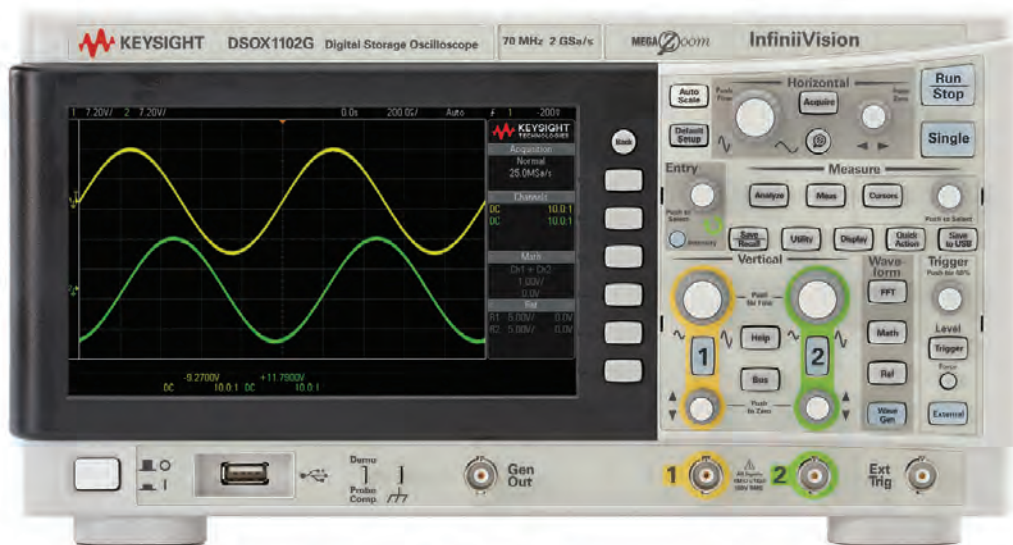


what's **new** in **Electronics**



**Scrap the Toys
Get a Real Oscilloscope!**

New Keysight Technologies 1000X

FUELING YOUR INNOVATION!

...the world's broadest selection
of the newest electronic components
in-stock for immediate shipment

**FREE
SHIPPING**
ON QUALIFIED ORDERS*

AUSTRALIA
DIGIKEY.COM.AU
1800 285 719

NEW ZEALAND
DIGIKEY.CO.NZ
800 449 837



5 MILLION PARTS ONLINE | 650+ INDUSTRY-LEADING SUPPLIERS | 100% AUTHORIZED DISTRIBUTOR

*No handling fees. Digi-Key is an authorized distributor for all supplier partners. New products added daily. Digi-Key and Digi-Key Electronics are registered trademarks of Digi-Key Electronics in the U.S. and other countries. **Australia:** A shipping charge of \$24 AUD will be billed on all orders of less than \$60 AUD. A shipping charge of \$20 USD will be billed on all orders of less than \$50 USD. All orders are shipped via UPS, Federal Express, or DHL for delivery within 3-4 days (dependent on final destination). **New Zealand:** A shipping charge of NZ\$26 will be billed on all orders of less than NZ\$66. All orders are shipped via UPS for delivery within 3-4 days (dependent on final destination). All prices are in New Zealand dollar. © 2017 Digi-Key Corporation, 701 Brooks Ave. South, Thief River Falls, MN 56701, USA

ecta
MEMBER

ecsn
member

CEDA
MEMBER

CONTENTS

- 04 USB Type-C: The single cable of the future
- 12 Tomorrow's wireless
- 18 The server-on-module era begins
- 27 EMC compliance standards are changing
- 30 A new breed of spring-loaded pin
- 34 Measuring voltage waveforms from outside signal cables
- 39 Driving car security into the 21st century
- 46 Ingestible sensors powered by stomach acid
- 50 Microbial nanowires for green electronics



READ ONLINE!

Your copy of *What's New in Electronics* is available as an online eMag.
www.electronicsonline.net.au/magazine



Keysight's InfiniiVision 1000 X-Series low-cost oscilloscopes have been released. They are available in 50 to 100 MHz models.

These oscilloscopes are ideal for new users and students. Learning how to use the scope and set up measurements is simple. The front panel is easy to use and features built-in help so users can quickly analyse signals. The educator's resource kit comes standard and includes built-in training signals, a comprehensive oscilloscope lab guide and an oscilloscope fundamentals slide set for professors and lab assistants.

The 1000 X-Series uses Keysight's Mega-Zoom IV custom ASIC technology, which enables an update rate of 50,000 waveforms per second. It also has a high sampling rate of up to 2 GSa/s and comes standard with two probes. The oscilloscopes use segmented memory capability to maximise memory depth.

Six-in-one instrument integration means it is also a serial protocol analyser, digital voltmeter and frequency counter — and the G models include a frequency response analyser and WaveGen function generator for teaching Bode plot fundamentals.

The scope features 24 typical oscilloscope measurements. The gated FFT function allows users to correlate time and frequency domain phenomenon on a single screen. Mask limit testing allows users to easily detect signal errors. It supports serial bus applications decoding and analysis, which include I²C, SPI, UART/RS232, CAN and LIN.

Find more about the InfiniiVision 1000 X-Series oscilloscopes at www.keysight.com/find/1000X-Seriesinfo.

Keysight Technologies Australia Pty Ltd
www.keysight.com

An abstract digital graphic featuring concentric circles and a glowing orange line. The background is dark blue with concentric circles of varying shades of blue and white. A bright orange line, resembling a stylized 'C' or a cable, curves through the center. The overall effect is futuristic and high-tech.

USB TYPE-C

THE SINGLE CABLE OF THE FUTURE

David Pike, Product Merchandiser

USB Type-C promises to make all other cables and connectors redundant as it delivers power and high-speed data connectivity combined, but there are a few things to look out for.

USB is one of the most successful connectivity technologies and has been used in practically all types of electronic device and system for many years; the familiar form factors of Type-A (the original, full-size USB plug) and Type-B are ubiquitous in consumer devices such as PCs and smartphones. A new version of the connectors, Type-C, has been heralded as a major step forward for consumer electronics as it is much smaller than USB Type-A connectors, with enough bandwidth for a HD video signal (10 Gbps) plus enough power capability to charge a laptop (up to 100 W). The idea is that USB-C cables will eventually replace all the older style connectors, both large and small, in all types of devices with a single type of cable that can be used for everything. USB-C connectors and cable products are now available from manufacturers including TE Connectivity and Molex, and RS Components offers its own RS Pro range.

Forward functionality

One of USB-C's biggest selling points is its compact size, especially its minimal thickness. The connector itself, at 2.4 mm, is slightly thicker than today's micro-USB connector but much thinner than the 4.5 mm-thick USB Type-A plugs we still use. The first mainstream product to use USB Type-C connector, the 12" Apple MacBook released in March 2015, is just 13.1 mm thick at its thickest point, and it has only a single USB port which does everything, other than the 3.5 mm headphone jack. This is all thanks to USB-C. Other early adopters of the technology include Nokia's N1 tablet and Google's Chromebook Pixel laptop.

Another big selling point is that USB-C connectors and cables are designed to be easy to use. The connectors are symmetrical and can be plugged in either way up, saving a lot of time and reducing the risk of damaging either the male or female connectors by trying to force connectors in upside down. The cables can also be plugged in either way around as they have the same connector on each end. To make this happen, there is additional circuitry

inside USB-C cables to ensure power and data travel in the correct directions. This includes an IC which allows the connector to determine whether it's plugged into a host or peripheral device.

Other much-quoted benefits of USB-C connectors and cables include their bandwidth and power-carrying capabilities. However, while these features require Type-C connectors to work, they are also dependent on the standards used by the device itself.

In terms of speed, Type-C connectors enable 10 Gbps signals — enough to carry high-definition video such as DisplayPort 4K resolution signals. This is a feature of the USB 3.1 standard, which doubles the speed of USB 3.0 but requires Type-C connectors and cables. In other words, to get the advertised speed, you need both USB 3.1 on the device and a Type-C port. The two are not mutually exclusive; a device could feasibly use Type-C for its power properties without supporting fast data speeds. For example, a USB 3.0 device with a Type-C port, connected via a Type-C cable, will still be limited to 5 Gbps as that is the maximum speed of USB 3.0.

Power-wise, USB-C connectors and cables are designed to carry up to 100 W — enough to charge laptops and bigger devices. Confusingly, though, the high power capability is part of another standard called USB Power Delivery (USB PD), which is separate from USB 3.1. It's perfectly possible to have a USB 3.1 device that does not support USB PD — and then even with a Type-C cable, the full 100 W will not be possible. Assuming the device is USB PD compatible, then Type-C cables enable five power profiles: 10 W (5 V, 2 A), 18 W (12 V, 1.5 A), 36 W (12 V, 3 A), 60 W (20 V, 3 A) and 100 W (20 V, 5 A). It's also important to note that these power levels can be reached while data is being transferred simultaneously. The limit for previous generations of USB and older connectors was considerably lower, but by using the connectors/cables only for power delivery (not data), manufacturers could get around this and get enough power through to charge small batteries such as in smartphones.

USB TYPE-C



USB-C IS DESIGNED TO BE BACKWARDS COMPATIBLE WITH DEVICES THAT USE OLDER CONNECTOR TYPES.



An RS Components certified USB Type-C cable.



A Molex USB Type-C receptacle.



A TE Connectivity USB Type-C receptacle.

Points to consider

There are a few points to consider when using USB-C connectors. Firstly, as they are extremely compact, it follows that the connectors are a little more fragile than the robust USB Type-A plugs. USB-C male connectors have a hollow centre, while female connectors/receptacles have a thin tab at the centre. There has been some speculation about whether these tabs will withstand frequent mating or rough treatment of the cable or device while it's plugged in. It's likely that robust applications outside the consumer world that don't need such compact dimensions will stick with USB-A connectors for this reason (USB-A connectors can handle USB 3.1).

USB-C is designed to be backwards compatible with devices that use older connector types and older versions of the USB specification. A wide range of plug-type adapters that convert between connector types is available, as well as cable assemblies with a USB-C plug at one end and a legacy USB plug at the other.

Another thing that has been widely discussed is the authenticity of cables. Since the introduction of the USB-C connector, manufacturers have flooded the market with cheap cable products, many of which

are unfortunately not certified and may or may not meet the technical specifications required for USB PD, in particular. Since Type-C cables have circuitry in them, there is much more scope for products to make it to the marketplace that don't actually work, or worse, end up damaging electronic devices beyond repair. One famous recent case concerned Google engineer Benson Leung, who bought a cheap USB-A to USB-C adapter cable online which blew up his test rig and 'fried' his Chromebook Pixel laptop. On further investigation, the cable he was using had wires soldered to incorrect terminals, one wire missing altogether and what should have been a 56 k Ω pull-up resistor was a 10 k Ω part connected in pull-down configuration. He speculates that the manufacturer may have noticed the pull-down mistake and tried to correct it by swapping the Vbus and Ground wires, with unfortunate consequences.

To avoid stories like this becoming commonplace, consumers and business users alike are advised to buy only certified cables from reputable sources. A USB-C Authentication specification has also been introduced, which defines 128-bit cryptographic authentication for USB-C chargers, devices, cables and power sources. Host

systems will be able to use this protocol to tell very quickly whether a product is compliant, before beginning data or power transfer. As a bonus, the authentication protocol can be used for secure systems to allow only authorised devices to work with a particular host device.

Moving forward, Intel has announced that its Thunderbolt 3 protocol, designed for high-definition display signals up to 40 Gbps, will use the USB-C connector. Previous versions of Thunderbolt used Mini DisplayPort connectors, so this move is seen as a big stamp of approval for the technology. It should also encourage consumer device manufacturers to include USB-C ports into their PCs, tablets and smartphones.

It seems clear that USB-C cables will eventually replace not only older USB cables, but all portable device power cables, as well as HDMI and other high-definition display cables. As a result, consumer device data and power connectors are likely to converge into a single connector type, and devices of the future will only have one port for everything. It really will be one-cable-fits-all.

*RS Components Pty Ltd
au.rs-online.com*



Get ready for the widest IoT market ecosystem

4000 possible combinations of STM32 and STM8 MCUs and SX127x radios

THE BRAIN

Choose from basic, ultra-low-power or high performance with STM8 (8-bit) or STM32 (32-bit) MCUs. Pick from a portfolio that offers from 2 Kbytes up to 2 MB Flash, 14-pin up to 216 pins with tiny form factor packages, and a rich set of analog and connectivity peripherals.

COMMUNICATION

Choose the appropriate LoRa radio matching your application needs. Add short range connectivity with NFC and Bluetooth.

SECURITY

STSAFE-A is a turnkey solution for the IoT. Optimized for small platforms, state-of-the-art security relying on CC EAL5+ HW, the STSAFE-A allows easy integration using libraries compatible with standard MCUs.

SENSING

Add sensing capabilities to your application with environmental, motion and proximity sensors.

STMicroelectronics

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

Authorized Distributors

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

www.st.com/stm32



PXle CHASSIS RANGE

The Keysight Technologies PXle chassis range enables a broad range of applications in R&D and manufacturing.

There are three models, including PXle 10-slot chassis for benchtop R&D and design validation applications, with low fan noise, DC power and Gen 3 performance; PXle 5-slot chassis for low-cost desktop and portable applications; and PXle 18-slot chassis for large system applications, with cost-effective Gen 2 performance, and improved power supply and system integration features.

Features of the M9010A Gen 3 PXle 10-slot chassis include all hybrid, Gen 3 backplane with an x8 PCIe link to each slot and x 24 (two-link) system slot; quiet, high-capacity cooling system; two front panel SMB trigger ports providing access to PXI Trig (0:7); one-button power control for multichassis power sequencing for large configurations; and high power capability for high-performance PXle modules.

The M9005A PXle 5-slot chassis is suitable for small, low-cost applications such as low-channel count VNA systems. It provides an integrated system module with a x 1 cable interface to an external PC; three hybrid and two PXle slots; and Gen 1, x 1 backplane performance.

The M9018B Gen 2 PXle 18-slot chassis is a cost-effective platform to build large systems when Gen 3 performance is not required. It is an updated version of the M9018A and provides all hybrid, Gen 2 backplane with a mix of x 4 and x 8 links to each slot; high-performance cooling system; two front panel SMB trigger ports providing access to PXI Trig (0:7); one-button power control for multichassis power sequencing for large configurations; and new power supply to provide more power for next-generation PXle modules.

Keysight Technologies Australia Pty Ltd
www.keysight.com

DIGITAL LOW-RESISTANCE OHMMETER

The Megger DLRO100 digital low-resistance ohmmeter is a readily portable lightweight instrument that can deliver a test current of 100 A. It has internal rechargeable Li-ion batteries that provide power for up to 200 tests on a single charge. This allows users to perform high-current low-resistance testing in almost any location, even if there is no access to a mains supply.

The instrument uses novel circuitry that gives high noise immunity and provides stable readings. For physical protection it features enclosures with an IP54 ingress protection rating, even when the lid is open and testing is in progress.

Operator safety is protected by a CAT IV 600 V safety rating in line with IEC61010. With an optional DC clamp, dual-ground operation is also supported. This provides safety when working in substations and similar environments by allowing tests to be carried out with both sides of the equipment under test grounded.

The product has capacity to check the resistance of busbar and cable joints, measure wire and cable resistance, and verify lightning conductor bonding. It is also suitable for testing switchgear and circuit breakers during manufacture and in the field. Additionally, it offers a smooth DC output for circuit breaker tests.

The product has a measuring range of $0.1 \mu\Omega$ to 1.999Ω with a resolution of $0.1 \mu\Omega$. Results are shown on a large LCD display panel and can also be stored in a large-capacity internal memory for later access via the display or USB download. Versions are available with support for remote operation, Bluetooth connectivity and asset/result tagging.

Manual mode allows the user to initiate the test once the probes are in contact with the object. In auto mode, as soon as the potential leads are connected, the test starts automatically.

In continuous mode, the instrument will continue to test, updating the display after each new test cycle, until the test button is pressed again.

Both standard and Kelvin lead sets are available. They are 5, 10 or 15 m in length. All have a CAT IV 600 V rating.

Megger Limited
www.megger.com



ELECTROSTATIC FIELDMETER

The Simco-Ion FMX-004 is a compact electrostatic fieldmeter used for locating and measuring static charges. Available to rent from TechRentals, the device has a 30 h battery life and automatically powers off in the event of inactivity.

With automatic range switching up to ± 30 kV, the product measures polarity charges at a distance of 1" with LED guides to ensure repeatable measurements. With a lightweight and portable design (170 g), three-button operation, a digital bar graph display and an audible alarm, it is convenient and easy to use.

TechRentals
www.techrentals.com.au

Cable Assembly & Box Build Assembly



Electrical box assembly



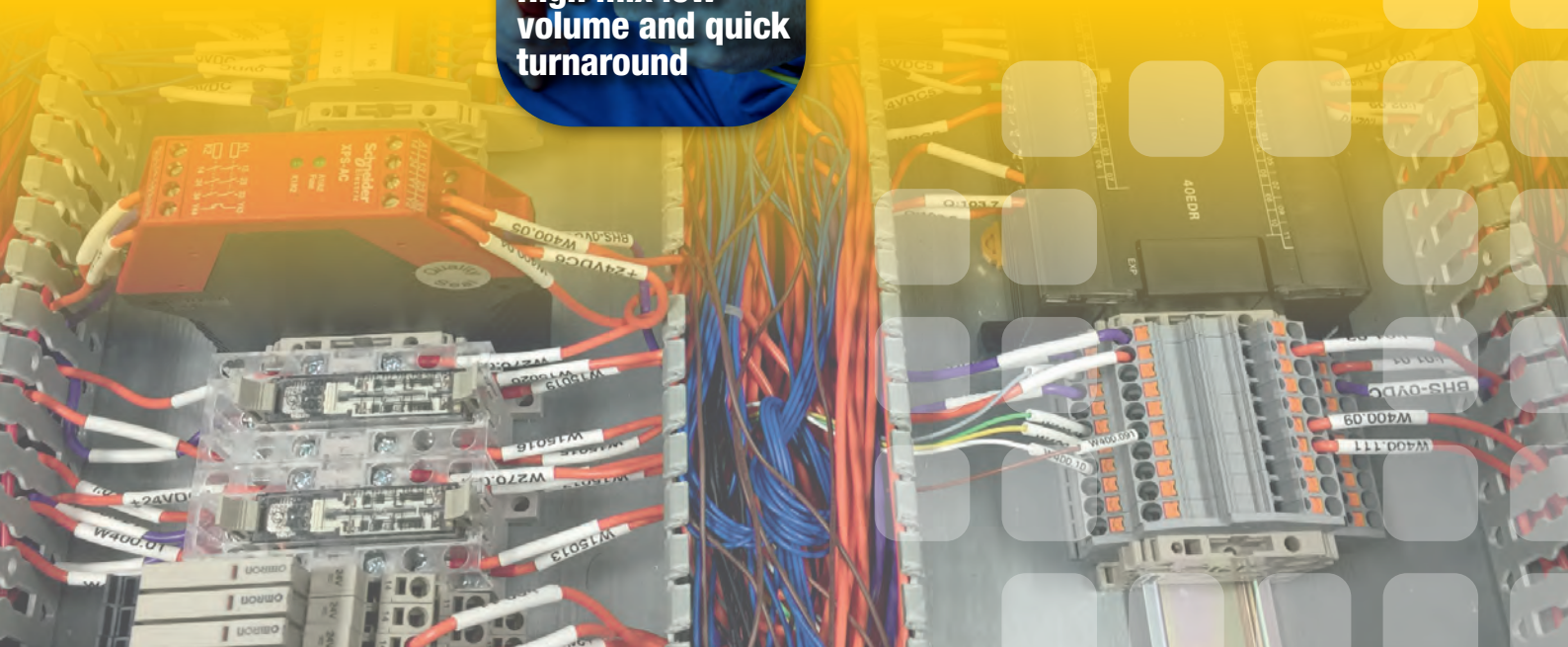
Fully automatic cut, strip and crimp machines



High mix low volume and quick turnaround

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

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



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





FREQUENCY SELECTABLE RF POWER SENSOR

Anritsu introduces the frequency selectable RF power analyser, Power Master MA24507A. The ultraportable power analyser enables simple, numeric, frequency-based measurement of RF power from 9 kHz to 70 GHz.

As signal frequency increases, attenuation due to the air or cabling grows, which can make power measurements particularly difficult at mmWave frequencies. The product's ultraportable size overcomes this challenge by enabling users to place it directly at the signal source.

The USB-powered device is slightly bigger than a smartphone, weighs around 280 g and can make measurements as low as -90 dBm at 70 GHz. It is so small and lightweight that it can easily be used to make measurements on antenna towers or with an extension pole to measure small cell signals from the ground.

Because the unit enables frequency selective power measurements, users can differentiate intended signals from unintended signals for the first time. With spans from 1 kHz to full span over the entire frequency range, the product can zero in on a signal of interest in harsh environments, including those with unintended signals that can impact power readings. This enables measurements such as channel power and adjacent channel power to be made, while avoiding spurs and harmonics.

Unlike many other power measurement instruments, no reference calibration is required. The power analyser can stay connected to a test system constantly, eliminating the need to disconnect and reconnect it between test procedures.

The product can be controlled remotely via the USB interface or through Anritsu's PowerXpert data analysis and control software, which now has added features to optimise the performance of the power analyser. These include a Power Hunter mode to easily identify the six highest CW amplitudes and their corresponding frequency, and a Channel Monitor mode so users can select up to six frequency channels and monitor their CW amplitude or channel power simultaneously.

Anritsu Pty Ltd
www.anritsu.com

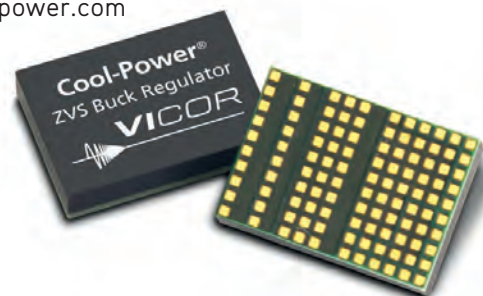
BUCK REGULATOR

The Vicor PI3525-00-LGiZ Cool-Power ZVS buck regulator has a 48 V (3060 Vin) input. The product enables scalable power options for 48 V direct to point of load (PoL) applications. It is a 5 V output regulator, supplying up to 20 A, packaged in a 10 x 14 mm LGA SiP package.

The product requires only an output inductor and minimal passives for a complete cost-effective design that consumes less than 740 mm² of PCB real estate. Designed to be easily paralleled in combinations of up to three regulators, the regulators can be scaled to support applications with even higher load currents.

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

Vicor Corporation
www.vicorpower.com



NATA ACCREDITED TESTING

EMC Technologies NATA accredited testing is available to Power Quality standards EN/IEC 61000-3-2 and EN/IEC 61000-3-3 including the AS/NZS equivalents.

Also available is the internationally accepted ISO 17025 NATA accreditation for the calibration of Harmonics and Flicker (H&F) compliance test systems, used to measure H&F in per IEC/EN/AS/NZS 61000-3-2 and 61000-3-3. Accredited calibration of H&F test systems was only previously possible in overseas calibration labs. Shipping of these large and heavy H&F test systems is expensive and fraught with risk. This has always been a major problem for Australian test labs wishing to obtain NATA accreditation for testing to H&F standards.

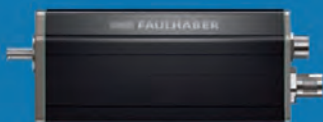
Two standards (IEC Technical Reports) have been published to standardise the calibration methods, including 'IEC TR 61000-4-37:2016 Calibration and verification protocol for harmonic emission compliance test systems', and 'IEC TR 61000-4-38:2015 Test, verification and calibration protocol for voltage fluctuation and flicker test systems'.

Both calibration and testing are available on-site at customers' premises.

EMC Technologies
www.emctech.com.au

FAULHABER Motion Control

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

**NEW**

WE CREATE MOTION

FAULHABER Motion Control Systems Series MCS 3242 / 3268 ... BX4

It is hard to believe how much intelligent and high-performance drive technology we have conjured up in the compact FAULHABER Motion Control Systems. Their robust construction in accordance with IP 54 meets even the most severe industrial requirements. And, equipped with RS232, EtherCAT and CANopen interfaces, they secure future connections. Ready for networked industry? With FAULHABER, it's not a trick.

ERNTECwww.faulhaber.com/mc/enEasy commissioning with
the new Motion Manager 6Contact us ERNTEC +61 3 9756 4000 or email us at sales@erntec.net

TOMORROW'S WIRELESS

Lauren Davis

Every year, the National Instruments (NI) Technical Symposium offers an insight into the latest innovations in the areas of test, measurement and control.

At the 2016 symposium, held in Sydney on 17 November, attendees were presented with an overview of how 5G and the Internet of Things (IoT) are changing the future of wireless.

Jeremy Taylor, area sales manager for NI, explained that standards bodies are currently putting together some of the standards that will form what everybody knows as 5G. These standards will differ across the three main use cases of 5G — that is, the three main ways in which it will be utilised:

- Enhanced mobile broadband — requiring high data throughput, in the order of 10 Gbps or higher, to allow for fast video download and for virtual reality technologies.
- Massive machine-type communication (mMTC) — requiring the ability to handle dense networks of devices, in order to increase the number of devices available to a network.

- Ultrareliable machine-type communication (uMTC) — requiring low latency and high reliability, for applications where vehicles are talking to each other and to infrastructure.

Different 5G applications will have different requirements, said Taylor, “whether you’re dealing with vehicles or transportation systems, in manufacturing, industrial automation, energy or health care”. 5G researchers therefore need to develop the right capabilities for each application, and the technologies to support these capabilities.

But what exactly is 5G? Professor Jinhong Yuan, from UNSW’s School of Electrical Engineering and Telecommunications, set out to explain the differences between 5G and 4G, noting that some people may think their 4G mobile phone has all the power they need.

“People may say that 4G is faster than 3G, 3G is faster than 2G, so 5G will be better than 4G for sure,” said Professor Yuan.



But not only is 5G faster than 4G, he said — it is also more reliable, with low latency (1 ms) and high capacity, making it suitable for mMTC and crucial for mission-critical applications.

"Here's an example," he said. "If a doctor wants to use the internet to do a remote operation, you really need to have a critical 1 millisecond delay."

Professor Yuan also stressed the efficiency of 5G technology, which he claimed is more important than speed. He noted that telco companies only ever advertise their peak data rates, failing to mention that these rates are substantially reduced if a network is being accessed by multiple users.

"20 gigabits [per second] doesn't mean everyone will get it," he said. "As a peak point, if you are the only user there, you will get it. If lots of people are there, everybody will have to share that peak data rate."

The advantage of 5G, said Professor Yuan, is that efficiency will be tripled, so while this peak data rate is still unlikely to be reached in a high-capacity environment, user experience will certainly be improved compared to today's standards.

Connecting all the devices in a single building is one thing, but as Professor Yuan explained, massive machine-type communication is quite another. mMTC refers to the connection of one million devices over 1 km², which means a new approach to connection will be required. And according to Professor Yuan, the future lies in random access.

"[With] a traditional, one-way standard packet, you have a big packet," said Professor Yuan. In the future, he said, your device may send only a little bit of data at a time — 1 to 2 bytes — so it will require the ability to carry out short-packet transmissions. This is currently achieved using a protocol called ALOHA, which is typically implemented in environments with large numbers of users.

"Everyone, if they want to transmit, can only transmit a very short packet," said Professor Yuan. "So what you do is that you transmit randomly. If the receiver can receive it, you are successful. Otherwise, after a while you retransmit."

"You can see this kind of protocol is easy to implement, but the problem is that if two users of the system simultaneously attempt transmission, you will have collision. Due to this collision, you need to retransmit. So the efficiency for this protocol is only 18%. You can think about it in such a way that there are 100 people in this room and everybody wants to transmit something, but only 18 people can get their data through the network."

Seeking a solution, Professor Yuan and his colleagues developed a more coordinated approach that involves a series of timeslots.

"If you want to transmit, you only transmit during a particular timeslot," he said. "You have no collisions... so eventually you can double the throughput compared to ALOHA. That means of 100 people trying to transmit, you can have 37 people successful."

He and his fellow researchers then went one step further, working to improve ALOHA with a methodology called coded slotted ALOHA — a system that works very similar to ALOHA, except instead of having one timeslot in which to transmit your data, you get two.

"If everybody transmits twice, chances are that you may have one of your packets without a collision," said Professor Yuan. "If your packet doesn't have a collision, you can get it through... At the end of the day, you can improve the throughput from 37% to 91%."

This is just one example of a technology that has been developed to cope with the demands of 5G, but there will be many more. According to Taylor, these technologies may include massive MIMO and millimetre-wave communications to deliver high-throughput and high network efficiencies; multiradio access technologies to improve bandwidth utilisation; and new networking technologies, like cloud radio access networks, to reduce the operating costs of networks by centralising baseband processing.

So when can we expect to see 5G networks in the general market? According to the various standards bodies, it won't be until 2020, though Taylor says this is "closer than you might have expected". In the meantime, standards bodies and researchers are working relentlessly so that when tomorrow's wireless technology arrives, we will be ready for it.

LIQUID METALS CREATE NANOMETRE-THICK ICS

Scientists are using liquid metals to create integrated circuits (ICs) that are merely atoms thick, opening the way for the production of large wafers around 1.5 nm in depth. A sheet of paper, by comparison, is 100,000 nm thick.

The project was led by Distinguished Professor Kourosh Kalantar-zadeh, from RMIT University, in collaboration with Australian and US colleagues. He said 2D printing will allow for "the next revolution in electronics", noting that "creating many layers of incredibly thin electronic chips on the same surface dramatically increases processing power and reduces costs".

Unfortunately, other 2D printing techniques have so far proven unreliable in terms of quality, been difficult to scale up and function only at very high temperatures — 550°C or more.

"None of the current technologies are able to create homogenous surfaces of atomically thin semiconductors on large surface areas that are useful for the industrial-scale fabrication of chips," said Benjamin Carey, a researcher at RMIT and CSIRO.

"Our solution is to use the metals gallium and indium, which have a low melting point."

Writing in the journal *Nature Communications*, the researchers explained that these metals produce an atomically thin oxide layer on their surface that naturally protects them. It is this thin oxide which was used in their fabrication method.

"By rolling the liquid metal, the oxide layer can be transferred onto an electronic wafer, which is then sulfurised," said Carey. "The surface of the wafer can be pretreated to form individual transistors."

"We have used this novel method to create transistors and photodetectors of very high gain and very high fabrication reliability in large scale."

Carey said creating electronic wafers just atoms thick could overcome the limitations of current chip production. It could also produce materials that are extremely bendable, paving the way for flexible electronics.

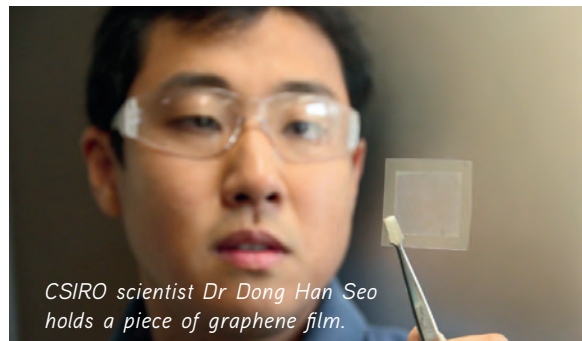
TURNING SOYBEANS INTO GRAPHENE

Graphene has long been lauded as something of a wonder material, with its thin composition and high conductivity meaning it is used in applications ranging from miniaturised electronics to biomedical devices. Now, scientists led by CSIRO have made the world's strongest material more commercially viable with the help of the humble soybean.

Graphene is typically grown in a highly controlled environment with explosive compressed gases, requiring long hours of operation at high temperatures and extensive vacuum processing. This high cost of production has so far served as a major roadblock in the material's commercialisation.

The CSIRO team have now developed 'GraphAir' technology, which eliminates the need for such a controlled environment. Writing in the journal *Nature Communications*, the scientists explained that GraphAir enables graphene film to be grown in ambient air with a natural precursor, making its production faster and simpler.

"This ambient-air process for graphene fabrication is fast, simple, safe, potentially scalable and integration-friendly," said Dr Zhao Jun Han, a co-author on the study.



CSIRO scientist Dr Dong Han Seo holds a piece of graphene film.

So where do the soybeans come in? Well, heat breaks down soybean oil into a range of carbon building units that are essential for the synthesis of graphene, which is itself a carbon material. The team additionally managed to transform other types of renewable and waste oils, such as those left over from barbecues or cooking, into graphene films.

"We can now recycle waste oils that would have otherwise been discarded and transform them into something useful," said co-author Dr Dong Han Seo.

"Our unique technology is expected to reduce the cost of graphene production and improve the uptake in new applications," added Dr Han.

FUNDING SECURED FOR NEXT-GEN LI-ION BATTERIES

Thanks to a partnership between the University of Wollongong (UOW) and Chinese battery manufacturer Tianneng Battery Group, researchers led by Professor Zaiping Guo (pictured) have secured funding to develop the next generation of high-energy-density lithium-ion batteries.

Tianneng Battery Group will provide \$250,000 for the researchers to develop innovative silicon/carbon composite anode materials for use in lithium-ion batteries, offering greater capacity compared to current graphite-based anode materials. Among other things, the batteries have the potential to significantly increase the range of electric cars.

"If we use a current lithium-ion battery for an electric car, the driving range is very limited because the energy density is still relatively low," said Professor Guo. "By replacing the graphite-based anode with a silicon/carbon anode, we can potentially increase the energy density by 50% — which would significantly increase the driving range of an electric car."

While there are significant technical challenges to overcome before silicon/carbon composite anodes can be used in commercial batteries, Professor Guo is confident that her team could solve these challenges, having commenced work on the project last year.

"The first product is showing promising results and we are trying to improve it further," said Professor Guo. "The amount of batteries we currently produce is still small scale, but I would say in three to five years we are going to be using this battery commercially in electric cars."





BACTERIA-POWERED BATTERIES ON A SHEET OF PAPER

Researchers at Binghamton University, State University of New York have developed a bacteria-powered battery on a single sheet of paper that can power disposable electronics. Published in the journal *Advanced Materials Technologies*, their battery has been created through a manufacturing technique that reduces fabrication time and cost.

"Among many flexible and integrative paper-based batteries with a large upside, paper-based microbial fuel cell technology is arguably the most underdeveloped," said Assistant Professor Seokheun 'Sean' Choi, director of Binghamton's Bioelectronics and Microsystems Lab and co-author on the paper.

"We are excited about this because microorganisms can harvest electrical power from any type of biodegradable source, like wastewater, that is readily available. I believe this type of paper biobattery can be a future power source for papertronics."

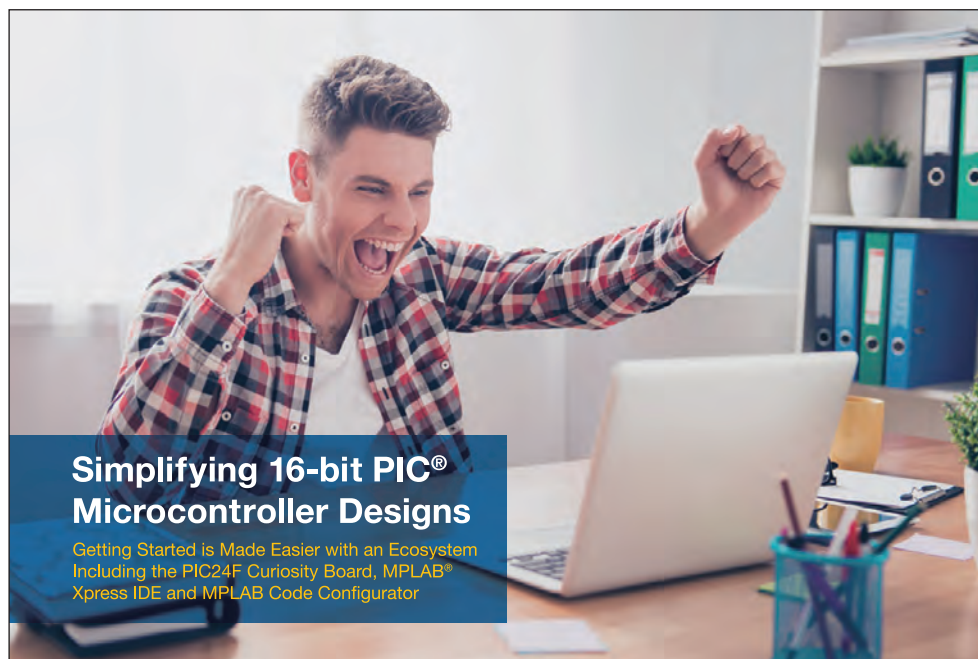
On one half of a piece of chromatography paper, Choi and study co-author Yang Gao placed a ribbon of silver nitrate underneath a thin layer of wax to create a cathode. The pair then made a reservoir out of a conductive polymer on the other half of the paper, which acted as the anode. Once properly folded and a few drops of bacteria-filled liquid are added, the microbes' cellular respiration powers the battery.

Choi acknowledged that there are "potential issues such as misalignment of paper layers and vertical discontinuity between layers, which ultimately decrease power generation". However, different folding and stacking methods were found to significantly improve power and current outputs, with the scientists able to generate 31.51 μW at 125.53 μA with six batteries in three parallel series and 44.85 μW at 105.89 μA in a 6x6 configuration.

The design could therefore revolutionise the use of biobatteries as a power source in remote, dangerous and resource-limited areas, where usability and portability are paramount. Plus, there is enough power to run biosensors that monitor glucose levels in diabetes patients, detect pathogens in a body or perform other life-saving functions.






*Pictured: A foldable, bacteria-powered battery.
Image credit: Seokheun Choi.*



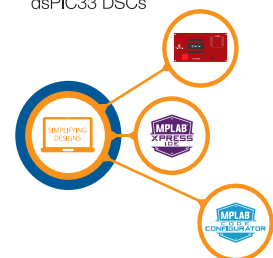
Simplifying 16-bit PIC[®] Microcontroller Designs

Getting Started is Made Easier with an Ecosystem Including the PIC24F Curiosity Board, MPLAB[®] Xpress IDE and MPLAB Code Configurator

Are you new to 16-bit PIC Microcontrollers or starting a new design? Step into the world of unlimited possibilities through an easy to start ecosystem including the PIC24F Curiosity Board, MPLAB Xpress Cloud-based IDE and MPLAB Code Configurator (MCC) to simplify your designs. This trio of tools can jump-start your design facilitating a hassle free start, conceptualization and easy creation of your prototype design.

- 1 PIC24F Curiosity:** Rapid prototyping board for only \$25
- 2 MPLAB Xpress:** A quick start online development environment for PIC24 MCUs & dsPIC33 DSCs
- 3 MPLAB Code Configurator:** Intuitive Code Development Tool for PIC24 MCUs & dsPIC33 DSCs



Contact Information

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

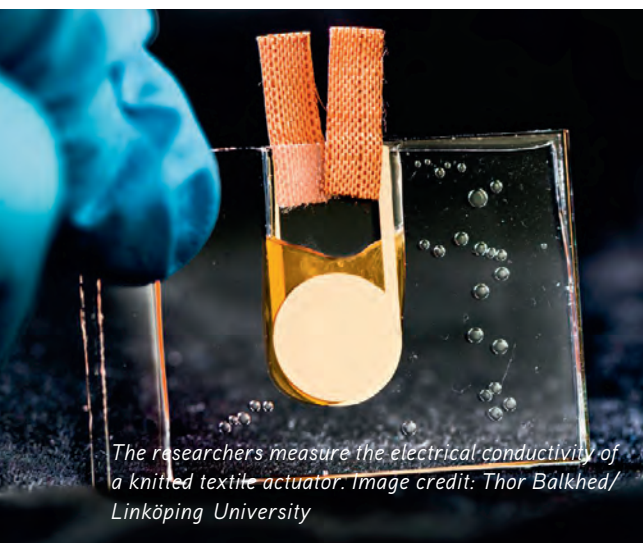
www.microchip.com/simplifying16bit

microchip
DIRECT
www.microchipdirect.com



The Microchip name and logo, the Microchip logo, MPLAB and PIC 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. © 2017 Microchip Technology Inc. All rights reserved.





The researchers measure the electrical conductivity of a knitted textile actuator. Image credit: Thor Balkhed/Linköping University

THE TRANSISTOR THAT'S DRIVEN BY HEAT

Researchers from Linköping University have created a thermoelectric organic transistor — apparently the first in the world to be controlled by a heat signal rather than an electrical signal. Their work has been published in the journal *Nature Communications*.

The transistor (pictured) builds on a study that last year led to the development of a supercapacitor being charged by the Sun's rays, in which the Sun's heat is converted to electricity and then stored in the capacitor until required. This study relied on a liquid electrolyte — consisting of small, quick, positively charged ions and large, heavy, negatively charged conductive polymers — located between two metal electrodes.

When one end of the electrolytes was heated and the other one cooled down, the small ions rushed towards the cold side while the heavy polymer chains stayed where they were. The ions stuck to the metal electrodes and the charge that arose was stored in carbon nanotubes next to the metal electrodes, available for discharge whenever electricity was needed.

"When we had shown that the capacitor worked, we started to look for other applications of the new electrolyte," said Professor Xavier Crispin.

After many hours in the laboratory, Professor Crispin and his colleagues showed that it was possible to build a logic circuit — in this case, a transistor — that is controlled by a heat signal. Furthermore, its sensitivity to heat — 100 times greater than traditional thermoelectric materials — means that a temperature rise of a single degree is sufficient to cause a detectable current modulation in the transistor.

The heat-driven transistor could potentially be used for applications such as detecting small temperature differences and in functional medical dressings in which the healing process can be monitored. It is also possible to produce circuits controlled by the heat present in infrared light, for use in heat cameras and other applications.

CONDUCTIVE POLYMER FILMS FOR PLASTIC ELECTRONICS

Singaporean scientists have developed conducting polymer films that provide high performance in plastic electronics, including organic LEDs, solar cells and transistors.

To create devices with better functionality and efficiency, researchers are constantly looking for better ways to make them, in particular from earth-abundant materials using eco-friendly processes. A lot of attention has been placed on plastic or organic electronics, made from organic carbon-based semiconductors, which can potentially provide flexible, lightweight, large-area and additively manufactured devices.

To make high-performance devices, however, good ohmic contacts with low electrical resistances are required to allow the maximum current to flow both ways between the electrode and the semiconductor layers. That is what the scientists from the National University of Singapore (NUS) have achieved, creating conducting polymer films with apparently unprecedented ohmic contacts.

Writing in the journal *Nature*, the researchers explained that they sought to design polymer films with the desired extreme work functions — ie, the minimum amount of energy needed to liberate an electron from the film surface into vacuum — needed to generally make ohmic contacts. As noted by research leader Dr Png Rui-Qi, "The lack of a general approach to make ohmic contacts has been a key bottleneck in flexible electronics."

To design polymer films with high work functions, the researchers "developed the concept of doped conducting polymers with bonded ionic groups, in which the doped mobile charges — electrons and holes — cannot dissipate away because their counterbalancing ions are chemically bonded", said Dr Rui-Qi. Work functions as high as 5.8 eV and as low as 3 eV could now be attained.

"As a result, these conducting polymers can remain stable despite their extreme work functions and provide the desired ohmic contacts," said Dr Rui-Qi, claiming that his team's research will open a path to "better performance in a wide range of organic semiconductor devices".

The work was a result of collaboration between the departments of chemistry and physics at NUS, as well as technology company Cambridge Display Technology (CDT). The researchers are now looking to further develop the technology.



Dr Png Rui-Qi, Mervin Ang and Cindy Tang. Image credit: Seah Zong Long.

More new products **in stock** than any other distributor.



australia@mouser.com
newzealand@mouser.com
Order now at **mouser.com**



Mouser and Mouser Electronics are registered trademarks of Mouser Electronics, Inc. Other products, logos, and company names mentioned herein, may be trademarks of their respective owners.

The Newest Products for Your Newest Designs®



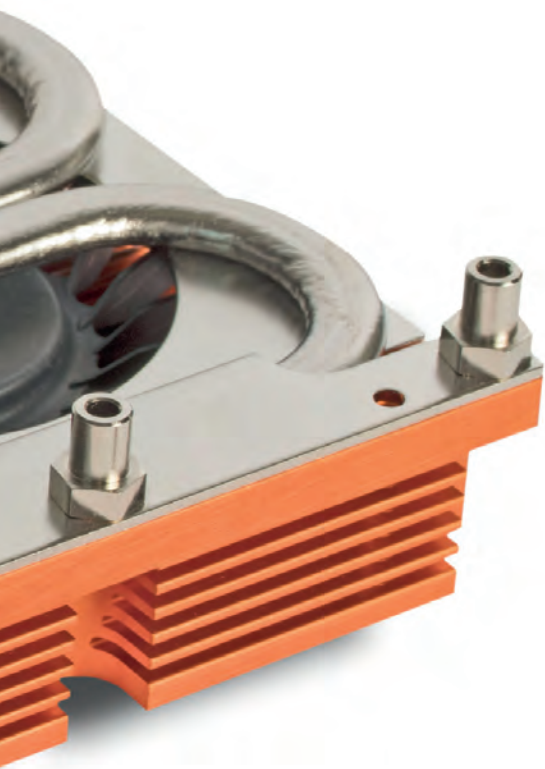
THE SERVER-ON-MODULE ERA BEGINS

Christian Eder*

PICMG has published the COM Express Release 3.0 specification. It not only features an upgrade for the latest existing pin-outs for Type 6 and Type 10 modules, but most notable is the final release of the COM Express Type 7 specification.

It is the first module specification for server technologies, offering innovation that defines a new class of embedded computer technology: server-on-modules. What makes this new module class unique, what are the target markets and which processors fit?

The new COM Express Type 7 modules are similar in many ways to earlier generation modules; however, this is by design and essential to enabling new server-level capabilities. Form factor, connector location, number of signal pins, mounting holes, PCB board layers, heat spreader design, design-guide for carrier board layouts and embedded API guidance from PICMG all remain consistent. Even the pin-out has been changed only 23% compared to COM Express Type 6. But it is exactly these relatively small differences that transform a typical computer-on-module into a true server-on-module.



Heat pipe-based cooling solutions from congatec are designed for COM Express Type 7 server-on-modules.

What makes the difference?

Support for 10 GbE and a rich set of PCIe lanes are the major characteristics of server performance. A server also needs to provide highest bandwidth possible to connect many standard computers via 1 GbE or thousands of smaller IoT devices. And COM Express Type 7 delivers: compared to Type 6, several interfaces have been removed to make room for up to four new 10 GbE interfaces and up to eight more PCIe lanes. All audio and video interfaces have been replaced, as well as four of the eight USB 2.0 ports, the ExpressCard interface and two of four SATA ports. This frees up 60 pins on the AB connector and 42 pins on the CD connector to accommodate the new interfaces. Performance is elevated from embedded computer-on-modules to server-on-modules, optimised for all types of carrier-grade edge and cloud computing as well as the broad spectrum of Industrial Internet of Things (IIoT) and Industry 4.0 applications.

Why do we need server-on-modules?

Modules provide an application-ready computing core so that developers no longer need to design and configure servers from the ground up. They need only to choose the suitable module, integrate an application-specific carrier board and define the required extensions and external interface. As a result, server-on-modules significantly reduce design efforts and resources as compared to the requirements of a full custom design. Test and certification demands are reduced as well, because the core is already tested and prevalidated for all major, globally recognised certifications.

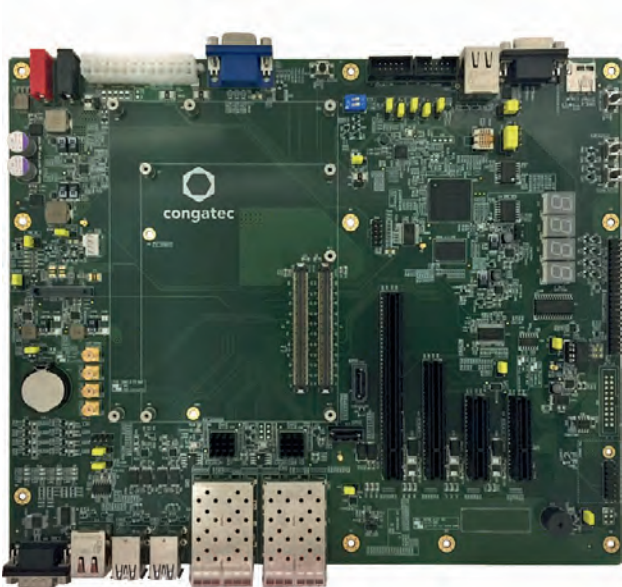
Standardisation offers further benefits; for example, engineers can rely on identical interfaces for new or next-generation products. Designers are well supported by a range of vendors, improving long-term availability and ensuring freedom to choose the best solution. The broad ecosystem of accessories includes application-ready cooling solutions and carrier boards, enabling a competitive landscape for purchasing components or even re-using third-party layouts to minimise NRE costs. The form factor is used by a large community, which in turn ensures continuous improvement of the standard. As a vendor-independent standardisation body, PICMG has launched this new server-on-module standard and actively supports the developer community in promoting its value contrasted to proprietary solutions.

Which different server categories do server-on-modules target?

In most networked computing infrastructures, including both standard IT/carrier-grade data centres and network computing infrastructure, decentralised server nodes are the most in-demand applications and made possible through network functions such as virtualisation and software-defined networking (NFV/SDN). At the network edge, server-on-modules may play an important content distribution role; for example, in cloudlets (aka follow-me clouds or mobile micro-clouds). They are located at the edge of the internet and reside in the middle of a three-tier hierarchy that runs across mobile device to cloudlet to cloud. Their function is to decrease latency for response-critical applications and relies on the ability to support a very wide range of user-level computations; for example, voice recognition applications such as Siri, Alexa, Cortana and/or video transcoding with variable adaptive rates. Such systems need to also handle mechanisms for authentication, access control and metering, and must offer dynamic resource allocation for user-level computations.

In these performance-driven areas, modular designs offer better scalability and upgrade capacity at lower costs than conventional server designs; this results from system updates that can be executed across different processor, socket and memory generations. Only the module itself has to be changed instead of the entire board or system. This adds critical value in highly competitive markets, fuelled by users' continued demands for greater performance at lower costs.

Decentralisation of server performance is also a growing embedded computing trend in IoT applications. Edge and fog server architectures, either private or publicly located, demand a highly individualised set-up in terms of interfaces connecting the field to local intelligence; this can range from wireless sensor networks to Industry 4.0 connected machinery. Examples can be found in smart cities, where decentralised server intelligence provides local processing and storage for real-time analytics in traffic management, emergency response or video surveillance for public safety. Smart grids and renewable energy parks also demand local intelligence with low latency, ideal to control power generation and distribution in real time. IIoT and Industry 4.0 applications also call for local server performance, consolidating real-time control of several machines, IoT connectivity and data analytics on a single industrial edge server. Even commercial data centre applications can benefit from server-on-modules.



For a quick start with COM Express Type 7 modules, congatec offers an evaluation carrier board, which routes all the defined signals to standard interface connectors. For Ethernet, it offers 10 Gigabit Ethernet SFP+ cages.

COM Express Type 7 target markets:

- Carrier-grade computing at the edge of the grid
- Embedded IoT applications at the edge of a public grid
- Embedded IoT applications in a private grid
- IT-driven data centre applications
- IP-based base stations
- Public edge server
- Private edge server
- Server systems
- Cloudlets
- Public FOG server
- Private FOG server
- Cloud systems

Which processors come with server-on-modules?

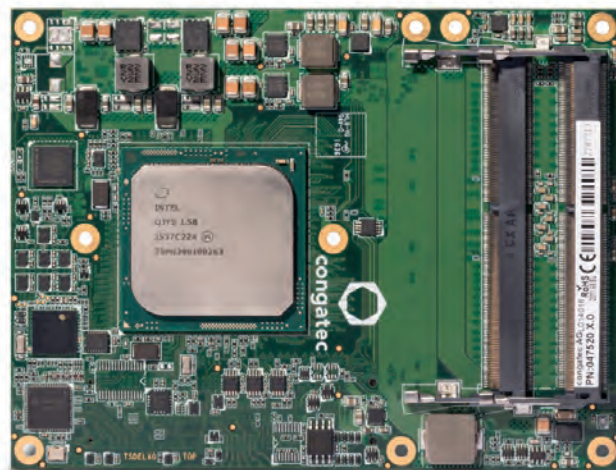
The first server-on-modules made available are equipped with the Intel Xeon D processor family (codename: Broadwell DE). They offer headless computing power from a 16-core Intel Xeon D1577 processor to the Intel Pentium D1519 processor for industrial temperature ranges (-40 to +85°C). They offer up to 48 GB of 2400 MHz DDR4 RAM with or without error correction code (ECC). Engineers will be able to incorporate silicon from other vendors; for instance, look at the latest AMD launches. It can be expected that upcoming embedded variants of the Zen microarchitecture might be a good fit as well. So engineers will have access to a very attractive modular solution, which is instantly scalable as new server processors become available.

What is the feature set of server-on-modules in detail?

The new conga-B7XD COM Express Type 7 server-on-modules from congatec come in a headless design and are available with 10 different server processors, ranging from the 16 Core Intel Xeon processor D1577 to the Intel Pentium processor D1519 for the industrial temperature range of -40 to +85°C. An outstanding



MODULES PROVIDE AN APPLICATION-READY COMPUTING CORE SO THAT DEVELOPERS NO LONGER NEED TO DESIGN AND CONFIGURE SERVERS FROM THE GROUND UP.



The first COM Express Type 7 server-on-modules from congatec with two 10 Gigabit Ethernet channels are equipped with headless computing power from 16-core Intel Xeon D1577 processor to the Intel Pentium D1519 processor for industrial temperature ranges from -40 to +85°C.

characteristic of the congatec server-on-modules product family is the high level of network performance due to 2x 10 Gigabit Ethernet ports. They also support the NC-SI Network Controller Sideband Interface for connecting a baseboard management controller (BMC) allowing out-of-band remote manageability. Powerful system extensions, including server-class NVMe storage or GPGPU computing capabilities, can be connected via up to 24 PCIe Gen 3.0 Lanes and 8x PCIe Gen 2.0 Lanes. 2x SATA 6G ports are available for conventional storage media. Further I/O interfaces, including 4x USB 3.0, 4x USB 2.0, LPC, SPI, I²C Bus and 2x UART are featured.

What else counts?

With application-specific, hardware-related software support, including standardised IoT APIs from the server-on-module manufacturer, developers can quickly create reliable custom cloudlet, edge and fog server applications. With congatec's optional Embedded Design & Manufacturing Services, even complete custom server designs can be implemented quickly.

A white paper on the COM Express Type 7 specification is available for download from congatec.

Congatec Australia Pty Ltd
www.congatec.com

**Christian Eder is Director Marketing at congatec and the COM Express 3.0 specification editor. He is a member of PICMG, also working as specification editor in the COM Express Workgroups for COM Express 2.0, COM Express 2.1, COM Express Design Guide 2.0, Embedded EEPROM and Embedded EAPI.*



maxon product range

The solution is always a matter of the right combination.



maxon DCX motors are configurable online via maxons interactive web based configuration portal. This allows a customer to change the motors shaft shape and dimensions, the gearhead features, the mounting holes, the winding and even the connectors. As more mechatronic and automation engineers use the technology the products available online expand. Recently we have seen the addition of 12 mm, 14 mm and 16 mm micro DC motors as well as "mix and match" different motor and gearhead diameters.

maxon motor australia Pty Ltd., Unit 1, 12-14 Beaumont Road, Mount Kuring-Gai, NSW 2080, +61 2 9457 7477, www.maxonmotor.com.au

maxon motor
driven by precision

DC POWER SUPPLIES

The bipolar voltage/current power supply IT6400 series can be used as both a power source and an electronic load which is suitable for battery charge/discharge tests.

The IT6412 is a dual-channel power source which can output up to ± 15 V at up to ± 3 A or ± 9 V at up to ± 5 A. The IT6411 and IT6432 are the single-channel type and the IT6432 extends the output voltage to ± 30 V with power up to 150 W. The IT6411S is an updated version of the IT6411 that can monitor load currents to 10 nA, which is more suitable for testing atomic scale current or dark current. The IT6431 extends its output current to ± 10 A to meet the latest quick-charger test requirement or to simulate the latest USB-C output.

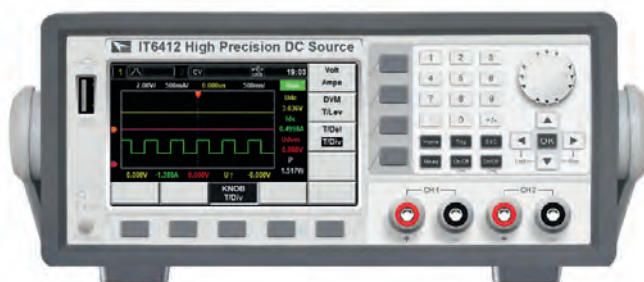
The series can not only charge/discharge a battery by setting shut-off conditions including voltage, current, capacity and time, but also simulate a battery with settable internal resistance. The user can import a list of the battery's parameters, including voltage, remaining capacity and resistance, to simulate a battery's charge/discharge procedure while monitoring the SoC, remaining capacity, resistance, open-circuit voltage, voltage and current.

To monitor fast changing and pulse-like load currents properly, the series offer the speed necessary to capture load changes that occur at intervals as short as 50 μ s when 50–100% loaded. This allows designers and manufacturers of portable, battery-operated devices to monitor load currents easily in all of a device's operating modes. Speed shift mode achieves voltage/current high-speed rising waveform without overshoot, supports stable power supply and ensures security, especially for LED testing.

Abundant electrical basic measuring functions are available. High-precision DVM is built into each channel, with readback resolution up to 1 mV and the measured data visible on each channel screen. The waveform of voltage/current display function lets the test be visible and simple.

Fuseco Power Solutions Pty Ltd

www.fuseco.com.au

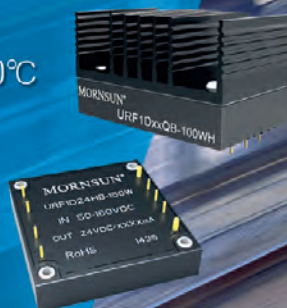


MORNSUN®

SAVE power, SAFE track

6-150W DC/DC Converter URB1D/URF1D Series

- Compatible with vehicle battery voltage: 40-160VDC
- Isolation up to 3000VDC
- Operating temperature: -40°C to +100°C
- Efficiency up to 88%
- International standard brick package
- Protections: UVP, OVP, OCP, SCP
- EN50155/ EN60950



* For the detailed information, please refer to datasheet.

Railway



DLPC Pty Ltd
Tel: 07 3823 4844 Fax: 07 3823 4866
Email: keith@dlpc.com.au
Web: www.dlpc.com.au



Fairmont Marketing
Tel: 03 9878 3077 Fax: 03 9878 4522
Email: nick@fairmontmarketing.com.au
Web: www.fairmontmarketing.com.au



SYSTEM-ON-CHIP

The STMicroelectronics BlueNRG-1 system-on-chip contains a Bluetooth low energy radio. It is optimised to satisfy high-volume opportunities in the fast-growing Bluetooth low energy (Bluetooth Smart) market through the combination of energy efficiency and good radio performance.

The product's ability to transition quickly between power-saving and active modes extends battery life from months to years in low-power smart sensors and connected devices like wearables, retail beacons, keyless entry systems, smart remote controllers, asset trackers, and industrial and medical monitors.

It features a 32 MHz 32-bit ARM Cortex-M0 core and delivers performance and efficiency for targeted applications. The product also includes 160 KB of on-chip flash memory, allowing designers to embed both the Bluetooth Low Energy 4.2 protocol stack and the application code; 24 KB of static RAM with retention (in two 12 KB banks); and SPI, UART, I2C standard communication interface peripherals.

The device benefits from an ultralow-power design, including support for fast wake-up and sleep transitions, and sub-1 μ A standby current. In addition to the device's good link budget up to 96 dB, RF-output power is boosted to +8 dBm to ensure clear and reliable communication for optimum efficiency, even in noisy environments. The product is compliant with a range of RF regulations, including ETSI EN 300 328, EN 300 440, FCC CFR47 Part 15 and ARIB STD-T66.

Mouser Electronics
www.mouser.com

MODULAR DC-DC CONVERTER

The DCM in a VIA Package is a ruggedised, modular DC-DC converter that operates from an unregulated, wide-range input to generate an isolated and regulated high-efficiency output with high power density.

The DCMs are said to offer power system engineers a better BRICK with their enhanced functionality of EMI filtering, transient protection, inrush current limiting and a secondary-referenced control interface for trim, enable and remote sensing. Configurations are available for both on-board and chassis mounting.

Aimed at a variety of applications, including industrial and communications, Vicor has added two models to the range: a 48 V input nominal module (36–75 V range) in a 3414 VIA package (3.38 x 1.40 x 0.37") with a 28 V/320 W output; and a 300 V input nominal module (200–420 V range) in a 3714 VIA package (3.75 x 1.40 x 0.37") with a 28 V/500 W output, achieving a power density up to 257 W/in³.

Vicor Corporation
www.vicorpower.com

"Rigol offer Australia's Best Value DSOs"



RIGOL DS-1000E Series

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

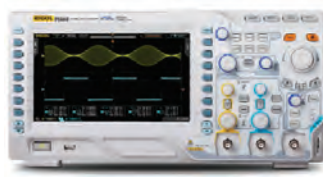
FROM \$469 ex GST



RIGOL DS-1000Z Series

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

FROM \$579 ex GST



RIGOL DS-2000A Series

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

FROM \$1,247 ex GST



RIGOL DS-6000 Series

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

FROM \$8,461 ex GST

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

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



SINGLE-CELL BATTERY-BOOST SWITCHING REGULATOR

RECOM's Boost R-78S switching regulators have been specially designed for single-cell powered IoT applications. Due to their wide input voltage range, high efficiency and low stand-by losses, they extend not only the working lifetime of the cell, but also maintain a stable 3.3 V output for the life of the battery.

Based on the simple plug-and-play concept of the standard R-78 buck regulator, the boost regulator is able to provide a stable 3.3 VDC output from a lower input voltage from 3.15 down to 0.65 V. Applications such as microcontrollers, WLAN/Bluetooth/LoRa modules or IoT systems can now be supplied from a single 1.5 V cell, which, in contrast to conventional 3 V button batteries, is said to offer more power for a longer operational life. The efficiency of the series can reach 93% at full load and maintain at over 90% even under light loading. No load current consumption is 160 μ A, reducing to 7 μ A when the control pin is used.

The converters are protected against permanent short circuit and over-temperature conditions and have an undervoltage lockout to protect rechargeable cells from deep discharge. They can be operated in the ambient temperature range from -40 up to +100°C and are certified to the new EN62368-1 standard.

RECOM Power GmbH
www.recom-power.com

AC/DC CONVERTERS

The Mornsun LO10-26D0512-04L and LO20-10C0512-01 LO Series AC/DC converters are designed to be cost-effective.

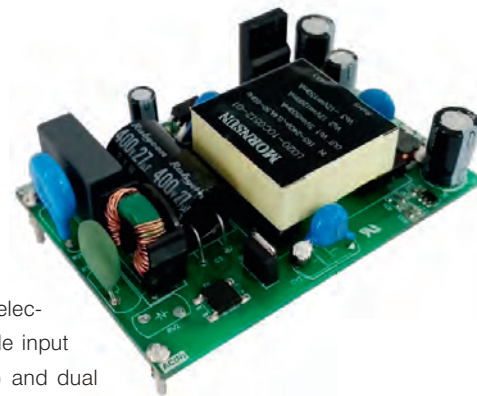
The LO10-26D0512-04L specialised electric meter is compact in size, with wide input voltage of 57–528 VAC (80–745 VDC) and dual outputs (5.1 VDC/1.2 A, 12 VDC/0.4 A), which meets the requirements of 380/220 VAC nominal voltage of a three-phase four-wire system and any two wires connection from a three-phase four-wire system.

The converter offers 4000 VAC isolation, provides protections such as SCP, OCP and OVP, and meets IEC/EN61000 standard of 'EFT (± 4 KV), surge (± 2 KV) and CE/RE meets CISPR22/EN55022 CLASS B'. Therefore, the product is suitable for applications which have higher requirements for isolation and EMC performance.

Open frame LO20-10C0512-01 is an AC/DC converter with high voltage accuracy and triple outputs (5 V/500 mA, 12 V/1200 mA, -12 V/150 mA) specialised for AC charging point. It features output voltage accuracy ($\pm 3\%$) and load regulation ($\pm 5\%$). The converter also offers a wide input voltage range of 165–264 VAC (230–370 VDC), 3000 VAC isolation, high efficiency up to 78% and takes both DC and AC input voltage. It also has protections such as SCP, OCP and OVP. It is suitable for AC charging point, industrial control and other industrial equipment applications even in harsh environments.

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

DLPC Pty Ltd
www.dlpc.com.au



SILICON-CONTROLLED RECTIFIERS

High-temperature silicon-controlled rectifiers (SCRs) from STMicroelectronics allow manufacturers of voltage regulators, inrush current limiters for switch-mode power supplies, motor-control circuits and industrial solid-state relays to improve the reliability of their applications and/or reduce costs by using smaller heatsinks.

Operating with junction temperatures of up to 150°C, the TN4015H SCRs offer on-state RMS current ratings of 40 A, extending and complementing the existing 12–20 A product range. They are designed to offer tight control of the gate triggering current, leading to enhanced reproducibility on the customers' assembly lines with corresponding improvements in the reliability of the end products, according to the company.

The SCRs are more gate-sensitive compared with previous generations, while delivering good electrical noise immunity (dV/dt up to 1000 V/ μ s). Other key technical features include: 600 V blocking voltage; high turn-on current rise (dI/dt = 100 A/ μ s); and ECOPACK 2 packaging for compliance with safety regulations and faster certification.

Addressing a wide range of industrial and two- and three-wheel vehicle applications, the product is available in various power packages, with UL 1557 certified insulated packages withstanding up to 2500 VRMS.

STMicroelectronics Pty Ltd
www.st.com

INDUCTIVE TOUCH SENSING

The Texas Instruments LDC2114 Evaluation Module inductive touch sensing detects and measures the presence of conductive objects to implement inductive touch buttons. The product features a multichannel low-noise inductance-to-digital converter optimised for inductive touch applications on monolithic surfaces.

Inductive sensing technology enables touch button design on a wide variety of materials such as metal, glass, plastic and wood by measuring small deflections of conductive targets. The sensor for an inductive touch system is a coil that can be implemented on a small, compact PCB located behind a panel and protected from the environment.

The product can connect up to four buttons using the LDCCOILEVM or customised coils designed using the WEBENCH inductive sensing designer. The board offers integrated and configurable algorithms for button press detection with onboard LED indicators. The product consumes as little as 6 μ A at 0.625 samples per second, and designers can configure the device at different duty cycles to optimise the power consumption of their system.

The product is a 1.8 V, multichannel, low-noise, inductance-to-digital converter with integrated algorithms to implement inductive touch applications. The two-channel LDC2112 and four-channel LDC2114 devices employ an innovative inductive-capacitive (LC) resonator that offers high rejection of noise and interference, with a wide range of oscillation frequencies from 1 to 30 MHz. With adjustable sensitivity per input channel, the product can reliably detect material deflections of less than 200 nm with a wide range of physical button structures and materials. The high-resolution measurement further enables the implementation of multilevel buttons.

The devices can operate in an ultralow-power mode of 6 μ A for optimal battery life or can be toggled into a higher scan rate for more responsive button press detection for game play or other low-latency applications. The devices are configured through 400 Hz I2C, and the only external components necessary for operation are supply bypass capacitors and a COM pin capacitor to ground.

Mouser Electronics

www.mouser.com



Protection in Tough Environments

▪ Bocube Alu Enclosure

IP 69

Contact: +61 3 9756 4000 or sales@erntec.net

ERNTEC

BOPLA

BATTERY MANAGEMENT IC

The Renesas battery management IC for lithium-ion (Li-ion) is designed for rechargeable batteries used in industrial equipment, such as electric power tools.

The RAJ240090 supports three to eight cells, while the RAJ240100 supports three to 10 cells. They simplify the design of industrial battery management systems, providing a high degree of safety.

The product includes an integrated microcontroller (MCU) that enables flexible support for a wide variety of industrial battery system specifications. It integrates the remaining capacity measurement and safety monitoring functions, such as overvoltage and overcurrent, into a single package to provide flexible support for a wide variety of industrial battery system specifications. This provides a high-precision A/D converter (required for battery control voltage measurement) and MCU that have been matched and adjusted beforehand.

In addition, the peripheral functions required by industrial applications, including power supply, field effect transistor (FET) driver and real-time clock, are included on-chip.

Other features include rich design support tools that enable even beginners to easily implement battery systems with a high level of safety, and maintenance of high safety level through constant safety monitoring in ultralow-power mode. This provides the ability to safely shut down the system if a problem occurs.

A record-keeping function can store information such as battery history to monitor deterioration and store system faults in the MCU memory. The MCU can issue an alarm and disable battery to prevent Li-ion battery failure.

Renesas Electronics

www.renesas.com



THREE-PATH DIODE POWER SENSOR

The R&S NRPxxS(N), R&S NRPxxT(N) and R&S NRPxxA(N) power sensors deliver precision and speed, offer USB capability and can be additionally controlled via LAN. The R&S NRP18S three-path diode power sensor is a self-contained, fully characterised instrument that can be operated with the R&S NRP2 base unit, with a laptop/PC via USB and with many Rohde & Schwarz instruments (eg, signal generators, signal and spectrum analysers, network analysers).

Three-path diode power sensors are suitable for numerous applications, since they support continuous average, burst average, timeslot average, gate average and trace measurements. Featuring high performance, measurement speed and accuracy, the sensors can be used to perform precise average power measurements on wireless signals such as GSM and 3GPP as well as on higher bandwidth signals such as LTE and LTE-Advanced. For detailed analysis, the sensors offer additional measurement functions such as timeslot mode and trace mode with a video bandwidth of 100 kHz.

Rohde & Schwarz (Australia) Pty Ltd

www.rohde-schwarz.com.au

ELECTRONICS MANUFACTURING AND ASSEMBLY

Through Hole and Surface Mount PCB assembly at very competitive rates include full turnkey service. We can supply sourcing for all components, including blank PCB's, to customer specifications.

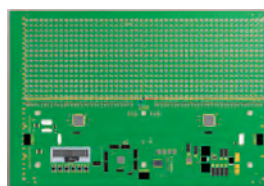
- Wiring Looms, harnesses and control panels
- Electrical panel and component labelling
- Plastics & Aluminium Machining
- Metal Turning Lathe

External Capability

Sheet metal fabrication



Ramzonics Pty Ltd



www.ramzonics.com.au

SPACE FOR RENT: OFFICES & 120M² FACTORY, COMPETITIVE RATE,
INC. PHONE, AIR CON & SECURE CAR PARK

Phone 02 9824 1199 | Mob 0433 405 930
ramez@ramzonics.com.au

EMC COMPLIANCE STANDARDS ARE CHANGING

Image courtesy of Mathias Buehler (Via Flickr) under CC BY-NC 2.0

Years ago, manufacturers made AV equipment and others made information technology equipment. Crossovers between the two categories were rare.

Fast forward to today and the line between audiovisual devices and computers is extremely blurred, with AV integrating Wi-Fi, Bluetooth, Ethernet and other technologies.

CISPR 32 'Electromagnetic compatibility of multimedia equipment — Emission requirements' is a response to this blurring of product categories and is intended to replace and combine CISPR 22 (IT equipment) and CISPR 13 (AV equipment), due to significant overlaps across the two standards and equipment similarities.

CISPR 32 is already included on the EMC mandated list and can be used for RCM compliance effective immediately. AS/NZS CISPR 32:2013 is intended to replace AS/NZS CISPR 22 and AS/NZS CISPR 13, although a date of withdrawal has yet to be made.

The ACMA has indicated this is not likely before mid-2017. It should, however, be noted that in Europe it is no longer possible to use CISPR 22 (EN 55022) or CISPR 13 (EN 55013). Only CISPR 32/EN 55032 will be accepted for CE compliance.

Equipment is to be classified as either Class A or Class B. Class B limits are the lower limits and are intended to offer adequate protection for broadcast services within the residential environment, similar to CISPR 22.

Applicable tests include:

- Radiated emissions at either 10 or 3 m distances, 30 MHz to 1 GHz, with additional testing up to 6 GHz dependent on EUT highest clock frequency. 10 m distance limits are identical to those specified in CISPR 22.
- Conducted emissions at the AC mains power ports, 150 kHz to 30 MHz. Limits are identical to CISPR 22.
- Asymmetric mode conducted emissions, 150 kHz to 30 MHz. This covers wired network ports, optical fibre ports with metallic shield or tension members, antenna ports and broadcast receiver tuner ports (Class B equipment only). It is similar to the requirements specified in CISPR 22 for conducted disturbances at telecommunication ports. It is only applicable to those ports that will connect to cables longer than 3 m.
- Conducted differential voltage emissions, 30 MHz to either 1000 or 2150 MHz. This covers TV broadcast receiver tuner ports (terrestrial and satellite), RF modulator output ports and FM broadcast receiver tuner ports. It is similar to CISPR 13 and only required for Class B equipment.

Testing company Austest Laboratories has multiple facilities covering compliance testing to CISPR 32.

Austest Laboratories
www.austest.com.au



HANDHELD ENCLOSURE

The STYLE-CASE handheld enclosure by OKW Gehäusysteme combines ergonomics with modern design. The plastic enclosure is suitable for remote control units and controllers, as well as for mobile data recording in medical technology, the home and industry.

The three-part enclosure consists of the top part as well as a bottom part in which a removable battery compartment cover is integrated. Each enclosure has an integrated battery compartment for 2 x AA batteries. A matching set of battery clips is available as an accessory.

The enclosure is screwed together with corrosion-free Torx screws in the bottom part. It is available in two versions: in ASA+PC-FR material with high UV protection in traffic white and in infrared-permeable PMMA Plexiglas in jet black.

Polished surfaces ensure an elegant appearance. The product's ergonomic design makes it pleasant to hold and thus facilitates sequences of hand movements. A recessed operating area is integrated into the top part for the use and optimum protection of decor foils and membrane keypads. The unit is available in the size 166.5 x 63 x 31 mm.

To improve its protection class, a sealing kit is optionally available for the enclosure and the battery compartment. This offers the electronics protection from dust and water. Self-tapping screws for mounting the PCBs are also available.

The product can be modified according to users' requirements, eg, with mechanical processing for interfaces, printing of logos, a functional EMC aluminium coating on the inside or through membrane keypads/decor foils. To plan modifications and installations, CAD drawings or 3D models of the enclosures can be downloaded from the company's website.

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

THIN MINI-ITX MOTHERBOARD

Advantech has announced the AIMB-216, an industrial-grade Thin Mini-ITX motherboard. With Intel Pentium/Celeron N3710/N3160/N3010 processor support, plus the latest Intel 14 nm technology, it offers significant CPU and graphics performance improvements with low power consumption (CPU TDP is only 4–6 W).

The product is fanless and designed with a low-profile I/O to offer high performance with low power consumption. It comes with high connectivity and multiple high-speed I/O, including dual GbE LAN ports, 4 x USB 3.0, 6 x USB 2.0 and 2 x SATAIII. For expansion, it supports 1 x PCIe x1, 1 x M.2 (B key) and 1 x full-size MiniPCIe (with PCIe and USB signals) for flexible modular add-on card installation. It additionally supports 6 x COM (COM3 supports RS232/422/485 auto-flow control, COM6 supports 5/12 V), which benefits users who want to connect devices without additional external power supplies and those needing data transfers over long distances. Furthermore, the device accommodates both ATX 12 V and DC-IN power. These features make it suitable for low-power industrial applications such as panel PCs, PIS (passenger information systems), small kiosks and entry-level medical systems which require power-efficient and space-saving solutions.

The product integrates an Intel Gen 8 graphics engine, which improves throughput, media acceleration, display resolution (3840x2160) and additional media codecs and improved media acceleration compared with previous iterations. It supports the H.265 HW decoder that delivers stunning graphics and media performance and includes DirectX11, OpenCL1.2 and OpenGL4.2. In addition, it supports rich display output with HDMI1.4 (or dual-channel 24-bit LVDS), Displayport 1.1 (or eDP) and DVI-D for multiple display capability. It also supports up to three independent display outputs and up to 4K2K resolution support for HDMI/DP, which makes it suitable for gaming and digital signage customers who require a slim solution with high-resolution graphics.

The product bundles with Advantech's IoT software WISE-PaaS/RMM, which constantly monitors the health of multiple devices and sends out alarm notifications via email and SMS if any system faults occur. It also provides remote device management and system recovery powered by Acronis, plus system protection powered by McAfee.

Advantech Australia Pty Ltd
www.advantech.net.au





ISOLATION TRANSCEIVER MODULE SERIES

The Mornsun TD301MCAN and TD501MCAN compact size isolation transceiver module series are cost-effective CAN bus transceiver modules which integrate power isolation, signal isolation, CAN transceiver and bus protection in one module.

The series convert TTL/CMOS level to difference level of a CAN bus to achieve signal isolation. Moreover, the products feature 2500 VDC electric isolation and a miniature package which enable them to easily achieve connectivity functions of a CAN bus network.

With rapid development of intelligent electronics, the product further promotes the data transmission rate to 5 Mbps. The two series come in the same package and both are pin-compatible, which makes it convenient for users to choose according to their system's communication protocol. The products are suitable for automotive electronics and instrumentation.

Features include meeting the ISO 11898-2 standard/ISO 11898-5 physical layer standard; 2500 VDC (input and output terminal are mutually isolated); bus timeout protection; baud rate high up to 5 Mbps (TD-MCANFD)/1 Mbps (TD-MCAN); operating temperature of -40 to +105°C; suitable for 12 V, 24 V system; and compact size, standard DIP8 package.

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

DLPC Pty Ltd
www.dlpc.com.au

SEMICONDUCTOR LASER DIODES

The Renesas NX6375AA Series semiconductor laser diodes contribute to stable operation in high-speed communication and high-temperature environments.

The product enables system developers to develop high-speed optical transceivers and optical modules that are highly reliable even in high-temperature environments.

Key features include stable operation at up to 28 Gbps per wavelength over an operating temperature range of $T_c = -5$ to 85°C ; the LDs not only support 100 Gbps with four wavelengths, but also are capable of supporting up to 112 Gbps systems; and an MTTF of 100,000 h. Narrow width selection growth technology was used for the wafer crystal growth, with controlled crystal defects in the active layer.

Renesas Electronics
www.renesas.com



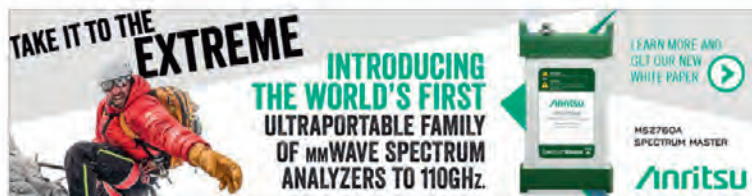
MS2760A Ultraportable Spectrum Analyzer 9 kHz up to 110 GHz

Anritsu
Since 1895



World's First Ultraportable mmWave Spectrum Analyzer up to 110 GHz

In the lab, on the manufacturing floor, or out in the field, no other instrument can match the price, performance and size of the MS2760A. It provides benchtop level spectrum analyser performance in the palm of your hand. Anyone making basic spectrum measurements can benefit from the size and affordability, especially those making measurements for mmWave applications like 5G, 802.11ad, satellite communications, E-band microwave radios, or automotive radar.



For additional information visit us online at: www.anritsu.com

Anritsu
envision: ensure
© 2016 Anritsu Company

Talk to an Expert: 1800-689-685
Email: Au-sales@anritsu.com

A NEW BREED

OF SPRING-LOADED PIN



© Stock-Adobe.com/au/Szasz-Fabian Jozsef

Connector manufacturers are turning to more affordable H-Pins over traditional pogo-style options without sacrificing performance.

For decades, connector manufacturers have relied on traditional spring-loaded, or pogo-style, pins to provide highly compliant, reliable interconnections. Although expensive, these highly compliant pins are used to connect batteries to docking stations and antennas to PCBs; for rugged, high-shock and vibration applications; or to compensate for floating heights and uneven mating surfaces.

However, with the market drive to continually pack more electronics into ever thinner, shrinking packages, spring-loaded connectors are playing a new role: as a space-saving device to reduce the real estate occupied by the connector itself.

Even when miniaturised, connectors with traditional male pins and female receptacles take up valuable space. This is opening the door for compression-style board-to-board and board-to-device connectors that utilise spring-loaded pins mounted against pads or gold-plated lands on the PCB. This approach can be used to create mezzanine-tiered board modules as well.

The trouble is, with hundreds of millions of spring-loaded pins required to produce these connectors, the high cost of traditional pogo-style pins remains a considerable barrier.

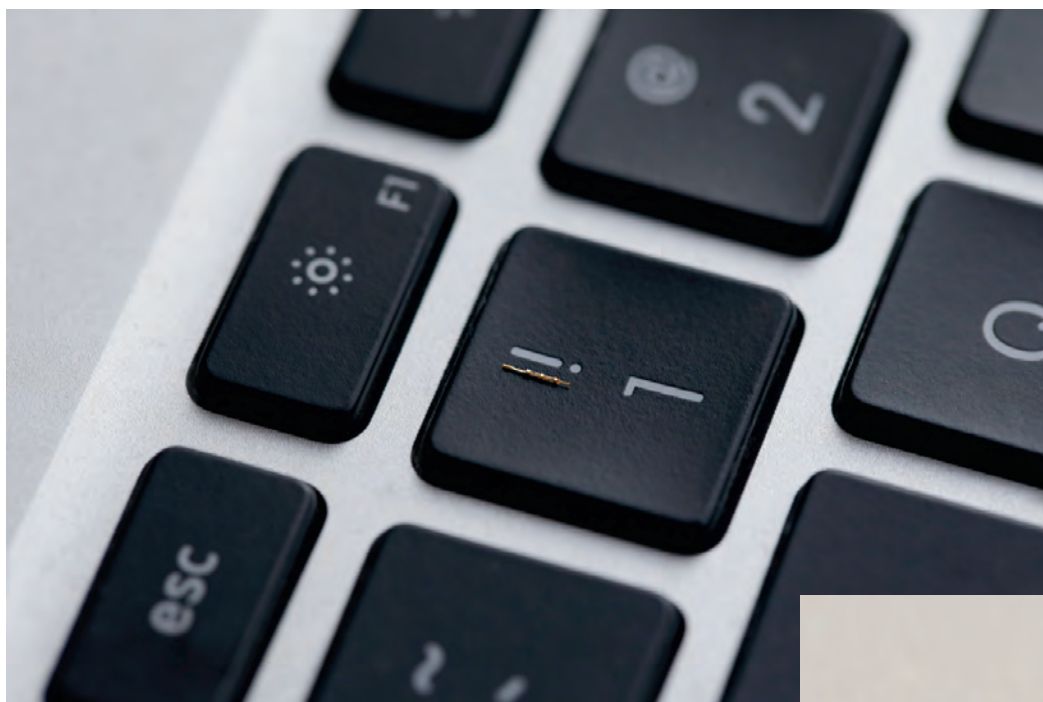
As a result, connector manufacturers are turning to a new breed of miniaturised spring-loaded pins as small as 0.2 mm that reduces costs by 30–50%. These pins deliver high performance in a highly compliant contact that — unlike pogo-style pins — is manufactured in a fully automated, high-speed production process.

Pogo-style pins

For decades the spring-loaded probe, also known as the pogo-style pin, has delivered excellent mechanical and electrical performance. However, this often came at a high cost.

Although designed and manufactured in subtly different ways, the pogo-style pin is typically constructed of 4–5 components that include a drawn barrel, a wound spring, two screw machined plungers and some means to bias the plunger to the barrel.

Depending on volume, the traditional pogo pin is either assembled completely by hand or with semiautomatic process steps with pins hand-shuttled from process to process. As a result, the market stopped using pogo pins for all applications other than the most critical applications that could afford the premium costs.



THE COMPLETELY AUTOMATED STAMPING PROCESS THAT PRODUCES THE H-PIN CAN PRODUCE 200–600 PER MINUTE.

Instead, many connector manufacturers turned to alternatives such as bend, buckle or cantilever-style contacts that require additional space between pins during compression. However, this approach is not viable for fine pitch applications — defined as the number of pins in a small area or the distance between pin centres — required for today's high-density electronics.

Spring-loaded pins, on the other hand, operate in a purely vertical or horizontal fashion, so the maximum space occupied at any time is defined by its diameter. This allows for placement of spring-loaded pins in fine pitch distances as low as 0.2 mm.

H-Pins

The H-Pin, on the other hand, is made using two stamped contact beams (sometimes symmetrical) and a wound spring in a fully automated, high-speed assembly and inspection process.

The highly compliant pin has a working range up to 1 mm with a flat spring rate and can be utilised up to 15 GHz with -1 dB loss, carry up to 4 A of current and withstand temperatures up to 200°C.

However, it is the way these pins are manufactured that is the most striking difference. Whereas traditional pogo-style pins are produced in a semiautomated process at the rate of 200–600 per hour, the completely automated stamping process that produces the H-Pin can produce 200–600 per minute.

By automating the process, the spring-loaded probe pins can cost 30–50% less, depending on quantities. Reducing the number of components also increases reliability.

Available in various lengths and pitch sizes as low as 0.2 mm, H-Pins are the brainchild of Plastronics, which uses spring-loaded probe pins — including pogo-style pins — in the test socket industry. Test sockets utilise spring-loaded pins to provide a temporary connection with PCBs for the purposes of burn-in, humidity, failure analysis and other test requirements.

Plastronics embarked on a mission to redesign the pins and reinvent the manufacturing process so it was fully automated. The goal was to provide a highly compliant pin that provides high temperature, current and bandwidth performance at the price of a stamped contact.

The company also inspects each stamped contact at multiple steps in the process to ensure the pins are identical. The spring winding process is controlled by wire diameter and spring OD is 100% inspected during spring winding. All components are auto-inspected as they enter the assembly machine. Finally, all finished parts are auto-inspected before leaving the machine.

With the market driving demand for increasingly miniaturised, fine-pitch pins in the hundreds of millions, this new breed of pin is expected to have major implications on cost, delivery and reliability.

Plastronics
www.plastronics.com

2 W DC/DC CONVERTERS

RECOM's 2 W RTC2 series come in a six-pin SMD open-frame package with a footprint of less than one-third of a square inch.

The 2:1 input voltage ranges from 4.5 to 9 VDC and 18 to 36 VDC can handle up to 15 and 50 VDC respectively for up to 100 ms. The converters have isolation of up to 3 kVDC/1s and offer an efficiency of up to 80%.

The 5 V output modules are the first to be launched on the market, with additional outputs to be released at a later date. The modules are regulated at $\pm 2\%$ accuracy, with a tight line regulation of $\pm 0.1\%$ and load regulation of $\pm 0.2\%$. They are short-circuit protected and operate under natural convection at temperature ranges of -40 to $+85^\circ\text{C}$ (24 V version) without derating.

The modules comply with the RoHS directive and are IEC/EN 60950-1, IEC/EN 62368-1 and EN 55022/24 certified. The MTBF is more than 2000×10^3 h at $+25^\circ\text{C}$ according to MIL-HDBK 217F.

RECOM Power GmbH

www.recom-power.com



ENERGY HARVESTING SWITCHES



The AF series energy harvesting switches, from ZF, offer a simple-to-install, long-lifetime alternative to wired or battery-powered products. The technology provides switching solutions in a wide range of environments and applications, including industrial installations, building automation, smart home and medical.

The product portfolio includes a stand-alone generator and a number of packaged switch variants, including a rocker switch for actuation by hand and a snap-action switch for mechanical actuation by a machine or proximity switch. Each switch has a unique ID, providing clear identification when operating several switches at once.

Activating any switch variant provides data transfer via RF technology, eliminating the need for expensive and complex cabling and increasing flexibility of use. Flexible pairing allows the operation of several switches with one receiver and vice versa. Up to three 'telegrams' are sent per actuation, with pseudo-random timing to assure robust data transmission.

Compatible with multiple wireless protocols, the products are suitable for global use. As there is no need to change or dispose of batteries, the solution is both environmentally friendly and maintenance-free.

Goodson Imports Pty Ltd

www.goodson.com.au



SPECTRUM ANALYSER SERIES

Rigol's DSA800 spectrum analyser series features a widescreen display, a compact design and an easy-to-use interface, making it suitable for benchtop or field apps in RF and wireless testing and production. The spectrum analyser offers the ability to measure smaller signals using the digital IF filter, which allows for smaller bandwidth settings and reduces displayed noise levels, according to the company.

The DSA815 distinguishes between signals with a frequency difference as little as 100 Hz. The DSA832 and DSA875 have RBW settable down to 10 Hz and a DANL (displayed average noise level) down to -161 dBm (typical). The DSA832E models provide additional value for applications without as stringent requirements.

Rigol offers options including an EMI filter, a quasi-peak detector kit, a VSWR measurement package and a tracking generator for all DSA800 models. A preamplifier comes with the DSA815 and is a suitable addition to the DSA832 or DSA875.

Emona Instruments Pty Ltd

www.emona.com.au



3-AXIS ACCELEROMETER

STMicroelectronics' LIS2DW12 3-axis accelerometer delivers flexibility and energy savings by supporting multiple low-power and low-noise settings in a 2 x 2 x 0.7 mm package.

The product has 16-bit output and can be set to prioritise low power consumption or low-noise performance, with five settings in either mode. A specific feature coupled with four settings in each mode saves waking the system to check for data and allows efficient single-byte transfers, further minimising system power consumption and helping extend battery life. Noise density down to 90 $\mu\text{g}/\sqrt{\text{Hz}}$ is said to be 25% lower than similar devices in the marketplace, which improves the measurement accuracy in next-gen applications from health care, fitness and gaming to industrial sensing and environmental monitoring.

Drawing as little as 50 nA in standby, or 380 nA in low-power mode at 1.6 Hz output data rate, the device adds negligible load on the battery. The supply-voltage range of 1.62 to 3.6 V allows extended operation from small coin or button cells. Features that support system-level power savings include a 32-bit output FIFO, a built-in temperature sensor, a programmable interrupt for freefall, wake up, activity/inactivity, 6D/4D orientation detection and tap/double-tap detection.

STMicroelectronics Pty Ltd
www.st.com



We'll beat any quote by 10%.
That's our Rental Rate Guarantee*
*Conditions Apply



High Speed LCR Measurement

Rent the Hioki 3532-50 5 MHz LCR Meter from TechRentals

14 Measureable Parameters:

|Z|, |Y|, θ , Rp, Rs (ESR), G, X, B,
Lp, Ls, Cp, Cs, D (tan δ), and Q



Visit our website for more information

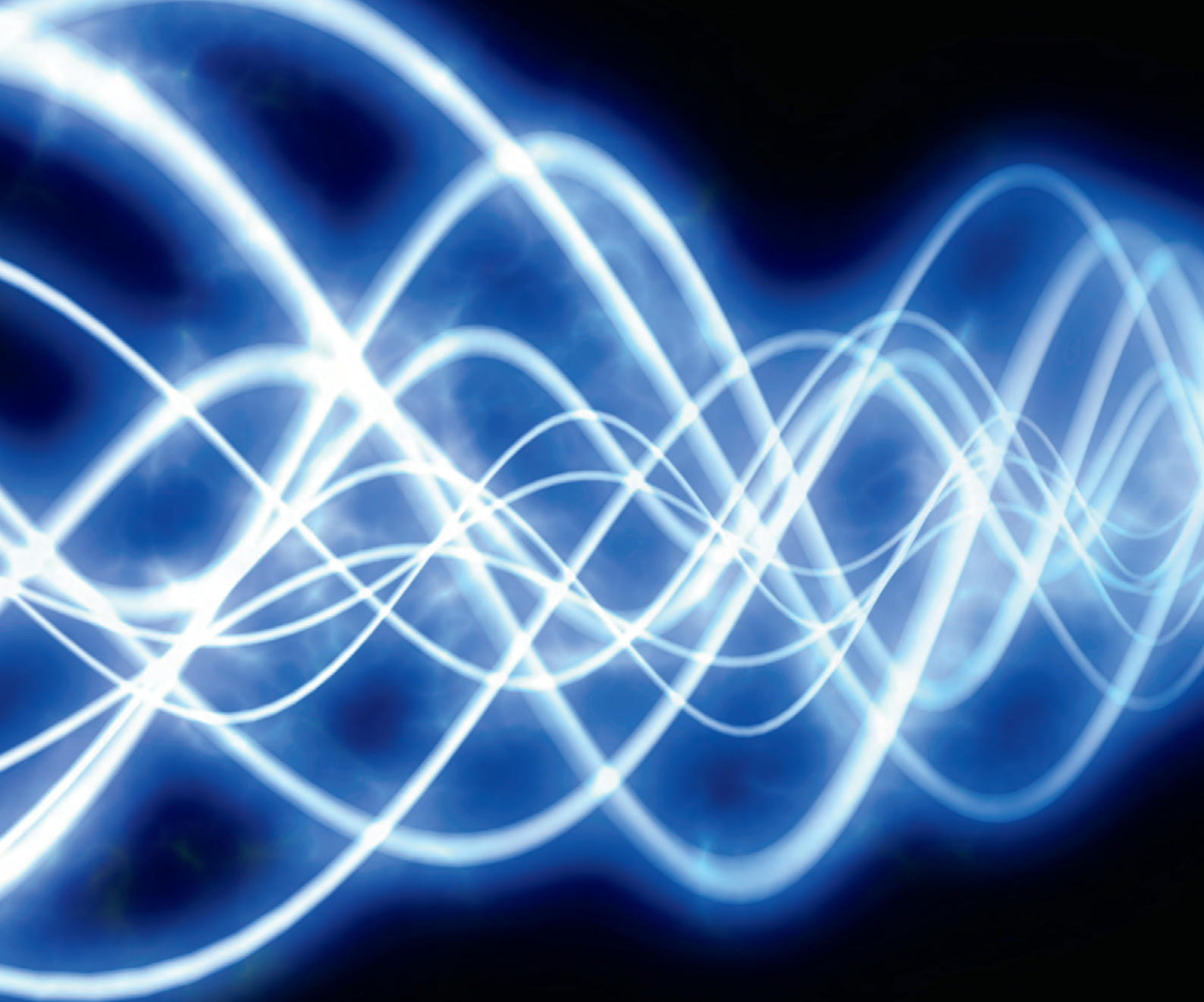
- ✓ Frequency range 42 Hz to 5 MHz
- ✓ Interactive touch-panel operation
- ✓ Fast 5 ms measurement
- ✓ Correlation correction function
- ✓ Basic accuracy of $\pm 0.08\%$
- ✓ Graphical data display

For more information, contact us today:

☎ 1800 632 652 ✉ rent@techrentals.com.au 🌐 www.techrentals.com.au



TR1770



MEASURING VOLTAGE WAVEFORMS FROM OUTSIDE SIGNAL CABLES

Koichi Yanagisawa, PhD

Engineers are often called on to measure pulse signals used to control industrial robots and output waveforms from automotive sensors using oscilloscopes and data recorders.



©Stock-Adobe.com/au/Masim_Kazmin

Examining disturbances at the edges of waveforms to ascertain signs of impending failure or investigate the causes of issues is essential in maintaining and managing such devices. However, connecting voltage probes to the signal terminals being measured often proves to be an exercise in frustration because the devices in question use high-density connectors and cable ends that are buried deep inside the hardware, making it a tricky proposition to establish reliable electrical contact.

The ability to obtain a voltage waveform from outside the cable — as is possible with many current sensors — would resolve most of these issues. To make possible this type of measurement, a revolutionary technology for acquiring voltage waveforms and levels with a high degree of precision, without regard to cable diameter or insulating material, would be ideal. This article introduces state-of-the-art technology for acquiring AC voltage waveforms in a manner that requires no contact with metal terminals.

Technical issues and their resolution

Imagine placing the tip of an oscilloscope probe that has high impedance, for example 100 M Ω , close to the insulation of a voltage signal cable. As you do so, you should be able to obtain a signal

waveform that differentiates the source voltage waveform, albeit in an unstable manner. This voltage signal is being captured via capacitive coupling, facilitated by an equivalent capacitor that forms between the conductor inside the insulated cable and the metal terminal on the tip of the probe. To obtain the voltage waveform that you desire, you need to pass the differentiated signal waveform that you've acquired through an integrator. Doing so would also allow you to suppress external noise.

However, the voltage levels characterising a waveform acquired in this manner remain undefined because the magnitude of the capacitive coupling that forms varies as the cable's diameter and insulation change. Furthermore, that magnitude also changes over time due to environmental factors such as temperature and humidity, posing other challenges. That fluctuations in capacitive coupling are significantly influenced not only by the voltage level but also by the frequency only makes it more difficult to acquire a stable voltage waveform.

To resolve these issues, we took the approach of generating a signal that is the same as the measured voltage waveform inside the probe and then cancelling out the coupling capacitance. When the probe is kept at the same potential as the conductor inside the insulated cable that is being measured, no current flows to the capacitive-coupled conductor, regardless of the magnitude of the coupling capacitance. In short, it is as if the equivalent capacitor has been eliminated. Moreover, since the probe's potential is the same as that of the cable conductor, we can measure the voltage without needing to establish contact with any metal terminals, simply by measuring the probe's potential with a suitable instrument.

Figure 1 provides a block diagram of a non-contact voltage probe. The probe's detection electrode undergoes capacitive coupling with the cable conductor. The potential difference between the electrode and the reference potential is then detected using an integrating transimpedance amplifier (I-TIA) in the potential differential detection block, which has a power supply that is independent of the external circuitry. The detected potential difference signal is transmitted in an insulated manner out of the potential difference detection block, subjected to signal amplitude and phase correction, and applied to the potential difference detection block's reference potential via a voltage generation amplifier. As a result, this circuit design serves to minimise the potential difference between the cable and the reference potential, causing the current flowing to the detection electrode to approach zero.

Example characteristics

The probe's design embodies a negative feedback circuit. Given suitable loop gain, it allows contactless voltage detection that is not affected by fluctuations in coupling capacitance. Furthermore, as a result of its use of negative feedback, the circuit delivers very flat frequency characteristics, from low to high frequencies. In fact, the non-contact voltage probe (Figure 2) has a frequency band that exhibits -3 dB characteristics from 1 Hz to 100 kHz (Figure 3). The voltage dynamic range of this sensor probe is 14 Vpp, making it suitable for use with most machinery control signal levels.

Figure 1.

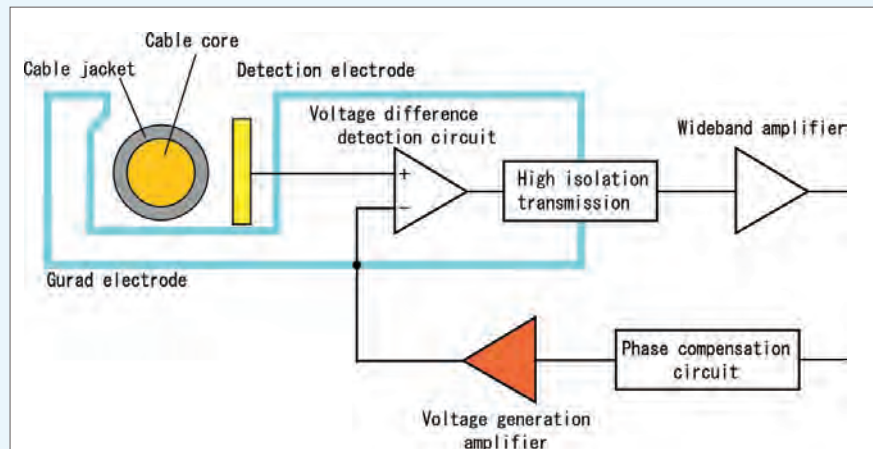


Figure 3.

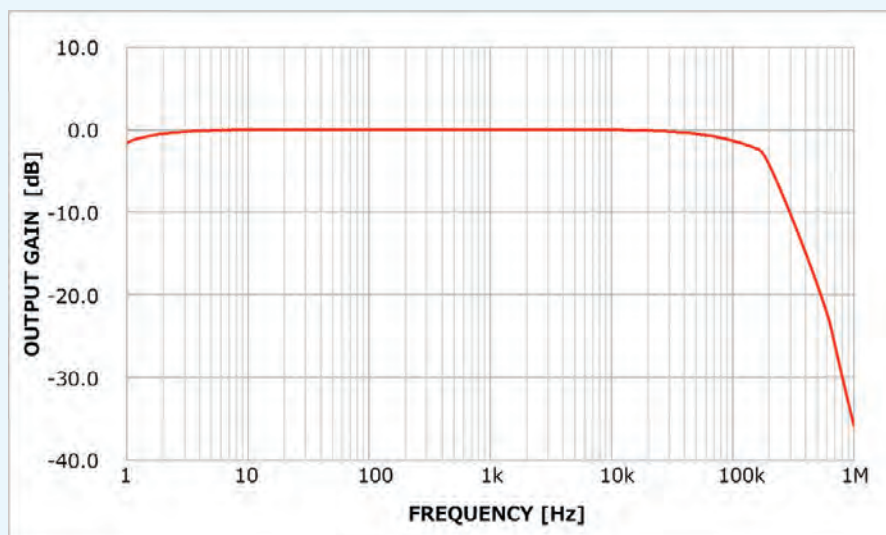


Figure 2.



Figure 4a.

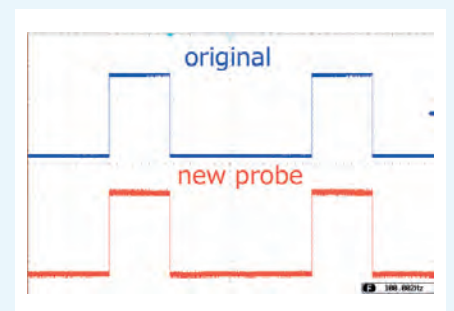
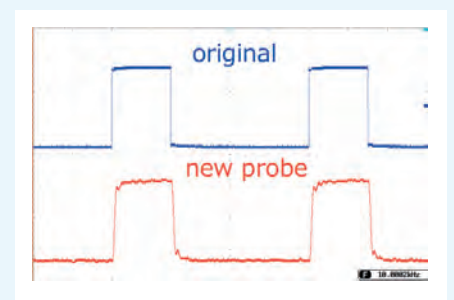


Figure 4b.



Figures 4a and 4b illustrate an acquired pulse waveform with a duty ratio of 30:70. The waveform was acquired by applying a 5 Vpp signal to an insulated cable (with an outer diameter of 1.8 mm, including 0.3 mm of polyvinyl chloride insulation) using a waveform generator. 4a illustrates the waveform acquired at 100 Hz, and 4b at 10 kHz. At 100 Hz, the voltage probe reproduces the original signal with a high degree of faithfulness. Although not shown, the signal is similarly reproducible at 1 kHz. While there is slight rounding of the edges at 10 kHz, the waveform exhibits little delay and is sufficiently faithful to the source waveform to permit use of the probe in applications involving communications signals such as those used by LIN-bus systems in vehicles.

Summary and future prospects

This article has summarised the technology to realise a non-contact voltage waveform probe. Although the work it describes envisioned maintenance applications involving device control signals and sensor signals, the technology is likely to also prove effective as a tool for reverse-engineering hardware that lacks detailed technology drawings and specifications.



SINCE THE PROBE'S POTENTIAL IS THE SAME AS THAT OF THE CABLE CONDUCTOR, WE CAN MEASURE THE VOLTAGE WITHOUT NEEDING TO ESTABLISH CONTACT WITH ANY METAL TERMINALS.

Future directions for related technological development include development of high-speed non-contact voltage waveform probes for capturing communications signals and development of probes for acquiring DC voltages.

Published with permission from Hioki E.E. Corporation.

Hioki E.E. Corporation
<https://www.hioki.com/en/>



REAL-TIME HANDHELD ANALYSER

The Narda SignalShark real-time handheld analyser provides comprehensive measurement systems for the increasingly complex RF spectrum.

The product is able to make real-time measurements with a real-time bandwidth of 40 MHz.

The modern user interface of the product combines with its 10.4" touch screen to give intuitive operation of the large number of measurement and analysis functions.

It can be adapted in advance to the measurement tasks and user needs, facilitating clear, effective and reliable measurements for both beginners and experts alike. The product covers a frequency range stretching from 9 kHz up to 8 GHz.

The two Li-ion batteries can be hot-swapped during operation, making it possible to operate the device for long periods in mobile applications. The robust design conforms to MIL standards, enabling the product to make reliable measurements even under difficult environmental conditions, delivering precise results.

There will be a comprehensive range of accessories for the product, including manual DF antennas, an adapter for third-party antennas, fully automatic direction-finding antennas, a fixing kit for vehicle mounting of DF antennas, and software for configuration and remote control by computer.

Narda Safety Test Solutions GmbH

www.narda-sts.de

ELECTROLUBE

THE SOLUTIONS PEOPLE

Thermal management solutions that perform when the heat is on

With a consumer requirement for ever-more diminutive devices and an expectation of improved efficiency and power, effective thermal management materials have become an increasingly essential part of product development.

From bonding and non-bonding thermal interface materials, to thermally conductive resins, our solutions offer the ultimate level of protection and heat dissipation.

With an expansive product range and a strong emphasis on research and collaboration, we provide a complete electro-chemical solution to the world's leading manufacturers across a variety of industries.

Isn't it time you discovered how Electrolube can serve you?
Simply call, or visit our website.

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

Scan the code to discover
our full spectrum of superior
Thermal Management and
electro-chemical solutions.



Electronic & General
Purpose Cleaning

Conformal
Coatings

Encapsulation
Resins

Thermal Management
Solutions

Contact
Lubricants

Maintenance
& Service Aids

COMPUTER-ON-MODULE

Advantech announces the SOM-5992 Type 7 COM Express Basic module. Powered by a server-grade processor with up to 16-core scalability and up to 64 GB DDR4 memory, it delivers high computing performance. Integrated with two 10GBASE-KR, it provides high bandwidth interfaces for data transmission and reception. The good computing capability and low thermal design power deliver high power efficiency and make it suitable for microservers, networking and cloud storage.

In the past, high-end COM Express modules could only support 32 GB memory because of board size limitations. SOM-5992 supports a maximum of 64 GB memory, which puts it closer to server application scenarios and makes it possible to take advantage of the Intel Xeon 16-core processor in a 125 x 95 mm COM Express Basic module. Designed for servers, the product will satisfy users who pursue high performance in order to process multiple complicated tasks in the system, and can cover thousands of data exchange demands from worldwide clients.

Since it is a standard form factor and ready to use, users can adopt it into their systems without taking additional time for customisation, and there is no sacrifice of limited system space. There is a wide spectrum of performance options; users only need to choose the configuration of CPU and memory requirements based on their system specifications. The enhanced availability and scalability allow for quick integration, easy platform upgrade and hardware virtualisation benefits.

The SOM-5992 incorporates two 10GBASE-KR interfaces, which help fulfil server application demands in the area of COM Express. Moreover, PCIe x16 and 8 PCIe x1 support non-transparent bridge (NTB), which allows redundancy via PCIe. This reduces data loss, allowing a secondary system to take over PCIe storage devices if a CPU fails and provides high availability for continuous service applications.

Advantech Australia Pty Ltd

www.advantech.net.au



Protect your precious system with a first rate enclosure!

We'll work with you from start to finish
Customise an existing enclosure or talk to us about a bespoke design.



Concept Design Approve Manufacture Improve Repeat



Contact us on +61 3 9756 4000 or sales@erntec.net



DRIVING CAR SECURITY INTO THE 21ST CENTURY

Cars are undeniably getting smarter, but few people understand why, and even fewer have the same grasp on how to make them smarter as STMicroelectronics does. This is because ST has been developing telematics solutions for years, long before anyone talked about autonomous driving or smart vehicles.

In keeping with that trend, ST released Telemaco3, a new family of single-chip telematics processors. However, before we can fully grasp the power and engineering that went into these new chips, we must first understand what telematics is.

Telematics is a compound word combining 'telecommunications' and 'infomatics', the science of information systems. Hence, according to its strictly academic definition, telematics is the science of sending, receiving and storing information using a telecommunication standard.

First coined in France in 1978, the word mostly refers today to vehicle telematics, meaning the information is about a mode of transportation (boat, car, train, plane, etc). Furthermore, although this was not the case at first, telematics now always includes information from global navigation systems (such as the GPS) and increasingly implies the ability to remotely control a vehicle or influence its operation.

Vehicle telematics

If the meaning of the word telematics has changed so much over the years, it's because since the mid-1990s the field has been the biggest driver of innovation for the automotive industry. In



THE SCIENCE OF VEHICLE TELEMATICS HAS EVOLVED TO ENABLE MORE AND MORE FEATURES, SUCH AS EMERGENCY OR ROADSIDE ASSISTANCE.

its early days, telematics was a simple battery-powered black box that received information from the car's sensors and sent a notification to an emergency service when a crash was detected. It was the first time that a GPS, a cellular data modem and a battery-powered system worked so well together, and it happened long before smartphones were commonplace.

The science of vehicle telematics has evolved to enable more and more features, such as emergency or roadside assistance, diagnostic reports sent to your garage, dealership or personal email, in-car navigation systems, media streaming and communication with a mobile phone or cloud, to name a few. For instance, an electric car can schedule charging at a time when drawing current is cheaper, then alert the owner that the battery is full by sending a notification to a mobile application. New systems can even help tweak driving habits to save fuel.

Security in Telemaco3

As telematics is responsible for the gathering and transmission of more and more personal, as well as sensitive, information about the vehicle and its users, the need to secure communications and data increases exponentially. Hence, the Telemaco3 family uses a secured CAN subsystem to parry attacks and protect users and the vehicle's main drive-train, chassis and safety systems connected to the CAN bus.

This mechanism relies on an ARM Cortex-M3 core which remains segregated from the main system that runs on a dual Cortex-A7. Because this subsystem has its own MCU, SRAM, timers, CAN controllers and GPIOs, among many other features, it is able to gather, process and store information independently from the rest of the platform. Hence, if hackers break into the main operating system, the subsystem remains intact and out of reach. Furthermore, a Hardware Mailbox manages communication between this subsystem and the Cortex-A7, and will block all interaction the moment it detects an inconsistency.

The Telemaco3 chips also include a dedicated hardware cryptographic engine to optimise encryption and decryption operations. Manufacturers can implement complex cryptographic algorithms, such as AES 256, SHA512 or elliptic curve cryptography to name a few, with almost no impact on performance. The chip can also store a cryptographic key using a one-time programmable memory. A locking mechanism protects every bit to prevent changes to the

cell. Thus, hackers will not be able to alter the system key, even if they manage to get a low-level access.

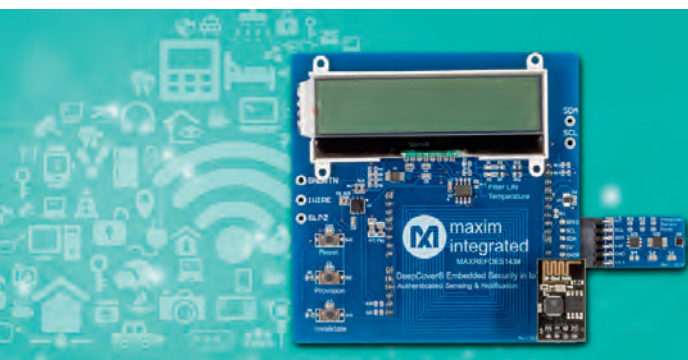
Security thanks to Telemaco3

Finally, ST recently announced an initiative with Airbiquity, a service provider for connected vehicles, that allows manufacturers to easily implement over-the-air (OTA) updates in their cars using Telemaco3 components. This is a fundamentally new and an important aspect of security protocols many still ignore. The first rule of any computer security system is that "there is no such thing as perfect security". It is estimated that there are about one to 25 bugs or vulnerabilities for every 1000 lines of code.

Hence, any protocol that doesn't plan for a backdoor, a system failure, DDOS attacks or a potential hack is flawed by design. By offering a quick and easy solution to implement OTA updates, ST ensures that manufacturers can immediately patch all their vehicles once they are aware of a problem. This system is also cost-effective since it doesn't necessitate recalls or physical access to the automobile.

Telemaco3 remains an open platform that will work with any connected service, but companies looking for the quickest path to market can already take advantage of the solution, designed by Airbiquity for the Telemaco3 family of processors, to protect their customers and their brand from a major catastrophe.

STMicroelectronics Pty Ltd
www.st.com



EMBEDDED SECURITY REFERENCE DESIGN

The Maxim MAXREFDES143# embedded security reference design provides protection against counterfeit sensor data, guaranteeing its authenticity and integrity along the entire data chain, from transducer to the cloud.

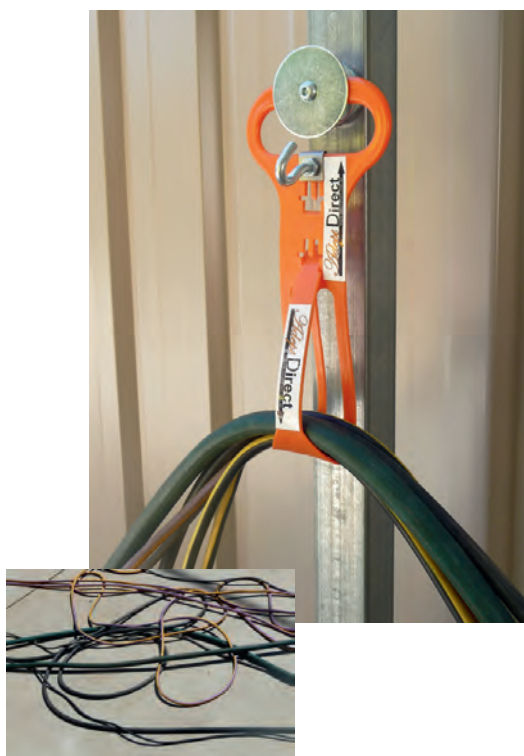
The rapid growth of IoT capabilities for industrial applications comes with legitimate concerns about data integrity, due to deliberate corruption of critical sensor data anywhere between a source and the cloud. The reference design's sophisticated architecture and components, Arduino-compatible hardware interface and ARM mbed libraries support simplify development of secure, uncorrupted and authenticated sensor-to-web data.

It is suitable for analog sensor node and data authentication in factory automation and industrial processing applications.

The reference design's two-stage hierarchical architecture consists of a shield that communicates to a web server and a protected sensor node for data acquisition and authentication. The shield includes a Wi-Fi module; a DS2465 secure coprocessor for offloading SHA-256 cryptographic computation; 1-wire and I2C interfaces; user-interface LCD, LEDs and push-buttons; along with alarm and logging functions. The sensor node contains a DS28E15 secure authenticator, DS7505 temperature sensor and MAX44009 light sensor.

Key features include fast time-to-market, with reduced development time using the provided hardware and source code to implement an authenticated node solution and web server interface; and ease of use, with a free evaluation web server providing immediate out-of-the-box implementation for real-time data collection and storage of sensor data. It is also secure, with an SHA-256 coprocessor offloading data authentication tasks and securely storing node authentication keys.

Avnet Electronics Marketing
www.em.avnetasia.com



MAGNETIC CABLE CLIP

The Adept Direct heavy-duty magnetic cable clip is designed for clipping up cables, hoses and power leads on building sites.

The clip is a magnetic bracket for hanging hoses, cables, power leads and pneumatic lines, or anything that creates trip hazards on building sites or around workshops. The cable clips can be easily attached to any steel surface including steel site sheds, steel fencing, purlins and steel framing, using the high-strength zinc-plated 25 kg magnet. The non-conductive HDPE strap is simply looped under any hoses, leads and cables and clipped up into the top locking mechanism.

The magnetic cable clips can be rapidly removed and reinstalled in any environment that needs cable holders, in just seconds. There are no screws to undo or tools needed. Users can simply skid the cable magnet sideways and position into the new location.

Features of the magnetic cable clip include safe support for 10–15 hoses, cables, air lines and electrical cords; high visibility, bright orange HDPE cable strap for increased safety; long-lasting zinc-plated magnet and cable hook; strong magnet supports up to 25 kg in the vertical plane; cable clip dimensions are 120 mm wide x 250 mm high; and a weight of 0.3 kg.

Adept Direct - Cable Rollers & Lead Stands

www.adeptdirect.com.au

AUTOMATIC SMT PICK and PLACE

Save time and money

Automate your SMT prototype assembly process and free engineering time, improve prototype quality and cut prototyping costs.

- Fast, Flexible and Affordable
- Ideal for Prototype and Low Volume
- Fine Pitch SMD down to 0.4mm
- Pitch from 0201 to 30x30mm
- Can mount BGA, QFN & LEDs
- Placement Accuracy ± 0.02 mm
- Placement Rate up to 5000CPH
- Up to 48 feeders



Call us today... +61 2 9687 1880

Embedded Logic Solutions Pty Ltd ABN 44 109 776 098

✉ sales@emlogic.com.au



www.emlogic.com.au



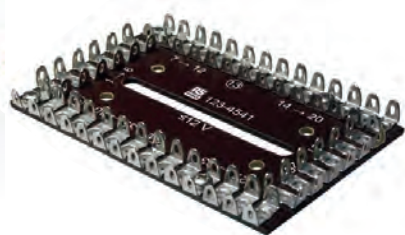
PROTOTYPING BOARD

The RS Components Raspberry Pi prototyping board is suitable for electronics engineers, as well as being well suitable for education and the training of students and electronics beginners.

The solder-tag board offers a total of 40 solder-tag terminals, matching the 40 pins on the Raspberry Pi. Connecting via the Raspberry Pi's GPIO header connector, the board offers users and developers flexible prototyping abilities by providing a simple means of soldering and de-soldering electronic components. This is done via easy to make and break solder connections.

The tag board can be mounted beneath the Raspberry Pi board using an additional mounting kit that consists of four legs and eight screws. In addition, the central slot in the solder-tag board allows a ribbon cable to pass through it.

RS Components Pty Ltd
au.rs-online.com



LOW-CAPACITANCE TVS DIODES

The Toshiba low-capacitance TVS diodes can be used in high-speed interfaces in mobile devices, including smartphones, tablet PCs and wearable devices.

The series offers five products for 3.3 V lines and five for 5.0 V lines, allowing users to select the product that matches the required interface voltage of their system.

The TVS diodes are fabricated with an EAP-IV process, which improves dynamic resistance. It also absorbs ESD and noise by approximately 50% and realises a low clamping voltage. Static electricity tolerance is also improved.

Depending on the mounting space of sets, users have a choice of three packages. SOD-962 (SL2) (0.62 x 0.32 mm) and SOD-882 (CST2) (1.0 x 0.6mm) are small-size packages suited for multi-ports including the increasingly adopted USB Type-C. The flow-through DFN10 package (2.5 x 1.0 mm) reduces the inductance that occurs from wiring.

Toshiba (Australia) Pty Ltd
www.toshiba.com.au

EMC EMR SAR SAFETY

Accredited testing and global product approvals
EMC Technologies Pty Ltd

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

www.emctech.com.au

Global Product Certification
EMC & RF Safety Approval

SCADA SYSTEMS

PC & PLC PROGRAMMING

We offer cost effective solutions for your automation technology needs Australia wide.
 At IS&E we specialise in systems integration and automation projects, big and small.
For more information phone us on 07 3856 2232.

INDUSTRIAL SOFTWARE & ELECTRONICS
 Tel: (07) 3856 2232 Fax: (07) 3355 1012
 E-mail: info@industrialsoftware.com.au
 Web: www.industrialsoftware.com.au

EMC&RF solutions

- > Components for RFI and EMI reduction and shielding
- > Antennas and Instruments for RF and EMI measurements.
- > Test equipment consultants and procurement

Authorised distributor for

PO Box 3787 Caroline Springs Vic 3023
Ph + 61 3 9390 4582 **Mob** + 61 4 2930 4480
Email sales@emcrf.com.au **Web** www.emcrf.com.au

Global Supplier of Custom Designed Quality
Transformers, Inductors & Coils

Talk to us about your requirements

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

Email: contact@mm-nz.co.nz
 Web: www.marque-magnetics.com

REMOTE SPECTRUM MONITORING

The Anritsu Vision Spectrum Monitoring Application Software simplifies locating interfering signals that adversely affect commercial and private wireless network performance. Compatible with the Anritsu range of Remote Spectrum Monitors, the software allows cellular and satellite operators, government regulators and broadcast professionals to quickly scan and view spectrum activity on multiple frequency channels and spectrum monitors deployed in the field.



The software has a high-speed port scanner which enables quick scanning of multiple RF inputs and frequency channels measured by compatible spectrum monitoring solutions. A multi-trace viewer in the scanner allows for simultaneous monitoring of large numbers of traces in a single display for more efficient spectrum monitoring.

The high-speed port scanner is particularly advantageous when used in applications where measurement speed is critical. Satellite operators can use the MS27103A multi-port monitor to view signals from numerous satellite feeds on one monitor. Operators can also simultaneously view the traces from each antenna as they are scanned.

A save-on-event feature has also been added to allow users to continuously save all measurements or limit line violations into spreadsheet format (CSV) for easier reporting and archiving. GPS location features allow users to save GPS date, time and position coordinates as measurements are scanned, which is particularly beneficial when making measurements in mobile environments. Data can be saved immediately when any of the appropriate spectrum monitors connects to a PC or laptop. A Spectrogram view can display measurements as functions of frequency and time to make it simple for users to detect unusual signals that may be present.

The product enables operators to protect their sizeable investment in frequency spectrum. The product family allows for spectrum to be monitored on a continual basis so problem signals can be identified as they occur in real time. Patterns of unwanted signal activity can also be examined, providing an efficient way to characterise and locate the interference sources.

Anritsu Pty Ltd

www.anritsu.com



view - measure - evaluate

application.....
with
Innovation

Metromatics is one of the leading suppliers of data acquisition systems, process monitoring and control systems instrumentation and has an extensive Sensor range and manufactures IP66 rated industrial and outdoor LCD Displays to suit a broad range of markets.

Call us today.

Load Cells
Torque Sensors & Multi Axis Sensors
Force & Pressure Sensors
Accelerometers
IP66 Industrial Displays
IP66 Sunlight Readable Displays
Ethernet, Modbus & Profibus I/O
Signal Conditioners & Converters
4-20mA Isolators & Splitters
Portable & Rack mount Data Acquisition Systems



Metromatics

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

Brisbane

Sydney

Adelaide

Melbourne

Perth

New Zealand



Combating PIM in cellular networks

In 2013, a strategic alliance was formed between the Biomedical and Communications research group at London South Bank University (LSBU) and Hughes Electronics, London. Its aim: to develop innovative and disruptive technologies to combat passive intermodulation (PIM) in cellular networks.

PIM is a series of resulting signal harmonics and distortions that emerge between two or more interacting signals when transmitted through passive components such as cables and connectors, causing unwanted interference and degradation of wireless communications. 4G and future-generation networks require stricter signal-to-noise ratios (SNRs) and the issue of PIM must be addressed if cellular capacity is to be maintained.

Investigations between Hughes Electronics and LSBU demonstrated that metal connectors are particularly vulnerable to PIM, with studies concluding that the universally accepted multiple metal-segment design results in return signal paths and the creation of multipath signal transmissions leading to 'ghost signals' and harmonics. Moreover, each conductive segment creates micro-separations in the transmission path forming intra-media signal transition points. This results in reflections, energy loss, distortion, arcing and capacitive junctions, all of which negatively interfere with legitimate signal transmissions.

The research project also unearthed a number of other sources of hitherto unrecognised sources of PIM, including humidity, temperature and material phase change. Temperature changes can add up to 10 dBc of PIM in the third harmonic, with metal connectors being

particularly vulnerable, while phase change can add to PIM by 11 dB in the worst case (complex multiconnection) systems. Metal connectors are also susceptible to the electrical fields generated in and around cellular base station environments and to vibrations and microphonics from cables — all of which increase PIM.

Seeking to mitigate sources of PIM, Hughes Electronics developed the WaveWay connector system. By implementing a single-piece forward and return path mechanism, separations are removed and signals constrained, severely restricting multiple-signal path opportunities and the consequent PIM effects. The system is also constructed from non-metal composite material, creating an isolation layer from energy fields while at the same time absorbing microphonic vibrations, resulting in reduced PIM readings.

Hughes Electronics

www.hugheselectronics.co.uk



tel: 08 8240 2244

Standard and modified
diecast aluminium, metal
and plastic enclosures

www.hammondmfg.com



CAPACITORS

The EPCOS MKP X2 capacitors for EMI suppression have a rated voltage of 350 VAC. This makes them suitable for EMI suppression in input filters and output filters of photovoltaic inverters.

The capacitance range extends from 0.47 to 10 μ F in accordance with the E12 series. Even under severe ambient conditions the capacitors are characterised by a stable capacitance, in which the change in capacitance does not exceed 7.5% (test conditions: 1000 h at 85°C with a relative humidity of 85% and a voltage of 330 VAC). The maximum operating temperature of the components is 110°C.

The capacitors are approved in accordance with UL and EN and, depending on the capacitance, are available with a lead spacing of 27.5 mm (B32924*4*) or 37.5 mm (B32926*4*). Both the casing and the epoxy resin sealing material comply with the UL 94 V-0 standard.

The capacitors are suitable for applications with higher demands in terms of current capability, as well as capacitive power supplies.

EPCOS

www.epcos.com



LINEAR MOTOR WITH INTEGRATED DRIVE

The LinMot linear motor with integrated drive allows the controller to be eliminated from the electrical enclosure for linear direct drives, thus reducing installation time and effort.

On the application side, this opens up the possibility to efficiently couple the devices in a daisy chain linkage. Clevis and rod-ends can be provided to replicate air cylinders. Most communication standards can be provided to suit the application. The actuator is rated to IP65.

The motors can be supplied to IP69K and even Ex rated. The benefits of the motors are full servo control capabilities, high- and low-speed positioning and force control. According to the company, these motors cost less to run than pneumatic cylinders and normally pay the cost outlay of the system within 6 months.

Motion Technologies Pty Ltd

www.motiontech.com.au

SEMIKRON
innovation + service

Maximal power output and power density

Allows smaller passive filter components

Compact system design: reduced weight and volume

Highest reliability with sinter technology

Flexible packaging and various topologies



Motor
Drives



Solar
Energy



Power
Quality



AC/DC
Power
Supplies



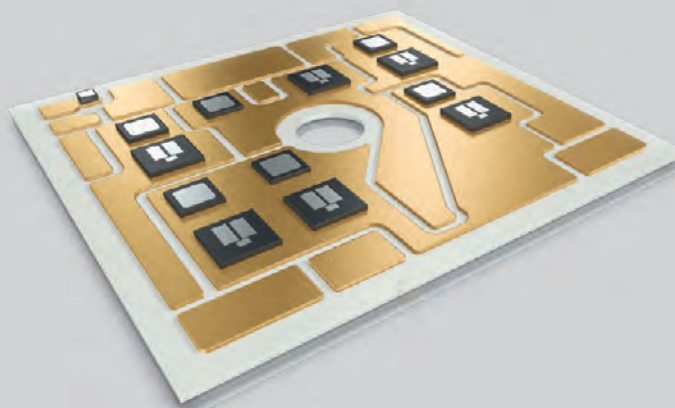
Urban Transport
Equipment

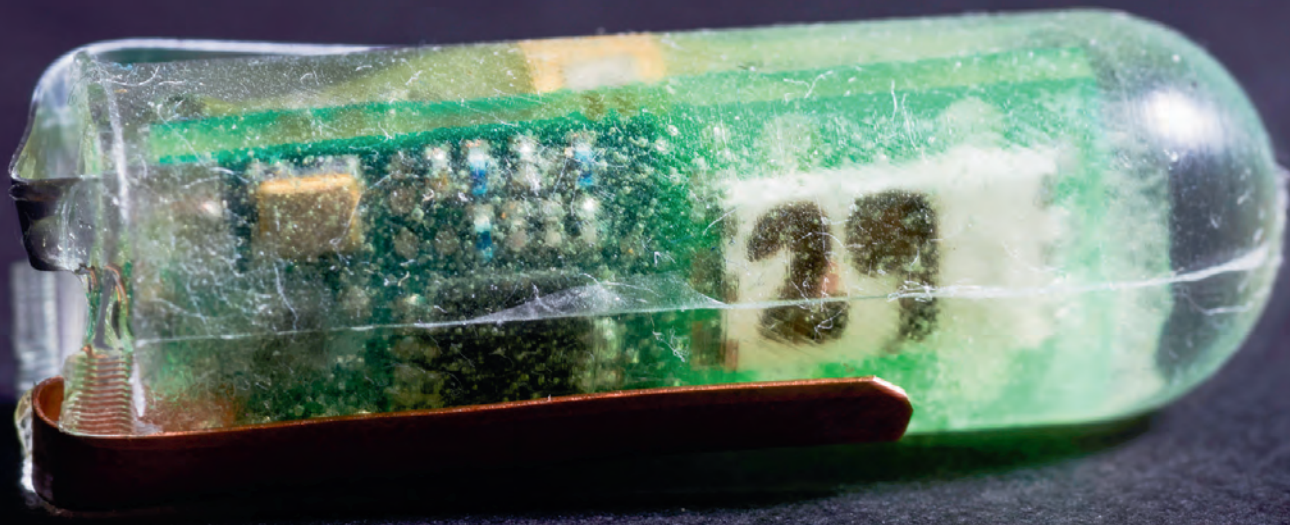
Phone +61 3 85 61 56 00

sales.skaus@semikron.com

www.semikron.com

Silicon Carbide Components
Leading Chip and
Packaging Technology for
Highest Energy Efficiency





INGESTIBLE SENSORS

POWERED BY STOMACH ACID

Image courtesy of Demut Strebe under CC BY-NC-ND 3.0

MIT researchers have designed a voltaic cell that is sustained by the acidic fluids in the stomach. Described in the journal *Nature Biomedical Engineering*, the system can generate enough power to run small sensors or drug delivery devices that can reside in the gastrointestinal tract for extended periods.

Senior authors Giovanni Traverso and Robert Langer had previously built ingestible devices that could be used to sense physiological conditions such as temperature, heart rate and breathing rate, or to deliver drugs to treat diseases such as malaria. These devices are usually powered by small batteries, but conventional batteries self-discharge over time and pose a possible safety risk.

To overcome those disadvantages, Langer and Traverso worked with fellow senior author Anantha Chandrakasan and lead author Phillip Nadeau, who specialise in developing low-power electronics. Together, the team took inspiration from a simple type of voltaic cell known as a lemon battery. This consists of two electrodes — often a galvanised nail and a copper penny — stuck in a lemon, whose citric acid carries a small electric current between these electrodes.

To replicate this strategy, the researchers attached zinc and copper electrodes to the surface of their ingestible sensor. The zinc emits ions into the acid in the stomach to power the voltaic circuit, generating enough energy to power a commercial temperature sensor and a 900 MHz transmitter.

In tests in pigs, the devices took an average of six days to travel through the digestive tract. While in the stomach, the voltaic cell produced enough energy to power a temperature sensor and to wirelessly transmit the data to a base station located 2 m away, with a signal sent every 12 seconds.

Once the device moved into the small intestine, which is less acidic than the stomach, the cell generated only about 1/100 of what it produced in the stomach. “But there’s still power there,” noted Traverso, “which you could harvest over a longer period of time and use to transmit less frequent packets of information.”

The current prototype of the device is a cylinder about 40 mm long and 12 mm in diameter, but the researchers anticipate that they could make the capsule about one-third that size by building a customised integrated circuit that would carry the energy harvester, the transmitter and a small microprocessor. Once the researchers miniaturise the device, they anticipate adding other types of sensors and developing it for applications such as long-term monitoring of vital signs.

“You could have a self-powered pill that would monitor your vital signs from inside for a couple of weeks, and you don’t even have to think about it,” said Nadeau. “It just sits there making measurements and transmitting them to your phone.”

Such devices could also be used for drug delivery, with the researchers demonstrating that they could use the power generated by the voltaic cell to release drugs encapsulated by a gold film. This could be useful for situations in which doctors need to try out different dosages of a drug, such as medication for controlling blood pressure.

“This work allows us to envision new medical devices where the body itself contributes to energy generation, enabling a fully self-sustaining system,” said Chandrakasan.



WATERPROOF MICRO USB 2.0 CONNECTOR

The CUI UJ2W-MIBH-4-SMT waterproof micro USB 2.0 connector is a micro B type jack connector with an Ingress Protection (IP) rating of IPX7, offering protection from liquid and moisture in challenging environments.

Due to its copper alloy contact terminals with 30 μ m gold over nickel plating and stainless steel shielding, the product is designed for high durability at 10,000 mating cycles. The series features a surface mount package and horizontal orientation with a voltage rating of 30 VAC, current rating of 1.8 A and an operating temperature range of -25 to 85°C. Plastic mounting ears are also included to provide added stability on the board.

Complying with the USB 2.0 standard, this micro B USB connector allows for high-speed data and power transmission, making it suitable for a variety of I/O applications in consumer and portable electronic devices that may be used in outdoor environments, including mobile computing equipment, digital audio devices, camcorders and GPS units.

Digi-Key Electronics
www.digikey.com

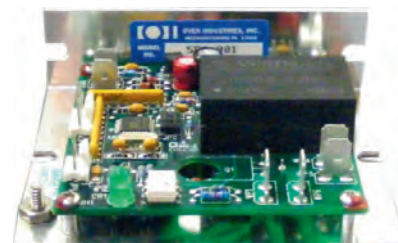
COMPLIANT TEMPERATURE CONTROLLER

The Oven Industries 5R1-001 RoHS-compliant temperature controller is a universal AC input proportional temperature controller for resistive heaters.

The unit is designed with 1500 VAC isolation from the electronic circuitry, which virtually eliminates interference from noise or errant signals. The software is PC programmable and requires no programming experience. The included user-friendly PC software has 1500 VAC isolation from the electronic circuitry.

Once the controller is set up, the computer may be disconnected and the controller becomes a standalone unit or the computer can remain connected for data acquisition. The temperature may also be set through the optional display or remote potentiometer. The load circuit delivers a maximum load current of 15 A.

Oven Industries



LITHIUM ION & LITHIUM IRON PHOSPHATE BATTERIES FROM 1AH to 200AH CAPACITY



LITHIUM IRON PHOSPHATE IDEAL FOR GOLF CARTS/BUGGIES, HIGH RATE DEEP CYCLE APPLICATIONS
 With less than half the weight and up to 7 times more charge/discharge cycles than sealed lead acid, Lithium Iron Phosphate batteries offer many advantages, including their ability to fast charge and give high rate output without derating.



V-LOCK LITHIUM ION PROFESSIONAL CAMCORDER BATTERIES AND CHARGERS
 Manufactured using Sanyo/Panasonic cells for long life and reliability. Available in 100Wh, 130Wh 160Wh and 190Wh.

Also available is the new Dividable Battery in 2 parts of 95Wh to allow ease of transport on airlines but giving a 190Wh battery for everyday use.

LITHIUM ION CUSTOM MADE BATTERIES
 Premier Batteries manufactures a range of Li-ion batteries used in mining, medical applications etc. Manufactured using Panasonic, Sanyo or Samsung cells complete with protection circuits for safety and reliability.



(02) 9755 1845 | info@premierbatteries.com.au
www.premierbatteries.com.au





IN-VEHICLE COMPUTER

The Neosys Technology Nuvo-5100VTC in-vehicle computer is a rugged embedded system meeting EN 50155 certification, designed for railway and in-vehicle applications.

The product features an Intel 6th Generation Core processor for emerging high-end requirements, while its fanless design maintains an EN50155 TX class temperature range from -40 to 70°C.

Aiming particularly at railway and vehicle usage, the product offers Gigabit PoE+ ports with M12, x-coded connectors to provide best signal integrity and rugged Ethernet connectivity. It also integrates CANbus 2.0 and isolated DIO to interact with in-vehicle devices. Additionally, four mini-PCIe slots are available to supply a versatile means of wireless communication by installing 3G, 4G, Wi-Fi and GPS modules.

The product features intelligent ignition control, M12 PoE+ ports and CANbus, and has undergone severe tests, including EMI/EMS, rolling vibration/shock, cooling and dry heat, to ensure flawless performance in railway applications.

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

THREE-PHASE UPS

Schneider Electric has introduced Galaxy VX — an efficient, easy-to-deploy, compact, three-phase uninterruptible power supply (UPS) with flexible operating modes for large facilities, data centres and business-critical applications.

The pay-as-you-grow solution will support enterprises in their move to hyperscale data centres and enable them to reap the greatest value in their IT deployments. The device fully integrates with Schneider Electric energy management solutions.

Flexible operating modes include: Double Conversion Mode, which reduces switching losses and increases reliability while reducing failure rate; Eco Mode, which delivers up to 99% efficiency; and EConversion Mode, a hybrid between Eco and Double Conversion that improves efficiency.

The product offers continuous operation up to 40°C ambient without de-rating. It is compatible with traditional lead acid, fly-wheel, NiCd and Li-ion batteries.

Schneider Electric
www.schneider-electric.com.au



OKW presents the new STYLE-CASE which has a high gloss surface finish, thus creating another design highlight for modern handheld control units.

OKW
GEHÄUSE
SYSTEME

www.okw.com.au

NEW STYLE-CASE

ROLEC **OKW**

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



GNSS MODULE

The u-blox ZOE-M8G GNSS module is designed for markets where small size, minimal weight and high location precision are essential.

The product offers location accuracy by concurrently connecting to GPS, Galileo and either GLONASS or BeiDou. It also provides -167 dBm navigation sensitivity. This makes the small device suitable for wearable devices, unmanned aerial vehicles (UAVs) and asset tracker applications.

The product helps simplify product designs, because it is a fully integrated, complete GNSS solution with built-in SAW-filter and low noise amplifier (LNA). It can be used with passive antennas, without the need for additional components.

The module measures 4.5 x 4.5 x 1.0 mm. According to the company, due to its small size, a complete GNSS design using the module takes approximately 30% less PCB area compared to a conventional discrete chip design with a CSP chip GNSS receiver.

u-blox Singapore Pte Ltd
www.u-blox.com

CIRCULAR UPT CONNECTOR

The Amphenol circular UPT connector has a quick disconnect that is suitable for use in the heavy equipment, transportation, diesel engine and electric vehicle markets.

The UPT features a plastic shell with a metal coupling system and crimp termination. The lightweight connector has a smaller footprint and is easy to install in the field once it has been crimped in the facility. The UPT contact features three retention times that can easily be inserted and ensure retention force.

Used in buses, diesel engines, Class 8 trucks, trailers, garbage trucks, tractors as well as in construction equipment, industrial pumping and power generation, the UPT offers bayonet coupling for quick mating and reliability.

The RoHS compliant connectors are environmentally sealed and have an operating temperature range of -40 to +125°C. They offer jam nut and square flange mounts for 32- and 48-way contacts.

The UPT contacts are available in either gold or tin. Multiple back shell sealing accessories are available on request.

Amphenol Australia Pty Ltd
www.amphenol.com.au



HEATSINKS

www.tarapath.com.au

customerservice@tarapath.com.au

- * LED Lighting
- * Power Electronics
- * Mounting Hardware
- * Custom Machining



Low Pressure Moulding

Ph: 03 9269 6200

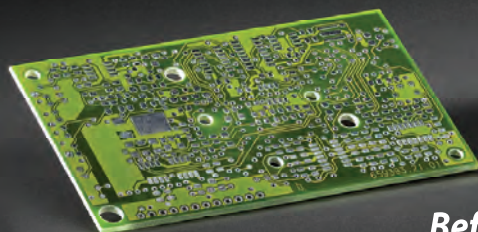
The smart way to protect electronics from....

dust

the environment

READY
IN
SECONDS*

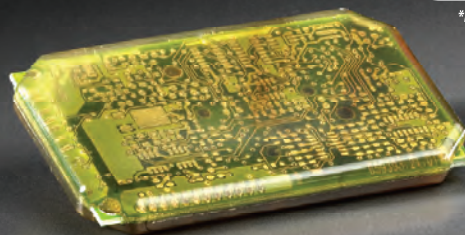
*NO CURE TIME



Before



After



www.lowpressuremoulding.com.au

E: karl.b@tarapath.com.au

Tarapath

MICROBIAL NANOWIRES

FOR GREEN ELECTRONICS

Images courtesy of UNMass Amherst

Microbiologists at the University of Massachusetts Amherst have discovered a type of natural wire produced by bacteria that could greatly accelerate their goal of developing sustainable conducting materials for the electronics industry.

Their research, led by Derek Lovley and published in the journal *mBio*, saw the scientists study microbial nanowires — protein filaments that bacteria use naturally to make electrical connections with other microbes or minerals. According to Lovley, these nanowires have “substantial advantages over man-made materials”.

“Chemically synthesising nanowires in the lab requires toxic chemicals, high temperatures and/or expensive metals,” said Lovley. “The energy requirements are enormous. By contrast, natural microbial nanowires can be mass-produced at room temperature from inexpensive renewable feedstocks in bioreactors with much lower energy inputs. And the final product is free of toxic components.

“Microbial nanowires therefore offer an unprecedented potential for developing novel materials, electronic devices and sensors for diverse applications with a new environmentally friendly technology,” he added. “This is an important advance in microbial nanowire technology.”

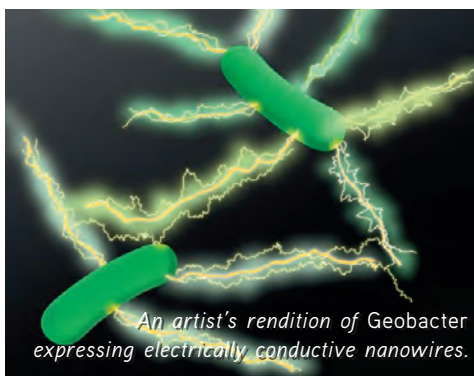
Until now, Lovley’s lab has been working with the nanowires of just one bacterium — *Geobacter sulfurreducens* — as they were just trying to understand why a microbe would make tiny wires. “Now we are most interested in the nanowires as an electronic material and would like to better understand the full scope of what nature may have to offer for these practical applications,” he said.

When his lab began looking at the protein filaments of other *Geobacter* species, they were surprised to find a wide range in conductivities. For example, one species recovered from uranium-contaminated soil produced poorly conductive filaments. Another species, *Geobacter metallireducens*, produced nanowires 5000 times more conductive than the *G. sulfurreducens* wires, suggesting they may be an attractive material for the construction of conductive materials, electronic devices and sensors for medical or environmental applications.

The researchers noted that they did not study the *G. metallireducens* strain directly; instead, they took the gene for the protein that assembles into microbial nanowires from it and inserted this into *G. sulfurreducens*. The result is a genetically modified *G. sulfurreducens* that expresses the *G. metallireducens* protein.

“We have found that *G. sulfurreducens* will express filament genes from many different types of bacteria,” noted Lovley. “This makes it simple to produce a diversity of filaments in the same microorganism and to study their properties under similar conditions.

“With this approach, we are prospecting through the microbial world to see what is out there in terms of useful conductive materials. There is a vast reservoir of filament genes in the microbial world and now we can study the filaments produced from those genes even if the gene comes from a microbe that has never been cultured.”



An artist's rendition of Geobacter expressing electrically conductive nanowires.



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

Editorial Assistant
Amy Steed

Publishing Director/MD Geoff Hird

Art Director/Production Manager
Julie Wright

Art/Production
Tanya Barac, Colleen Sam, Linda Klobusiak

Circulation Manager 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
Nic Stear – 0432 637 817
nstear@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

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

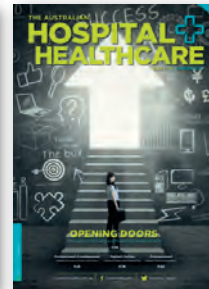
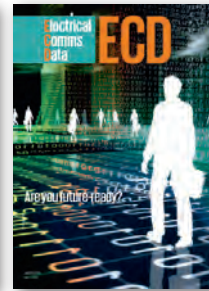
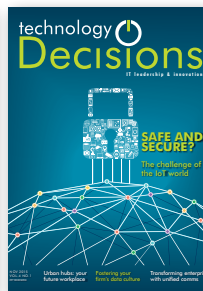
All material published in this magazine is published in good faith and every care is taken to accurately relay information provided to us. Readers are advised by the publishers to ensure that all necessary safety devices and precautions are installed and safe working procedures adopted before the use 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 twelve published by Westwick-Farrow Media. To receive your free subscription (magazine and eNewsletter), visit the link below.



www.WFMedia.com.au/subscribe

Power of ten

Get in touch with the new R&S® RTB2000 series oscilloscopes.

R&S® RTB2000 oscilloscopes (70 MHz to 300 MHz) team top technology with top quality. They surpass all other oscilloscopes in their class, delivering more power plus intuitive usability at a convincing price.

For more information visit
www.scope-of-the-art.com

sales.australia@rohde-schwarz.com



Starting at
\$1,899