enterprise

SPEAKERS INCLUDE



STEVE HWANG
Operational chair,
Korea SafeNet forum



HEIKKI RIIPPA
Senior Advisor
Suomen Erillisverkot
Oy Authority



EDWARD PARKINSON
Acting CEO
First Responder
Network Authority



**STATION OFFICER
GRAHAM TAIT AFSM**
Operational Communications
Systems Officer
Fire & Rescue NSW



MARY EGAN
National PMO Lead
Public Safety Mobile
Broadband
NSW Telco Authority

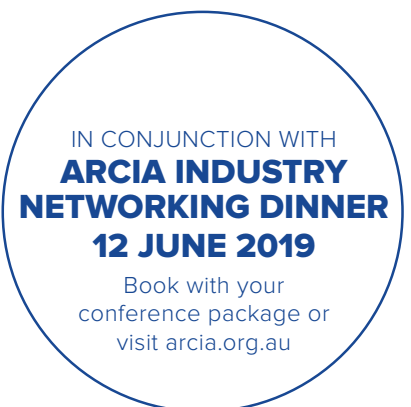
PLUS

500+ users and industry experts | 40+ exhibitors | 40+ speakers | 3 training workshops
Finnish critical communications stream — NEW | IoT Alliance Australia stream — NEW

TRAINING WORKSHOPS

included in conference package

- Sensors, smart cities and the implications for critical control rooms
- Critical communications standards supporting a multivendor and interoperable environment for all mission- and business-critical sectors
- ARCIA Professional Development Training workshop — multicoupling and filtering



Networking
Drinks Sponsor



Media Partner



Association Partner



Supporting associations and media organisations



For more information or to register visit www.sydney.comms-connect.com.au

3 CHALLENGES FOR ORGANISATIONS TACKLING DATA SCIENCE

David Willingham, Senior Application Engineer – Data Analytics

As data science continues to grow and evolve, new challenges are cropping up that companies must address as they move projects forward. From new technology to workflows, we outline three of the more common problems and how businesses can overcome them.

Learning curve for new technology

Challenge: The pace of innovation in the data science space is very fast, and each new piece of technology has its own learning curve. In many cases, the original technology is developed by computer scientists, with the intended audience also being someone with very strong programming skills. These software packages are implemented in many different programming languages, so the learning curve is very steep for those who do not write code full-time.

Solution: Engineers and scientists who do not program full-time should look for tools that enable them to get up and running quickly, preferably within computational platforms that they're already familiar with. Point-and-click apps like those found in MATLAB can serve as an easy starting point for learning the technology. Beyond that, a programmatic interface is typically required to fine-tune analytics to improve robustness and accuracy. Mature programming tools will have consistent APIs that make it easy to swap in different data science techniques.

Engineer or data scientist: who does what?

Challenge: Organisations are trying to determine 'who is the right team to do this work?' While data scientists often have strong backgrounds in machine learning, they are often new to or unfamiliar with the ins and outs of the business and its products. Engineering and science groups have knowledge of the business and its products but may not be experienced with machine learning.

Solution: A common compromise is to pair up engineers who have domain knowledge with data scientists to leverage each of their strengths, but this may not be possible in many cases because there are far more domain experts than data scientists. Another solution is to adopt tools that simultaneously lower the bar for machine learning (for the domain experts) and provide flexibility and extensibility (for the data scientists). In practice, this means

adopting a tool that has both a graphical interface (ie, apps) and a programming language, as well as the capability to integrate with a variety of other tools.

Where does an analytic end up?

Challenge: A successfully developed analytic or machine learning model has limited value to the business if it cannot be integrated with the business's systems, products and services. This could mean integrating the analytic with servers maintained by the IT organisation or deploying the analytic to embedded devices (such as sensors or edge nodes in an Internet of Things system).

Solution: Platforms for developing analytics offer ways to package the algorithm to run in different production environments. Look for a tool that provides integration paths and application servers for use with common IT systems, as well as the ability to target embedded devices. For example, MATLAB provides deployment paths for integrating analytics with programming languages commonly used in IT systems (eg, Java and .NET), as well as for converting analytics to standalone C code that can be run on embedded devices.

Technologies that enable domain experts to apply machine learning and other data science techniques to their work are here to stay. They provide exciting opportunities for teams to innovate — in both their design workflows and the products they create. It does not appear that the shortage of data scientists will be addressed anytime soon. Domain experts will play a crucial role in filling this gap. Their knowledge of the business and the products it produces positions them well to find innovative ways to apply data analytics technologies.

To hear about how organisations are using data science, register for MATLAB EXPO — touring Australia and New Zealand in May: <https://www.mathlabexpo.com/au/2019.html>.

MathWorks Australia
au.mathworks.com



FASTER INTERNET WITH OPTICAL FREQUENCY COMBS

New Zealand researchers have created a crystal-based device that could enable the next generation of faster, more energy-efficient internet.

© iStockphoto.com/Andrea Danti

The breakthrough marks a milestone for The Dodd-Walls Centre for Quantum and Photonic Technologies — a virtual organisation gathering New Zealand's top researchers working in the fields of light and quantum science, hosted by the University of Otago. The study was led by Dr Harald Schwefel and Dr Madhuri Kumari, and has been published in the journal *Nature*.

The internet is powered by lasers. Every email, phone call and website visit is encoded into data and sent around the world by laser light. In order to cram more data down a single optical fibre, the information is split into different frequencies of light that can be transmitted in parallel. With data capacity expected to double every year, the current infrastructure used to encode and process this data is reaching its limits.

Now, researchers have found a solution to this problem in the form of a device called a microresonator optical frequency comb, made out of a tiny disc of crystal. The device transforms a single colour of laser light into a rainbow of 160 different frequencies — each beam totally in sync with each other and perfectly stable. One such device could replace hundreds of power-consuming lasers currently used to encode and send data around the world.

"Lasers only emit one colour at a time," said Dr Kumari. "What this means is that, if your application requires many different colours at once, you need many lasers. All of them cost money and consume energy. The idea of these new frequency combs is that you launch one colour into the microresonator [and] a whole range of new colours comes out."

"It's a really cool energy-saving scheme," added Dr Schwefel. "It replaces a whole rack of lasers with [one] small energy-efficient device."

The optical frequency combs are based on an unusual optical effect that happens when the intensity of light builds up to extremely high levels. You send a single colour of visible light into the crystal disc along with a microwave signal and, because the crystal disc is such high quality, the light and microwave radiation gets trapped inside. In most situations light never changes colour, but in this case the intensity becomes so high that the light and the microwave radiation start merging and making different colours.

Dr Schwefel expects the device to be incorporated into suboceanic landing stations — where all the information from land-based fibres is crammed into the few suboceanic fibres available — in less than a decade, perhaps within a few years.

"To develop the device for the telecommunications industry we will need to start working with major telecommunications companies," he said. "We have started the process by collaborating with a New Zealand-based optical technology company."

The internet is just one of the possible applications for the new optical frequency combs. Another use is high-precision spectroscopy — using laser light to study and identify the chemical composition, properties and structure of materials including diseases, explosives and chemicals. Dr Kumari's next mission will be to explore this application amongst other possibilities.

"This is a very, very exciting project to be working on," he said. "Optical frequency combs have literally revolutionised every field of applications they have touched. You can use them for vibrational spectroscopy, distance measurement, telecommunications. I'm looking forward to seeing how we can use ours."



ENCLOSURE MODIFICATION SERVICE

OKW Gehäusesysteme has a versatile standard range of design-oriented plastic enclosures and tuning knobs. However, the requirement for customisation can also be fulfilled by the company's own in-house service centre. All conceivable technologies are used to adapt the products to specific customer requirements.

One possibility is mechanical processing, such as milling, drilling, tapping, stamping or engraving. A customer-specific appearance can be achieved with screen or tampon printing, and digital printing directly on the enclosure is particularly

impressive; images, colour gradations and more can be printed in photographic quality.

The company offers custom moulding in special materials and colours, coloured lacquering in different degrees of gloss, and metallic and soft-touch coatings. To protect the electronics from external interference and from emission noise, EMC aluminium coating of the internal surfaces is also possible.

High quality is ensured by certification in accordance with DIN EN ISO 9001 and 14001, as well as with UL 746C for the ALVACOAT (EMC coating) method.

For planning of the required modifications, CAD drawings or 3D models of the enclosures can be downloaded from the website. For repeat orders, the manufactured products can be reproduced at any time using the latest CAD/CAM systems.

ROLEC OKW Australia New Zealand P/L
www.okw.com.au

SEMIKRON
innovation + service

Higher switching frequencies allow for optimized and lower-cost filter components
Reduced power losses boost efficiency and lower system costs and size thanks to the more compact cooling devices
Latest SiC chips from leading suppliers
Various packages and connection technologies with optimised chipsets for your application
Standard industry packages

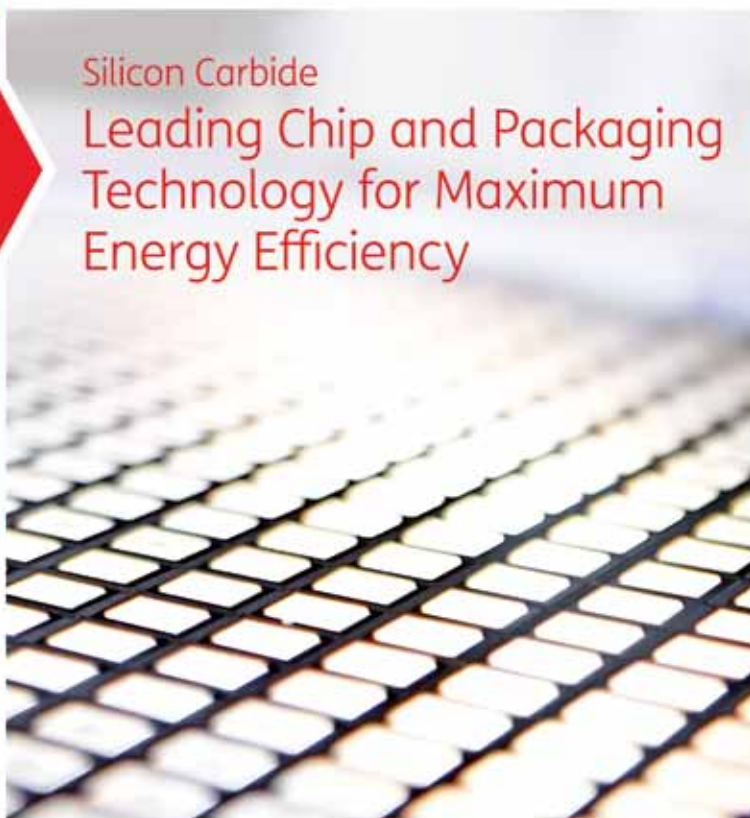


Phone +61 3 8561 5600
sales.skausa@semikron.com www.semikron.com

Silicon Carbide Power Modules
10kW up to 350kW

MiniSKiiP	SEMITRANS
SEMITOP	SKiM 93
SEMITOP E1/E2	SEMiX 3p
SEMI PACK 2	

Silicon Carbide
Leading Chip and Packaging
Technology for Maximum
Energy Efficiency



BRUSHLESS DC SERVOMOTORS

FAULHABER has released several models in its 1660 series of brushless DC servomotors.

The 1660 ... BHx series are high-power slotless brushless motors in 16 mm diameter based on a 2-pole technology. Through their robust, compact design and high-performance data, the motors are particularly suitable for demanding applications like dental handpieces, medical robotics and electrical grippers, as well as laboratory equipment, professional hand tools or robotics.

The BHx series delivers high speed and power values with low vibration and heat development, making it useful for handpieces with high power requirements in applications with limited installation space. In order to fit at best the large variety of different application needs, the series comes with two different motor designs, both in 60 mm length, respectively designed for high speed and high torque. The motors can be combined with high-resolution magnetic encoders, planetary gearheads and drive electronics from the FAULHABER product range.

The 1660 ... BHT series can provide a continuous output torque close to 19 mNm with the ability to manage variable loads. Its flat speed-torque curve as low as 95 rpm/mNm helps to minimise speed fluctuation to ensure constant speed and smooth behaviour. For specific applications, the motor can generate impulsive torque above 30 mNm.

The 1660 ... BHS series can operate at speeds up to 100,000 rpm and delivers high power of 96 W to satisfy demanding applications. It is suitable for devices running for long periods of time while preserving a low housing temperature, suitable for high-speed hand tools.

With their long form factor and low-vibration and quiet operation, the BHS and BHT series are particularly suitable for quiet hand tools, which reduce user fatigue when used for long periods of time. The low rotor inertia enables fine motor control by drive electronics and makes their operation smooth.

ERNTEC Pty Ltd
www.erntec.net



ElectroneX

electronics design & assembly expo

Design, Develop, Manufacture with the latest Solutions!
Showcasing new Innovations in Electronics and Advanced Manufacturing

Visit Australia's largest Electronics Expo and see, test and compare the latest equipment, products and solutions for manufacture and systems development.

Melbourne Exhibition Centre
11 - 12 September 2019

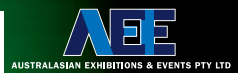
Free Registration online!
www.electronex.com.au

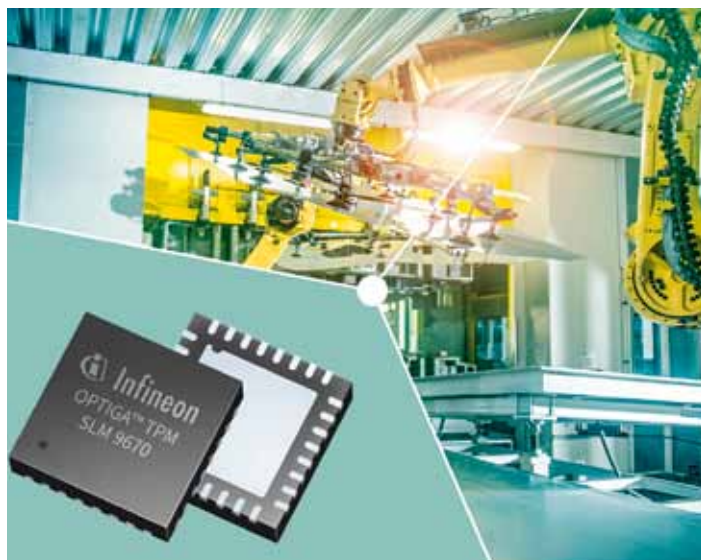


In Association with

Supporting Publication

Organised by





TRUSTED PLATFORM MODULE FOR INDUSTRY 4.0

Infineon Technologies has announced the OPTIGA TPM SLM 9670 — a Trusted Platform Module (TPM) specifically for industrial applications. The product protects the integrity and identity of industrial PCs, servers, industrial controllers or edge gateways. It controls access to sensitive data in key positions in a connected, automated factory as well as at the interface to the cloud.

The TPM is designed to act as a vault for sensitive data in connected devices and lower the risk of data and production losses due to cyber attacks. It also helps to shorten time to market; through the use of Infineon's audited and certified TPMs, manufacturers of industrial devices can achieve high security levels of the IEC 62443 standard and accelerate their certification processes. Furthermore, they can cut costs for maintenance of the devices through secured remote software updates.

The product fully meets the TPM 2.0 standard of the Trusted Computing Group and is certified by an independent test lab in accordance with Common Criteria. With a service life of 20 years and the ability to update the firmware on the chip, the TPM is able to cope with long-term security risks that may be encountered in an industrial environment. The chip has an extended temperature range of -40 to 105°C and meets the stringent requirements of industry in terms of robustness and quality, as it is qualified according to the industrial JEDEC JESD47 standard.

Infineon Technologies Australia Pty Ltd

www.infineon.com

COMPUTING AND GRAPHICS MODULE SOLUTION

The SOM-5871 is equipped with a 14 nm AMD Ryzen Embedded V1000 Processor (12–54 W TDP) with up to four cores and eight threads. The AMD 'Zen' core micro-architecture on the COM Express (PICMG COM.0) R3.0 Type 6 basic module provides high computing power and advanced graphics performance. With the integration of the AMD Ryzen Embedded V1000, the solution provides a good balance of high performance and low power consumption.

The product is built for use in demanding applications such as casino gaming, arcade gaming, digital signage, medical, industrial control, automation, thin clients and communications infrastructure fields.

With up to 32 GB of dual-channel DDR4 3200 MT/s memory (both ECC and non-ECC) the SOM-5871 has a high memory bandwidth for good performance and efficiency. The COM Express Basic module supports quad independent displays with VGA, LVDS, eDP, DisplayPort, HDMI and HDR playback support. VP9 decode and H.265 (HEVC) hardware decode and encode as well as four 4K display outputs are supported by leveraging the AMD Ryzen Embedded V1000. The premium performance of the device drives 4K animation and content.

The product features an Ethernet controller with speeds of 10/100/1000 Mbps and flexible I/O interface options with: 1x PCIe4, 3x PCIe1 through a PCIe Bridge, 2x SATA Gen 3 @ 6 Gbps, 3x USB 3.0, 8x USB 2.0 via USB Hub, 2x COM ports (2-wire), TPM 2.0, CAN Bus function (optional support), watchdog timer and GPIO to fulfil a wide variety of functions and high-performance system extension requirements. For improved structural integrity, the unit has an extra mounting hole design around the CPU for a strong board structure that avoids board bending and improves thermal throughput to fulfil high CPU TDP requirements.

Advantech Australia Pty Ltd

www.advantech.net.au



**HAMMOND
MANUFACTURING**

tel: 08 8240 2244

Standard and
modified
diecast aluminium,
metal and plastic
enclosures



www.hammondmfg.com

AUSTRALIAN RESEARCHERS CREATE ARTIFICIAL GRAPHENE

The ARC Centre of Excellence in Future Low-Energy Electronics Technologies (FLEET) has used a combination of nanofabrication techniques and conventional semiconductor materials to engineer an artificial version of graphene — one which can be manufactured on an industrial scale.

The amazing electrical properties of graphene and other 2D, atomically thin crystals are due to the symmetry of their lattice structure. For example, it is graphene's famous 'honeycomb' lattice that causes electrons to act as though they were massless, moving about 70 times faster than in silicon — the semiconductor material used in most computer processors today.

But graphene and similar 2D materials faced a challenge before they could be used in any commercially viable future electronics technology: the techniques currently used to fabricate graphene are not robust or scalable enough for industrial manufacturing. With this in mind, FLEET has used nanofabrication to manipulate the surface structure of semiconductors — creating the necessary pattern at a nanometre scale to precisely recreate the electronic structure of graphene and 2D topological insulators.

Working at scales of millionths of a millimetre, such nanoengineered materials are called artificial analogues of graphene and 2D topological insulators, or simply 'artificial graphene'. According to FLEET's Dr Oleh Klochan, who leads the research at UNSW, the process is "not a trivial task".

"The creation of synthetic, defect-free periodic lattices in conventional materials that successfully mimic graphene or topological insulators requires precise and accurate positioning of the lattice sites with a nanometre resolution," Dr Klochan said.

Artificial topological systems are one of several approaches used within FLEET to achieve 'dissipationless' electronic transport via topological materials, which could be key to future ultralow-energy electronics.

The challenges of artificial topological insulators

In Dr Klochan's team at UNSW, top-down processing begins with the cleanest and most extensively studied semiconductor available — a GaAs-AlGaAs heterostructure, in which scattering mean free paths exceed 100 μm .

To pattern the required artificial hexagonal lattice, the team uses high-resolution electron beam lithography. This approach allows the lattice constant of the artificial graphene to be precisely controlled, lattice defects to be controllably introduced and even local strain to be created with precision not possible in natural materials, allowing detailed tests of theories of transport in Dirac materials.

Advantages of this approach to artificial topological insulators are:

- the ease of integration with conventional semiconductor technologies;
- the ability to leverage advances in top-down fabrication of nanometre-scale structures in semiconductors;
- control of the topological properties via gate electrodes ('switching').

"By changing the bias on the gate electrode, we can switch our system from an artificial topological insulator with dissipationless edge states into a regular insulator," Dr Klochan said.

Achieving this 'switching' is an important FLEET milestone, accomplishing the binary function (ie, 0s and 1s) that underlies modern electronics.

"The success of this approach will not only make it possible to control dissipationless transport with unprecedented accuracy, but chart the course for using such artificially designed topological materials for repeatable and reliable large-scale production," Dr Klochan said.

Other advances and new facilities

A new atomic layer deposition system, supported by FLEET funding, has recently been commissioned for the project, and is now fully operational. Dr Klochan's team has also recently developed a new fabrication technique for artificially designed materials that delivers much more uniform artificial lattices, and less damage to the host 2D system.

Fabrication comprises two critical components:

- The semiconductor transistor, which is the basis of any electronic device. The new FLEET atomic layer deposition tool is used to deposit thin gate dielectric films and improves the yield of devices dramatically.
- The artificial lattice, the 'active' area of the device. Electron beam lithography, at the UNSW node of the Australian National Fabrication Facility (ANFF), is used to write the pattern. Reactive ion etching (RIE) at the Australian National University (ANU) node of the ANFF is then used to transfer/engrave the pattern into semiconductor. The RIE tool is a brand new one commissioned in 2018.

"Because of these two machines we can now make much more superior devices," Dr Klochan said.



SINGLE-BOARD COMPUTER

The conga-JC370 3.5" single-board computers (SBCs), from congatec, are equipped with commercial-grade 8th Generation Intel Core i7 Mobile processors, codenamed Whiskey Lake. By offering this processor generation in an embedded form factor, congatec is playing a leading role in the rollout for the harsh environment.

The SBC is equipped with the 1.8 GHz quad-Core Intel Core i7-8565U Mobile processor that features a performance increase of up to 40% compared to previous U-Series processors (codenamed Kaby Lake), enabled by a leap from two to four cores along with the improved micro architecture. The memory is designed to match this performance boost: two DDR4 SODIMM sockets with up to 2400 MT/s are available for a total of up to 64 GB. USB 3.1 Gen2 is now supported natively, and is capable of transferring up to 10 Gbps or

1.25 Gbps. This makes it possible to transfer even uncompressed UHD video from a camera to a monitor.

The product provides this performance via a rear USB-C connector that also supports 1x DisplayPort++ and power delivery for peripheral devices, thereby enabling monitor connection with a single cable. Further interfaces include the support of overall three independent 60 Hz UHD displays with up to 4096 x 2304 pixels as well as 2x Gigabit Ethernet (1x with TSN support).

The SBC features an economical 15 W TDP, which is scalable from 10 W (800 MHz) to 25 W (up to 4.6 GHz in Turbo Boost mode). Next to the Intel Core i7-8565U processor, a variant with i3-8145U processor is available, which offers two cores and a clock rate of up to 2.1 GHz. The high design quality of the boards is said to result in lower maintenance and service costs, less replacement during operation, less system downtime, lower design change costs, lower power consumption and longer board life.

Congatec Australia Pty Ltd

www.congatec.com



Technomelt Low Pressure Moulding

One Step Encapsulation

Protect your electronics from environmental factors, with the solution that does not harm the environment.

- Naturally sourced ingredients
- No harmful VOCs
- Eliminates wastage

At the same time enjoy the benefits of LPM in your production environment.

- Small equipment footprint
- Less WIPs
- Ready to test parts immediately
- Increased flexibility



Check out a video demo of the TM101 encapsulating PCBAs with attached wires.

TM101

Perfect for low volume production runs of small parts - connectors, PCBAs...

Tarapath

lowpressuremoulding.com.au Ph: 03 9269 6200 ✉ karl.b@tarapath.com.au



TRANSDUCERS

The SINEAX DM5S, from Camille Bauer, is a DIN rail instrument for measuring in single phase and three phase. 3- and 4-wire systems can be equipped with a Modbus RTU interface and up to four analog signals. Parameters can be queried via the Modbus and via the analog outputs (bipolar, unipolar or live-zero, eg, 4–20 mA).

Parameters include real, reactive and apparent power, frequency, cos phi, current, voltage, etc, all in one instrument. Programming is achieved via USB connector to a PC or laptop and the connection can be left in place when powering the DM5S from the mains.

The English-language CB-Manager can be downloaded for free and the configuration of the DM5S is self-explanatory. The DM5F (Fast) version (15 ms response) has 32 built-in energy meters that can be read via the Modbus.

Power Parameters Pty Ltd
www.parameters.com.au



RUGGED COM EXPRESS MODULE

The CB71C is an ultrarugged COM Express module for rail, public transportation and industry applications, eg, data acquisition, information, transcoding and live 3D. It is 100% compatible with COM Express Type 6 Pin-Out and conforms to the VITA 59 standard, which specifies robust mechanics to ensure operation even under harsh environmental conditions.

The module is based on the AMD Ryzen Embedded family and can now be equipped with the Ryzen Embedded R1000 dual-core SoC in addition to the Ryzen Embedded V1000 quad-core SoC. The R1000 SoC features a Radeon Vega graphics engine with three compute units and support for up to three displays with a resolution of up to 4K without additional graphics hardware. The strength of the SoC lies in its low power consumption, combined with its high single-thread performance and high clock with dual core and quad thread performance.

Modules featuring the V1000 SoC meanwhile provide passive cooling and a temperature range from -40 to +85°C is possible with the low-power versions. With up to four powerful 'Zen' processor cores when using the SoC, the module is suitable for virtualisation.

The module can be equipped with up to 32 GB directly soldered DDR4 main memory and a 16 GB eMMC; PCI Express 3.0, DDI (DP, eDP, HDMI), SATA 3.0, Gigabit Ethernet and USB 3.0 are available as high-speed interfaces. The module has a board management controller with monitoring functions and a trusted platform module. It also uses the Secure Memory Encryption capability in the R1000 SoC — an important feature for security-critical applications such as payment and ticketing terminals, fleet management or monitoring.

OEM Technology Solutions
www.oem.net.au

EMC EMR SAR SAFETY

Accredited testing and global product approvals since 1992

EMC Technologies Pty Ltd

Melbourne Telephone: +61 3 9365 1000

Sydney Telephone: +61 2 9624 2777

Bayswater Telephone: +61 3 9761 5888

Auckland (NZ) Telephone: +64 9 360 0862



Global Product Certification
EMC-EMF-Safety Approvals

www.emctech.com.au

ULTRACAPACITOR CELL

The BCAP3400 P300 K04 ultracapacitor cell, from Maxwell Technologies, is a 3 V, 3400F cell that has been designed as a high-energy, high-power workhorse.

The ultracapacitor cell is designed to support the latest trends in renewable energy, industrial electrification and transportation, including heavy transportation, heavy industrial and stationary solutions, and grid and microgrid applications. It can be used alone, integrated into a module assembly or in a hybrid configuration. Users can seamlessly upgrade to the 3 V cell from any of the current 3000F or 3400F products.

Key features include: 30 kW/kg of specified power; 4.25 Wh of stored energy; DuraBlue Shock and Vibration Technology; up to 1,000,000 duty cycles or 10-year DC life; and laser-weldable or screw posts.

Wireless Components
www.wirelesscomponents.com.au

INDUSTRIAL IoT ROUTER

NetComm has expanded its Industrial Internet of Things (IIoT) portfolio with the launch of the NTC-220 4G LTE Category 1 Industrial IoT Router, which will deliver secure medium-bandwidth connectivity using universally available LTE networks.

The introduction of medium-bandwidth IIoT connectivity, offering speeds in the order of a few Mbps, will enable fast deployment of a variety of IIoT applications in the market. It enables machines to send data over the network quickly while also still ensuring an optimised battery life, thereby increasing the performance lifetime of the IIoT product in the field.

The use of LTE Category 1 technology will provide near ubiquitous network coverage, which will enable wide IIoT deployment. The Linux-based NetComm operating system (OS), meanwhile, allows solution architects and system integrators to create their own applications using NetComm's software development kit (SDK), while built-in GPS enables the router to track on-the-move assets from anywhere.

NetComm Wireless Limited

www.netcommwireless.com.au



POWER MODULES

Renesas Electronics has announced a pair of encapsulated hybrid digital DC/DC PMBus power modules, the 10 A ISL8280M and 15 A ISL8282M. The hybrid digital power modules offer power density of 115 mA/mm² in a 12 x 11 mm package, with up to 95% peak efficiency. They are complete single-channel, synchronous step-down regulated power supplies that operate over a wide input voltage range of 5 to 16 V.

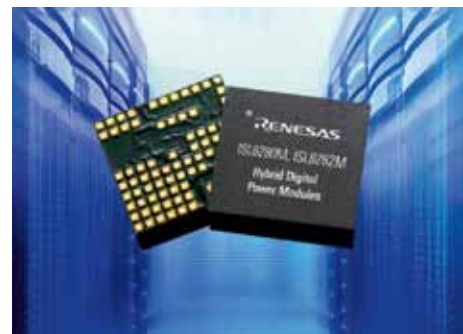
Also announced are the ISL8210M and ISL8212M analog power modules, offered in the same pin-to-pin compatible 12 x 11 mm package with 10 and 15 A of output current, respectively. The hybrid digital and analog power modules provide point-of-load (POL) conversion for advanced FPGAs, DSPs, ASICs and memory used in servers, storage, optical networking, telecom and a broad range of space-constrained industrial applications. Each device integrates a PWM controller, MOSFETs and inductor inside a thermally optimised, grid high density array (GHDA) encapsulated module. To complete the power supply, designers simply add input and output ceramic capacitors.

The ISL828xM hybrid digital and ISL821xM analog power modules feature integrated LDOs that enable single-supply operation. They leverage Renesas's R4 high-speed control loop architecture with inherent line voltage feed-forward, providing designers with a combination of ultrafast load transient response and high noise immunity. Their Grid HDA package offers high electrical and thermal performance through a single-layer conductive package substrate that efficiently transfers heat from the module to the system board, and dissipates it without requiring airflow or heatsinks.

Other features include: 4.5 to 16.5 V single rail input voltage and 0.5 to 5 V output voltage settings; $\pm 1.5\%$ output voltage accuracy over line, load and temperature with remote sense; 256 output voltage options configurable through a simple pin-strap resistor setting; seven switching frequency options from 300 kHz to 1 MHz; selectable PFM/light load efficiency mode; and comprehensive fault protection with voltage, temperature and current protections.

Renesas Electronics

www.renesas.com



**ENCLOSURES AND
TUNING KNOBS FOR
TODAY'S ELECTRONICS
EQUIPMENT!**




www.okw.com.au



ROLEC OKW
Australia New Zealand Pty Ltd
Unit 6/29 Coombes Drive, Penrith NSW 2750

Phone: +61 2 4722 3388
E-Mail: sales@rolec-okw.com.au

OKW
GEHÄUSE
SYSTEME



GETTING THE BEST

PERFORMANCE FROM RESIN ENCAPSULANTS

In this article on resin potting and encapsulation, Electrolube's resins expert, Alistair Little, expands on a Q&A guide format with some advice on selection and application.

There are a number of different factors that influence the protection afforded by potting compounds. The act of encapsulating a component or PCB means that it is surrounded by a layer of resin, which completely seals a component or an entire PCB from the environment in which it operates.

A two-part resin, when mixed, starts a chemical reaction that results in the resin becoming fully polymerised to provide a homogeneous layer. The polymerisation reaction creates a three-dimensional structure, which provides a barrier against chemical attack and high humidity, physical shocks and the potentially destructive effects of thermal cycling. So, let us refer to our questions.

What typical applications use epoxy resins?

Epoxyes are typically used where extremes of temperature and chemically aggressive environments are encountered. Under-hood applications are common, and epoxyes are often used to protect the huge variety of sensors, digital electronics and connectors that abound beneath the hood of a modern automobile — not just from high temperatures, but also from volatile fuels and lubricants.

Even as we switch from the internal combustion engine to the electric motor, the chemical environment might change, but the requirements for chemically resistant potting resins capable of tolerating a wide temperature range and resisting chemical attack will remain.

Their excellent adhesion to a wide range of substrates means that epoxyes are used to ensure that the electronics are also very

effectively sealed against the external environment and are perfectly adapted for use in equipment destined for deployment in ATEX and other hazardous areas.

What typical applications use silicones?

Silicones are used where extremes of temperatures are to be expected, or the components are temperature sensitive and would not survive the exothermic reactions that occur when two-part epoxyes and polyurethanes are mixed and cured; this is particularly so when a large volume of material is needed for pouring into a single unit. Silicones are also suitable for applications where a high degree of flexibility is required, such as on flexible PCBs, and, unlike epoxyes, are easy to remove if circuit modifications or repairs are required.

Silicone resins have the broadest continuous operating temperature range of any of the available resin chemistries, and so are a natural choice for both high- and low-temperature applications. They maintain their flexibility over this temperature range with very little sign of degradation over time. Due to their high flexibility, they place very low stresses on delicate components, particularly those with weak and fragile connecting legs.

There is, however, a downside to silicones, particularly the effectiveness of their adhesion to certain substrates. Moreover, their chemical resistance is not as good as that provided by an epoxy resin. Another category of resins — polyurethanes — would be the better choice for applications operating in the -30 to +120°C



region as these offer similar levels of flexibility and better adhesion to many substrates.

What key 'pain points' are associated with resin selection?

Resin selection is the art of compromise; it is deciding which characteristic or property of the resin is more important to your application compared with those outlined above. Often the main areas of potential problems lie in deciding what are the realistic maximum and minimum requirements compared, for instance, to the design limits, which are likely to include large safety margins.

Viscosity is another property that must be considered. Where, normally, the lowest mixed viscosity resin is desired to promote excellent flow and coverage, there are thixotropic resins that behave somewhat differently in that their viscosity increases rapidly after mixing. This apparent change should not be confused with curing; the resin is still able to flow and has a useable life after it has stopped moving prior to reaching a final cure.

How do I overcome these 'pain points'?

In most cases, many of the potential sticking points come down to the design brief and discussion between the designers and engineers as to what is feasible. If the high and low temperatures are only needed for a short period of time on an infrequent basis, and the normal operating temperature range is more modest, then this often opens up the choice to a much wider range of resins.



RESIN SELECTION IS THE ART OF COMPROMISE; IT IS DECIDING WHICH CHARACTERISTIC OR PROPERTY OF THE RESIN IS MORE IMPORTANT TO YOUR APPLICATION

Similarly, when considering chemical resistance, determine whether the resin is actually the primary point of exposure. For example, if an LED is potted with an optically clear resin, but then a plastic cover with gasket is placed over the top of it, then the level of protection that the resin needs to provide is significantly reduced as, although it delivers the primary electrical insulation layer, it is only providing a secondary barrier against the environment.

To pot or not to pot? Why do we pot?

Naturally we would recommend that all electronic components, boards and units are either coated or potted. This is to extend the life of the finished unit and to protect the components against the environment. The level of protection required is dependent upon the environment to which the finished unit may become exposed. It might be indoors in a domestic setting, where a light layer of dust might be expected. Contrast this with a unit submerged in a garden pond for four months of the year, or one that is located in a hazardous industrial environment. Some units may potentially be used undersea for 20+ years or positioned on an aircraft subject to short haul commuter routes (with regular temperature and pressure variations). Other units may be exposed to the vacuum, extreme low temperatures and ionising radiation hazards of outer space; the variations really are endless.

Under less extreme conditions, you might ask if a resin is still the best option or if a coating should be considered as an alternative. This is an interesting point as the protection provided by a coating offers a number of advantages over the application of a resin. However, as always, the choice will depend upon what level of protection the designer requires. In addition, if you need to protect your intellectual property and avoid the underlying circuit being copied, then a resin will not only provide excellent protection due to its toughness, chemical resistance and adhesion to the substrate and components, but its opacity will ensure that the circuit detail is visually obscured.

If you have any questions, or would like more information about potting resins, their selection, handling and applications, contact our Technical Support Team.

Electrolube
www.electrolube.com.au

SELF-HEALING ELECTRONIC SKIN INSPIRED BY JELLYFISH

Scientists from the National University of Singapore (NUS) have taken inspiration from underwater invertebrates like jellyfish to create an electronic skin with similar functionality. Just like a jellyfish, the electronic skin is transparent, stretchable, touch-sensitive and self-healing in aquatic environments.

The research was led by NUS Materials Science and Engineering Assistant Professor Benjamin Tee, who worked with collaborators from Tsinghua University and the University of California, Riverside for over a year to develop the new material. Asst Prof Tee was part of the team that developed the first ever self-healing electronic skin sensors in 2012, and so was able to identify the key obstacles that self-healing electronic skins have yet to overcome.

"One of the challenges with many self-healing materials today is that they are not transparent and they do not work efficiently when wet," he said. "These drawbacks make them less useful for electronic applications such as touch screens, which often need to be used in wet weather conditions."

"With this idea in mind, we began to look at jellyfishes — they are transparent, and able to sense the wet environment. So, we wondered how we could make an artificial material that could mimic the water-resistant nature of jellyfishes and yet also be touch-sensitive."

They succeeded in this endeavour by creating a gel consisting of a fluorocarbon-based polymer with a fluorine-rich ionic liquid. When combined, the polymer network interacts with the ionic liquid via highly reversible ion-dipole interactions, which allows it to self-heal.

"Most conductive polymer gels such as hydrogels would swell when submerged in water or dry out over time in air," Asst Prof Tee said. "What makes our material different is that it can retain its shape in both wet and dry surroundings. It works well in sea water and even in acidic or alkaline environments."

The electronic skin is created by printing the novel material into electronic circuits. As a soft and stretchable material, its electrical properties change when touched, pressed or strained. "We can then measure this change and convert it into readable electrical signals to create a vast array of different sensor applications," Asst Prof Tee said.

"The 3D printability of our material also shows potential in creating fully transparent circuit boards that could be used in robotic applications. We hope that this material can be used to develop various applications in emerging types of soft robots."

Soft robots, and soft electronics in general, aim to mimic biological tissues to make them more mechanically compliant for human-machine interactions. In addition to conventional soft robot applications, this novel material's waterproof technology enables the design of amphibious robots and water-resistant electronics.

One further advantage of this self-healing electronic skin is the potential it has to reduce waste. Asst Prof Tee explained, "Millions of tonnes of electronic waste from devices like broken mobile phones or tablets are generated globally every year. We are hoping to create a future where electronic devices made from intelligent materials can perform self-repair functions to reduce the amount of electronic waste in the world."

The team's invention has been described in *Nature Electronics* and was featured on the journal's front cover on 15 February 2019. Looking forward, Asst Prof Tee and his team are hoping to explore further possibilities of this material.

"Currently, we are making use of the comprehensive properties of the material to make novel optoelectronic devices, which could be utilised in many new human-machine communication interfaces," Asst Prof Tee said.



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

www.wfmedia.com.au

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

Editor
Lauren Davis
wnie@wfmedia.com.au

Publishing Director/MD Geoff Hird

Art Director/Production Manager
Julie Wright

Art/Production
Veronica King, Colleen Sam

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

Copy Control Mitchie Mullins
copy@wfmedia.com.au

Advertising Sales

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

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

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



Contact the editor

If you have any queries regarding our privacy policy
please email privacy@westwick-farrow.com.au

Subscriptions: For unregistered readers,
price on application.

To register, visit
www.electronicsonline.net.au/subscribe

Printed and bound by Dynamite Printing
Print Post Approved PP100007394
ISSN No. 0728-3873

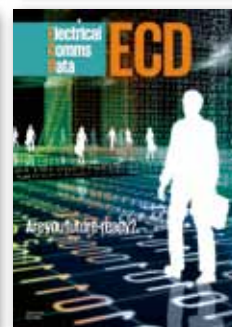
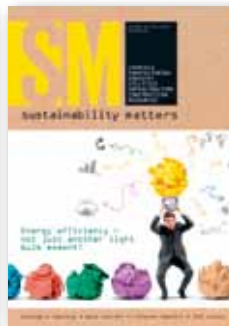
All material published in this magazine is published in good faith and every care is taken to accurately relay information provided to us. Readers are advised by the publishers to ensure that all necessary safety devices and precautions are installed and safe working procedures adopted before the use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

FREE

to industry and business professionals



The magazine you are reading is just one of eleven published by Westwick-Farrow Media. To receive your free subscription (magazine and eNewsletter), visit the link below.



www.WFMedia.com.au/subscribe

FLUKE®

Calibration



The World's most stable digitising multimeter

with best-in-class DCV stability and accuracy






**The industry's fastest direct 5 mega-samples-per-second digitising for
system automation in labs and manufacturing test environments**

The Fluke Calibration 8588A and 8558A 8.5-Digit Multimeters are designed for calibration and metrology laboratories that require the highest stability for the most accurate measurements to maintain maximum confidence in traceability.

Contact Fluke Australia for more information



 au.flukecal.com  1300 135 853  auinfo@flukecal.com