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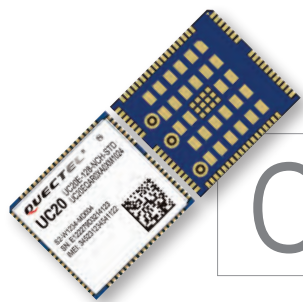
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COVER STORY



The DPO70000SX is the world's first 70 GHz real-time oscilloscope with Tektronix's patented Asynchronous Time Interleaving (ATI) technology that preserves signal-to-noise ratio for higher fidelity. This means that users can more accurately capture and measure their signals at higher speeds than possible with any other oscilloscope available today.

The oscilloscope is said to include the lowest noise and highest effective bits of any ultrahigh-bandwidth real-time oscilloscope available on the market.

It also features Tektronix's patent pending UltraSync architecture that provides precise data synchronisation and convenient operation of multiunit systems. Precise multichannel timing synchronisation is key to meeting acquisition requirements in leading-edge research applications such as 100G and faster coherent optical modulation analysis.

Other features include: 200 GS/s sample rate with 5 ps/sample resolution for improved resolution and timing; and compact form factor that enables the instrument to be positioned very close to the device under test (DUT) while providing flexible display and control for analysis. Reducing the distance to the DUT enables shorter cable lengths, which in turn help to preserve signal fidelity at very high frequencies.

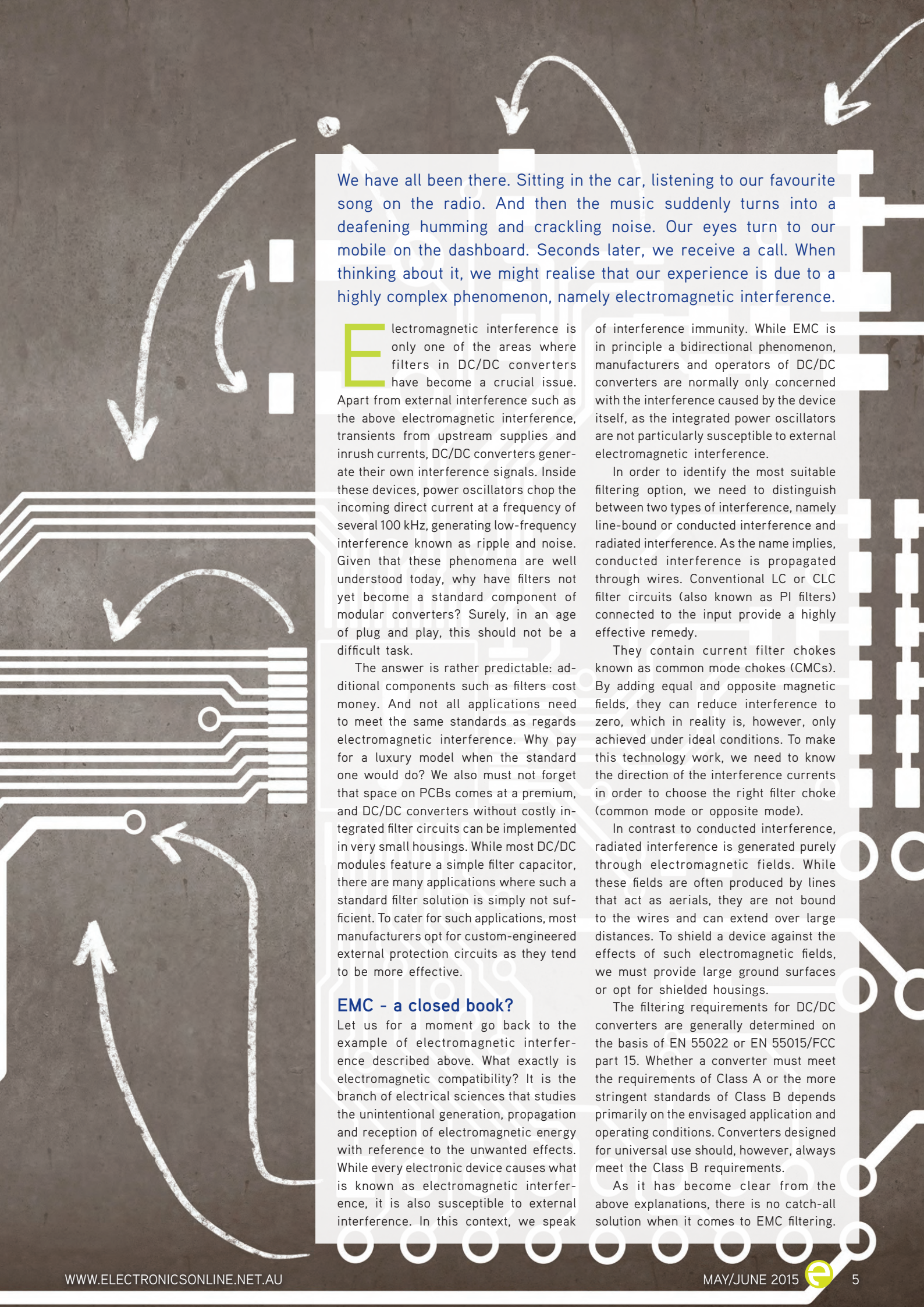
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DC/DC CONVERTER FILTERING

Thomas Rechlin, Senior FAE and Head of Global Application Engineering



We have all been there. Sitting in the car, listening to our favourite song on the radio. And then the music suddenly turns into a deafening humming and crackling noise. Our eyes turn to our mobile on the dashboard. Seconds later, we receive a call. When thinking about it, we might realise that our experience is due to a highly complex phenomenon, namely electromagnetic interference.

Electromagnetic interference is only one of the areas where filters in DC/DC converters have become a crucial issue. Apart from external interference such as the above electromagnetic interference, transients from upstream supplies and inrush currents, DC/DC converters generate their own interference signals. Inside these devices, power oscillators chop the incoming direct current at a frequency of several 100 kHz, generating low-frequency interference known as ripple and noise. Given that these phenomena are well understood today, why have filters not yet become a standard component of modular converters? Surely, in an age of plug and play, this should not be a difficult task.

The answer is rather predictable: additional components such as filters cost money. And not all applications need to meet the same standards as regards electromagnetic interference. Why pay for a luxury model when the standard one would do? We also must not forget that space on PCBs comes at a premium, and DC/DC converters without costly integrated filter circuits can be implemented in very small housings. While most DC/DC modules feature a simple filter capacitor, there are many applications where such a standard filter solution is simply not sufficient. To cater for such applications, most manufacturers opt for custom-engineered external protection circuits as they tend to be more effective.

EMC – a closed book?

Let us for a moment go back to the example of electromagnetic interference described above. What exactly is electromagnetic compatibility? It is the branch of electrical sciences that studies the unintentional generation, propagation and reception of electromagnetic energy with reference to the unwanted effects. While every electronic device causes what is known as electromagnetic interference, it is also susceptible to external interference. In this context, we speak

of interference immunity. While EMC is in principle a bidirectional phenomenon, manufacturers and operators of DC/DC converters are normally only concerned with the interference caused by the device itself, as the integrated power oscillators are not particularly susceptible to external electromagnetic interference.

In order to identify the most suitable filtering option, we need to distinguish between two types of interference, namely line-bound or conducted interference and radiated interference. As the name implies, conducted interference is propagated through wires. Conventional LC or CLC filter circuits (also known as PI filters) connected to the input provide a highly effective remedy.

They contain current filter chokes known as common mode chokes (CMCs). By adding equal and opposite magnetic fields, they can reduce interference to zero, which in reality is, however, only achieved under ideal conditions. To make this technology work, we need to know the direction of the interference currents in order to choose the right filter choke (common mode or opposite mode).

In contrast to conducted interference, radiated interference is generated purely through electromagnetic fields. While these fields are often produced by lines that act as aerials, they are not bound to the wires and can extend over large distances. To shield a device against the effects of such electromagnetic fields, we must provide large ground surfaces or opt for shielded housings.

The filtering requirements for DC/DC converters are generally determined on the basis of EN 55022 or EN 55015/FCC part 15. Whether a converter must meet the requirements of Class A or the more stringent standards of Class B depends primarily on the envisaged application and operating conditions. Converters designed for universal use should, however, always meet the Class B requirements.

As it has become clear from the above explanations, there is no catch-all solution when it comes to EMC filtering.

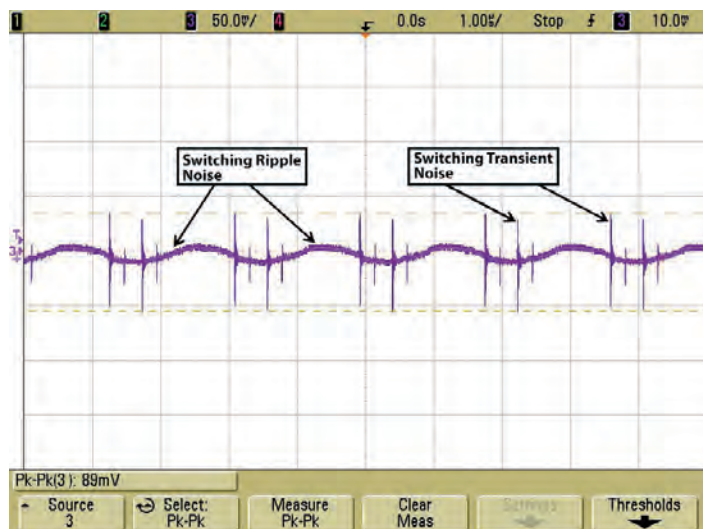


Figure 1: Ripple and noise signal of a typical DC/DC converter.

To come up with a good solution, we need to experiment and trust the experience of experts. There are, however, a few tips and tricks that can be useful when tackling EMC problems (see text box).

Tips and tricks for EMC filtering

Filtering options for low-frequency interference:

Low-frequency interference generally occurs in and around cables within a frequency range of up to approx. 1 MHz. It can be effectively prevented with LC filters or CMCs. Filter capacitors close to the input pins are also quite effective.

Filtering options for medium-frequency interference:

At frequencies of between around 1 and 30 MHz, we normally deal again with line-bound interference. High-frequency LC filters and Y capacitors have been proven effective here. In this case, all interference lines must be short-circuited (eg, with capacitances in the nF range at each pin).

Filtering options for high-frequency interference:

From around 30 MHz, interference is normally caused through radiation and therefore much more difficult to tackle. Good PCB design with adequate ground surfaces is the key here. If the problem cannot be resolved, additional shielding (eg, six-side shielding) might be the answer. Twisted wires are often helpful in tackling the issue.

Ripple and noise

The other major issue in relation to DC/DC converter filtering is ripple and noise. While these two terms are commonly mentioned together, they describe actually two different phenomena.

Ripple is caused by the periodic charging and discharging of the output capacitors of the converter. In devices with conventional half-wave rectification, the ripple frequency therefore corresponds to the switching frequency. In more sophisticated circuits with full-wave rectification, the ripple frequency is double the switching frequency. When referring to ripple, most technicians actually mean the output ripple that affects the output voltage. There is, however, a second type of ripple, namely sawtooth waveform interference on the input current. This

WHEN DESIGNING A DC/DC CONVERTER, ENGINEERS NEED TO FIND AN OPTIMUM BALANCE BETWEEN ACCEPTABLE NOISE AND MAXIMUM EFFICIENCY.

phenomenon is known as reflected ripple current and must always be taken into account when combining multiple converters in a single circuit.

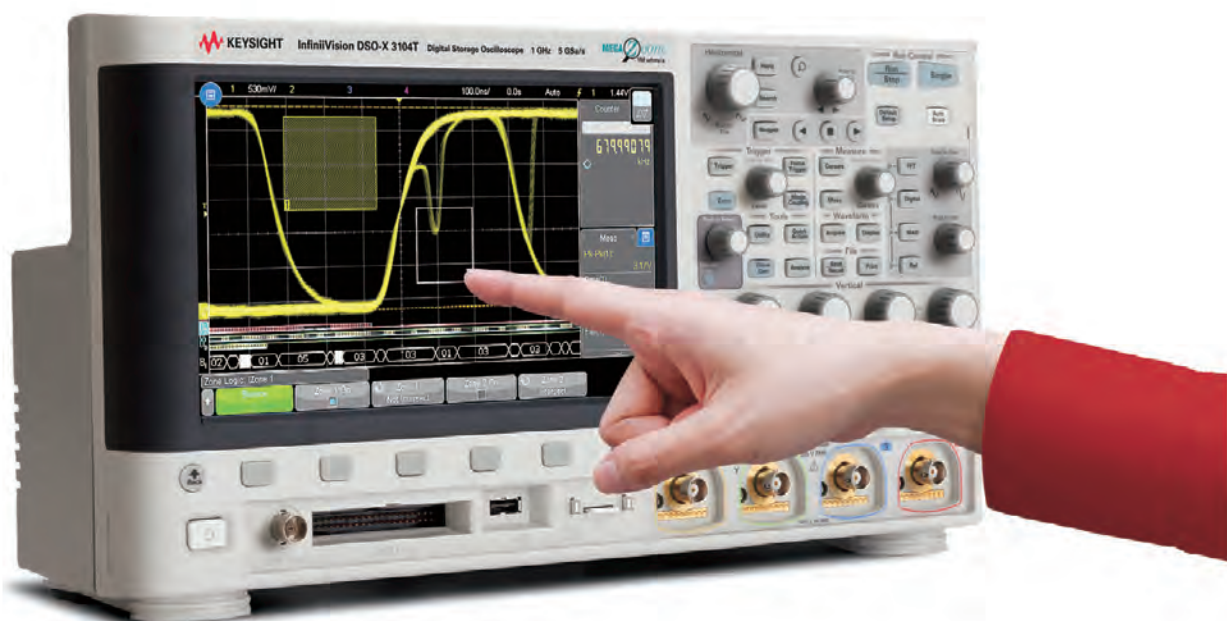
Noise is a more complex phenomenon with much more random waveforms caused by harmonics. It is produced by switching peaks of transistors/FETs at each switching cycle. The harder/faster the switching of the transistors/FETs, the more noise. When designing a DC/DC converter, engineers need to find an optimum balance between acceptable noise and maximum efficiency.

Figure 1 shows a typical ripple and noise signal. The near-sinusoidal signal is the ripple, while the interference peaks represent the noise. Before we can reduce ripple and noise by filtering, we need to measure these effects accurately. In order to eliminate



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* Refer to Keysight document 5992-0140EN for product specs, and 5989-7885EN for update rate measurements.

** Competitive oscilloscopes are from Tektronix publication 48W-30020-3



Unlocking Measurement Insights

ELECTROMAGNETIC INTERFERENCE

outside interference, measure as close as possible to the converter and connect the ground barrel of the probe head directly to the ground of the converter. Otherwise, the cable connections might cause interference signals that affect the measurements. We further recommend setting the bandwidth limitation of the oscilloscope to 20 MHz in order to eliminate high-frequency external interference signals. Always follow the instructions in the data sheet of the measuring equipment manufacturer, as some measurements require an output capacitor (typically 0.1 μF).

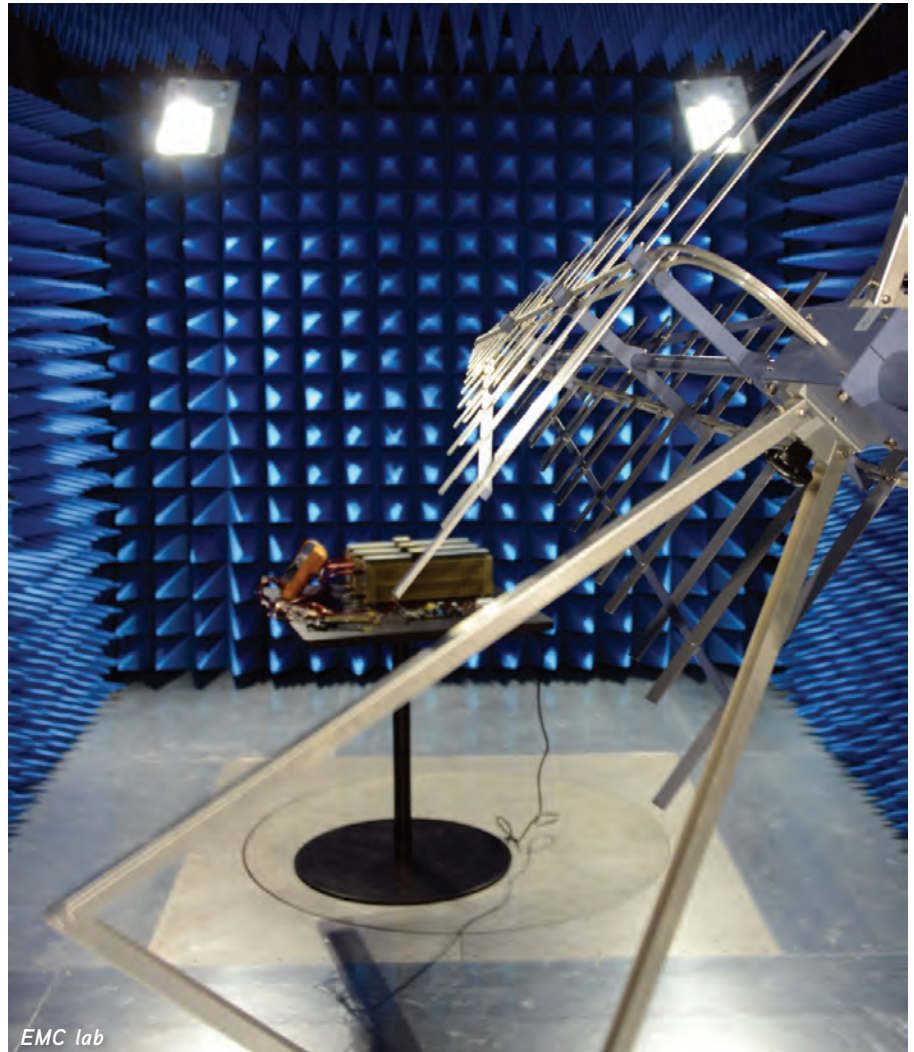
Ripple and noise must be measured from peak to peak. For reduction, we recommend an LC filter at the output. Always pay close attention to the properties of the capacitors. Their equivalent serial resistance or ESR should be as low as possible. Capacitors should always be positioned as close as possible to the pin of the converter. Use the two formulas to the right to determine the filter properties. Please note that the filter frequency (f_c) should be one-tenth of the operating frequency (f_o) of the converter.

Filtering does not stop here

Apart from the two main reasons for filtering, namely EMC and ripple and noise, there are many other interference effects that might require shielding or filtering. Below are two of the most common phenomena.

Inrush current: High inrush currents can damage the converter. These currents are caused by a number of processes in the converter that occur when the device is switched on. At that moment, the built-in capacitors as well as the capacitors at the output filter are charged. The magnetic fields in the transformer cores are built up and the transistors are supplied with maximum power, at least during the first few cycles. The current required to do all this is normally a multiple of the normal input current. It is, however, limited by the input impedance of the converter, the line impedances in the supply cable and the power supply itself. The last factor is normally the most critical here. If the power is taken from a battery, which is capable of supplying very high short-time currents, the converter might become irreparably damaged. To prevent this, DC/DC converters can be equipped with coils near the input, smoothing the inrush current. NTCs (thermistors) have a similar effect and provide excellent protection, especially in AC/DC modules.

Surge protection: Voltage surges known commonly as surges or transients can cause considerable damage to convert-



ers. We distinguish between long voltage spikes (in ms range), caused, for example, by instable power supply, and short-term spikes or transients (in μs range) that are typically caused by interference in circuits. Depending on the nature of the surge, varistors or TVS diodes, also known as suppressor diodes, provide good protection. Varistors are the more robust option as they offer protection against high power surges. They have, however, a comparatively long response time. TVS diodes respond more quickly and are therefore particularly suitable to prevent damage from very high voltage spikes (high du/dt ratio).

Power supply competence cluster

In order to study the effects of interference on converters and other devices in more detail and to help establish a competence cluster in the field of electric power supply, RECOM has invested in a new 3000 m^2 campus-like complex that now serves as the company's headquarters. While the existing research and development, testing and quality laboratories have all been extended, RECOM

now also has a state-of-the-art EMC lab, of which there are only very few in Austria and Southern Germany. The 3 m SAR (semi-anechoic room) test chamber enables the company to perform measurements conforming to CISPR22 within a frequency band from 9 kHz to 3 GHz. The chamber caters for the automated measurement of specimens with a diameter of up to 1.5 m. The computer-controlled rotary table and the near-field probes allow engineers to perform fully automated interference tests for critical sources. The lab also includes all the equipment required for measurements according to EN 61000-4-x and EN 61000-3-2.

Compliance with EN 61000-3-2 is particularly important for LED drivers. Last but not least, the in-house GTEM cell enables specialist engineers to determine the radiated immunity of a test specimen. However, the most advanced lab equipment is obviously of no use unless it is operated by qualified personnel. RECOM therefore recruited a highly experienced EMC specialist who is now in charge of the EMC lab.

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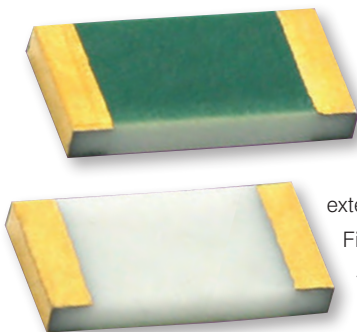
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THIN-FILM CHIP RESISTOR

Vishay Intertechnology's PLTT precision high-temperature thin-film chip resistor is now available in an AEC-Q200 automotive-qualified 0603 case size. Providing $>100^{\circ}\text{C}$ extension over conventional chip resistors, the Vishay Dale Thin Film PLTT 0603 features an operating temperature range from -55 to $+230^{\circ}\text{C}$, a low absolute TCR down to ± 5 ppm/ $^{\circ}\text{C}$ and laser-trimmed tolerances down to $\pm 0.02\%$.

With stable film and performance characteristics of 0.5% ppm at $+175^{\circ}\text{C}$ for 2000 h at 50% of rated power, the resistor is optimised for the low-noise single-signal processing required to compensate for low offset and temperature drift in high-temperature automotive environments. The device will also perform in down-hole applications, high-precision oil and gas exploration, and telecommunications and industrial equipment.

The product provides a resistance range from 250 Ω to 150 k Ω , with non-standard values available. It features low noise of <-30 dB, a low-voltage coefficient of 0.1 ppm/V, power dissipation ratings from 150 mW to 1 W and 75 to 200 V maximum working voltages. Devices are also available in the 0805, 1206, 2010 and 2512 case sizes with resistance values up to 3 M Ω .

The resistor features a high-purity ceramic substrate, <10 μm gold terminations over a nickel barrier for high-temperature HMP soldering and corrosion-resistant special passivation method (SPM) enhancement. The lead-free device is RoHS compliant, halogen-free and flame resistant.

Fastron Technologies Pty Ltd
www.fastron.com.au



SERIAL-TO-ETHERNET DEVICE SERVER

xDirect is a sleek and compact serial-to-ethernet device server, providing quick and easy ethernet connectivity to virtually any device or machine with a serial interface. With an integrated ethernet port and serial cable, plus multiple power options including PoE, the product offers a portable and flexible network connectivity solution.

The device comes with a built-in web server that enables users to access and configure the unit using a standard web browser on a PC, smartphone or tablet from anywhere. With plug-and-play simplicity, a small form factor and a robust device server application, the product provides an easy and short path to network connectivity.

The device features a serial data rate of up to 921.6 Kbps and 128/192/256-bit AES encryption. Modes include RS232, RS422 or RS485 (2- and 4-wire support). It has an extended temperature range of -40 to 85°C and is suitable for applications including IT/networking equipment or edge devices, POS terminals and security equipment.

Elecom Electronics Supply
www.elecomes.com

CONTACTLESS ANGLE SENSORS

Contelec has announced two multi-turn versions of its robust Vert-X series contactless Hall-Effect angle sensors. The Vert-X 37MT CANopen has a gearless 16-bit multi-turn and 16-bit single-turn resolution, while the Vert-X 24MT may be programmed for up to 10 turns and has a 12-bit single-turn resolution.

The Vert-X 37MT CANopen model boasts an IP68 environmental capability in a durable, sealed design with dual bearings and stainless steel housing. The combination of non-contacting absolute position, multi-turn capability, CANopen interface and robustness makes the sensor suitable for arduous tasks and aimed at high-precision position measurement under adverse ambient conditions where humidity, dampness, dust and vibration are prevalent. Typical applications include construction equipment, agricultural machinery, cranes, drilling rigs, etc.

The Vert-X 24MT is aimed at angle measurement where absolute position monitoring is required over just a few revolutions. It has a 5 VDC input power and a 10-90% single or half redundant signal output with an independent linearity of $\pm 1\%$. Its compact size, IP54/IP67 protection rating and 12-bit resolution make it suitable for demanding position measurement on industrial equipment such as forklift and truck steering angle, or position reference for linear and rotary electric actuators with a fixed travel range.

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CONNECTOR TECHNOLOGY

FUELS EMBEDDED COMPUTING GROWTH

Barbara Schmitz and Thierry Goossens*

The latest connector technology fuels growth in embedded computing as system efficiency is a critical component for today's embedded industry.

Regardless of the modern mobile application in question, whether it be fleet management of agricultural machines, passenger information in buses or video surveillance of trains, the trend is clear - system efficiency is a critical component for today's embedded computing industry.

One of the key drivers in this area is the increase in visual data incorporated into embedded systems. Graphics mean higher throughput. Slide shows and short films are no longer sufficient; nowadays, complex real-time 3D graphics or videos in HD quality are needed as well. Strong processors alone are not enough; applications like these require dedicated graphics hardware.

Grinding through graphics

Today, many chipsets have an integrated graphics controller and, therefore, are a good, cost-effective solution for small- and medium-sized system requirements. As a rule, the CPU and graphics controller share the main memory in this architecture.

When high-resolution displays or even several screens with different, high-resolution visual content are to be controlled at the same time, the bandwidth of this shared memory reduces both the performance of the CPU and of the graphics unit. So, independent graphics controllers with an integrated video memory become the preferred option.

But if you choose an external graphics controller, the data transfer rate of the connection between the chipset and the graphics controller is the critical performance factor. For this reason, connector technologies have led the development of many of the modern buses.

First the PCI bus, then the AGP bus and finally PCI Express were adopted for use with graphics cards, due to the need to efficiently and effectively connect the CPU with the graphics component.

Connectors control the flow

Data throughput is still at the forefront of connector technology, especially with the advent of high-speed serial connections quickly becoming the universally accepted data transfer route. Contrary to other serial interconnects - such as SATA and USB 3.0, for example - PCI Express is not limited to a single lane (a differential receive and transmit signal line pair) but combines up to 16 of these lanes in parallel to control the graphics card (PCI Express x16).

Using this data transfer structure, the migration from legacy, parallel CompactPCI platforms to modern CompactPCI Serial-based ones became easier.

Specification specifics

Graphics extensions are one reason for the new CompactPCI Serial architecture. Being just as robust and modular as its predecessor (CompactPCI), the new standard offers even more performance and serial interfaces. The CompactPCI Serial specification transfers the CompactPCI architecture to serial high-speed connections and offers better support for serial point-to-point structures.

A result of this enhanced specification was a newly introduced connector, specifically for CompactPCI Serial, that has, in turn, played an important role in the development of several embedded systems. This connector scales to data rates of 12 Gbps and



Image source: Bishop & Associates

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more without making space-wasting shields necessary. At the same time, it offers a much higher density than the conventional 2 mm signal connectors typically usually used for CompactPCI.

To make sure that conventional CompactPCI interfaces like PCI Express, SATA and Base-T Ethernet are not supplied alternatively but in parallel (meaning at the same time), connectors with high contact density on the system slot interfaces must be used.

Keeping pace with data demands

The AirMax VS used in CompactPCI Serial offers an exceptionally high contact density of up to 184 contact pairs on a 3U board, enabling developers to use many free pins for customer-specific I/O interfaces on the peripheral modules.

The connector does not have special power supply pins and withstands a current load of 1 A per pin at 85°C, with voltage supplied using standard connectors suited to signal transmission. The connector's mechanical design places the contacts individually, without thermal coupling. If one contact connection heats up more than another, the internal resistance increases, and the current finds its way over to cooler contacts. This guarantees that the load is spread equally over all contacts.

In CompactPCI Serial applications, connections between a front system or a peripheral board and the backplane are established using right-angled headers and vertical receptacle connectors. The interface to the rear I/O board uses right-angled receptacle connectors and vertical headers. The open design of the new signal connector offers flexibility in its contacts for differential or single-wire signals, grounding or current.

New connections made

The specially designed connector features enhanced thermal management properties and a rugged housing that combine to significantly increase reliability, enabling CompactPCI Serial to be considered for rugged applications not typically associated with its legacy specification.

But, the new connector type proved very useful in a new line of box and panel PCs from MEN Micro.

The uniqueness of this computing family, due in part to the connector, is that the external interfaces are separated from the main board. Depending on end-user requirements, many different versions based on the system core are possible. The connection to the system core is implemented without a cable and uses an AirMax VS connector for the high data rates required.

The electronic components are fully designed for demanding environments and even resist shock and vibration. Thanks to conduction cooling - in this case the housing of the box computer itself serves as the heat sink - the device operates at temperatures from -40 to +85°C, according to the EN 50155 class Tx railway standard.

Increased graphics requirements

Functioning as independent computers, box PCs take on a variety of tasks in which graphics data becomes increasingly more important, and the connector needs to keep pace with data transfer demands.

Offering medium to high graphics performance, these computers are ideal as onboard computers or content servers. They can communicate with the control room via a wireless connection and send information to several displays. After all, DisplayPort supports HD resolutions of 1920 x 1080 pixels with a cable length of 45 feet.

Therefore, many applications in buses and trains are implemented using this type of box computer, making the ruggedness of the AirMax connector a critical feature to ensure reliable operation. A single computer controls, for example, two monitors in a bus via DisplayPort. They keep the passengers informed on the course of the route and display the stops and stop requests. In the meantime info videos are shown.

Whenever the train is in the depot, the data is updated via WLAN. The connector is constantly moving data from the external graphics platform to the main processing hub within the system.

Performance reigns supreme

Wherever higher performance is required, the scalable concept of these box PCs is of great benefit. AMD is way out in front of this concept at the moment. The Embedded G-Series combines each single- or multi-core CPU with a graphics processor of the Radeon range. These APUs (accelerated processing units) make computing performance scalable thanks to their compatibility. A resolution of 2560 x 1600 pixels on several monitors is possible, even on devices suitable for vehicles.

Thanks to advanced connector technologies that keep pace with growing data demands, users have many possibilities to effectively employ enhanced graphics performance without the frustration of data bottlenecks. And by using standard components that can be flexibly integrated together, innovative ideas and technologies make cost-effective and robust graphics solutions possible.

**Barbara Schmitz is Chief Marketing Officer of MEN Mikro Elektronik and Thierry Goossens is Product Solutions Group Manager at FCI. For more information, please contact Robin Pearce, Bishop & Associates, via email at rpearce@bishopinc.com.*

Bishop & Associates
www.connectorindustry.com



APPLIED PANEL PCs

Avalue has launched the Intel Atom E3800 processor and Celeron J1900 applied panel PCs, powered by the Intel Atom processor E3800 and Celeron J1900 product family.

Based on the 22 nm Silvermont microarchitecture, the processors are designed for intelligent systems and applications with low power consumption and high performance requirements. They feature enhanced stereoscopic 3D capabilities, high-resolution graphics, data integrity and system uptime to meet intelligent systems requirements.

The LPC series features industrial-grade, modularised, low-power interactive panel PCs, while achieving full IP65 compliance to withstand dust and liquid ingress. It features an optional SAA (super-anti-abrasion) touch panel by adopting GOT (glass-on-top) technology.

The SPC series is an industrial, fanless, rugged IP65 solution characterised by its stainless steel chassis, with wide voltage input designed for rugged environments. It is suitable for the food industry, laboratories, slaughterhouse, wastewater processing, marine navigation systems and car wash machines.

The FPC series features a thin bezel and elegant ID in a full aluminium housing design. The design has modularised the main components from LCD display, system chassis and motherboard. This enables system integrators to set up a panel PC quickly and flexibly. The modular multimedia platform is suitable for in-vehicle, industrial automation, home automation, human-machine interface, POS, kiosk and thin client applications.

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



OPC UA SERVER FOR BIG DATA MANAGEMENT

Moxa has released the MX-AOPC UA Server, an automation software solution that helps users facilitate efficient yet seamless SCADA device data management. It is the company's first OPC UA software product that addresses big data challenges related to the industrial Internet of Things.

The product is claimed to be the first OPC UA server for industrial automation that supports both push and pull communication. Using the server, industry engineers can enjoy a cohesive and secure data exchange and control framework that enables instant alarms, real-time updates and efficient logging of historical data, allowing for both timely risk prevention and maintenance responses. The product features Moxa's Active Tag technology and supports the Modbus protocol for polling data. Engineers can seamlessly connect edge devices to a SCADA system and the Active Tag technology minimises data size. Other features include one-click active tag creation and simple viewing of tag values and UA server status.

The server is suitable for a variety of industrial automation applications that need to optimise data management, maximise uptime, reduce maintenance costs and increase safety.

MOXA Inc
www.moxa.com

MEMORY DEVICES

Microchip Technology has announced the SST26VF 3 V Serial Quad I/O interface (or SQI interface) SuperFlash memory devices.

The three-member '26 Series' SQI interface family is available with 16, 32 or 64 Mb of memory and is manufactured using Microchip's high-performance CMOS SuperFlash technology. The technology provides fast erase times, with sector and block erase commands completed in 18 ms and a full chip erase operation completed in 35 ms.

The SQI interface is a low-pin-count, high-speed 104 MHz quad-bit address and data multiplex I/O serial interface, which allows for high data throughput in a small package. The interface enables low-latency execute-in-place (XIP) capability with minimal processor buffer memory, reducing the overall design footprint. It also offers full command-set backward compatibility for the Serial Peripheral Interface (SPI) protocol.

Designed for low power consumption, the product is suitable for energy-efficient embedded systems. Standby current consumption is 15 μ A, typical, and the active read current at 104 MHz is 15 mA, typical. The combination of 3 V operation with low power consumption and small-form-factor packaging makes the device suitable for applications such as servers, printers, cloud computing systems, HDTV, internet gateways, appliances, security systems and a broad range of embedded systems.

Microchip Technology Australia
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Internet of Things



LoRaTM Internet of Things

KCS has extended their successful TraceME product line with an advanced module, targeted for worldwide mobility in the Internet of Things era. The latest development of the TraceME GPS/GPRS Track and Trace module will combine the RF location based positioning solution with the LoRaTM technology. This combination offers 'smart objects' being even smarter, since LoRaTM enables long range, battery friendly communication in a wide variety of (M2M) applications. Supporting GPRS/SMS and optional 3G, Wi-Fi, Bluetooth LE, ANT/ANT+ and iBeaconTM provides easy integration with existing wireless networks and mobile apps. Other variants in the high/mid-range and budget-line will follow soon.

ANTI-THEFT module based on RF

KCS TraceME product line offers an intelligent location based positioning solution for indoor and anti-theft applications. The solution is based on RF with an intelligent algorithm of measuring the propagation time of transmitted (proprietary protocol) signals. Unique features are: minimum size (46x21x6.5mm), weight (7 grams for fully equipped PCB) and a standby battery lifespan of more than 10 years. 'Listen before talk' algorithm makes it practically impossible to locate the module, which secures the valuable vehicle or asset. Supporting GPRS/SMS and optional 3G, Wi-Fi, Bluetooth LE, ANT/ANT+ and iBeacon provide easy integration with existing wireless networks and mobile apps.

www.Trace.ME

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HIGH-RESOLUTION DIGITAL OSCILLOSCOPE WITH SPECTRUM ANALYSIS

The Teledyne LeCroy Model HDO6000 high-resolution digital oscilloscope includes spectrum analysis as standard. The product also features a bandwidth range of 350 MHz to 1 GHz; 12-bit ADC resolution (up to 15-bit with enhanced resolution); long acquisition memory of up to 250 Mpts; and a 2.5 GS/s sampling rate.

The unit's HD4096 high-definition technology enables capture and display of signals up to 1 GHz with a high sample rate and 16 times more resolution. It also allows for the debug of complex embedded designs with an integrated, 16-channel, mixed signal capability.

The user can easily configure channels, timebase, trigger and all functions with the intuitive, efficient touch-screen interface. The WaveScan function can quickly search waveforms for runts, glitches or other anomalies, while LabNotebook saves all results and data with a single button press and creates custom reports.

The product's software analysis tools include Power Analysis, Serial Bus Trigger and Decode and PROTObus MAG Serial Debug Toolkit.

Scientific Devices Australia

www.scientific-devices.com.au



HIGH-BRIGHTNESS TFT DISPLAYS

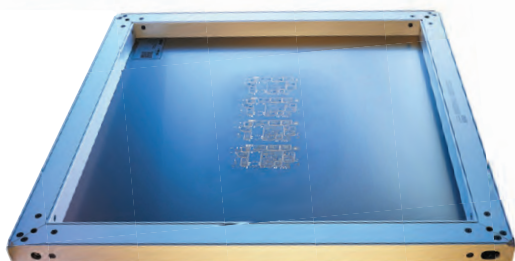
Kyocera's range of TFT LCD displays now includes the 10.4" TCG104XGLP and 12.1" TCG121XGLP. Both feature XGA (1024 x 768 pixels) resolution and Kyocera's Advanced Wide View (AWV) technology, which enables display images to be easily seen from 85° viewing angles in all directions.

Both displays feature high-efficiency LED backlights, with brightness ratings of 1300 cd/m² for the 10.4" module and 1200 cd/m² for the 12.1" module. No additional components are required to drive the backlights as an integrated LED driver circuit is included in both display modules. Backlight lifetime is an estimated 70,000 h at 50% brightness.

AWV technology, high-contrast ratios of 700:1 and 750:1 respectively and an anti-glare polariser ensure that display images are bright, colourful and easily read in high ambient light environments. The displays are suitable for demanding indoor and outdoor applications where optimum viewing angle performance is required, such as aerospace, marine navigation, medical, point-of sale, test and measurement, and process control. Dimensions include 230 x 180.2 x 10.5 mm for the 10.4" module and 260.5 x 203 x 10.3 mm for the 12.1" module. An operating temperature range of -30 to +80°C is supported and the products are RoHS compliant.

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PENTABAND 3G MODULE

The Quectel UC20-G is a powerful function UMTS/HSPA+ module offering a maximum data rate of 14.4 Mbps downlink and 5.76 Mbps uplink. The product is designed to provide users with global network coverage on the connectivity of UMTS/HSPA+. It can also be fully backward compatible with existing EDGE and GSM/GPRS networks through a multiband combination of pentaband UMTS and quad-band GSM.

The tiny profile of 32 x 29 x 2.5 mm and high integration level enable integrators and developers to easily design their applications and benefit from the module's small size, low power consumption and mechanical intensity. Its LCC package allows fully automated manufacturing for high-volume applications. A miniPCIE card format is available.

Embedded functions include GPS, GLOANSS, A-GPS, TCP/IP stack, FOTA, STK and QuecLocator for cell location services. The product has an extended operation temperature of -40 to 85°C and supports an Rx-diversity antenna. The device is CE/GCF/FCC/PTCRB/AT&T/OFCA/NCC/RCM/IC/Rogers/Vodafone/KC/NAL/TA approved.

A rich set of internet protocols, industry-standard interfaces (USB/UART/PCM/ADC/NETLIGHT/SD/Rx-diversity) and abundant functions (USB drivers for Windows XP, Windows Vista, Windows 7, Windows 8, Windows CE, Linux, Android/eCall/GNSS) extend the applicability of the module to a wide range of M2M applications such as automotive, metering, tracking systems, security solutions, routers, wireless POS, mobile computing devices, PDA and tablet PC.

Elecom Electronics Supply
www.elecomes.com

INTEGRATED BIAS NETWORK

The MABT-011000 is a rugged, fully monolithic, broadband, surface-mount bias network that utilises MACOM's HMIC process. This process allows the formation of silicon vias by embedding them in low-loss, low-dispersion glass along with high-Q spiral inductors and metal-insulator-metal (MIM) capacitors. The close proximity of elements and the combination of silicon and glass give the HMIC device low loss and high performance, with good repeatability through millimetre frequencies.

The bias network is suitable for the DC biasing of PIN diode control circuits. It functions as an RF-DC decoupling network, as well as the DC return, and contains a series DC blocking capacitor with DC currents up to 60 mA and DC voltages up to 50 V. Additional features include: specified over broad bandwidth (2-18 GHz), low insertion loss (<0.3 dB) and high RF-DC isolation (>34 dB).

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The average Australian worker would not recommend their workplace to others, is disinclined to do any more than what's expected and is probably on the hunt for another job, a new nationwide employee survey has found.

The State of Employee Engagement in Australia', conducted by Engaged Marketing, asked 3361 Australians about their attitudes towards their current workplace and employer.

The results were of great concern to Australian organisations as they pointed to significant productivity, referral and recruitment issues, said Engaged Marketing Managing Director Christopher Roberts.

On the whole, Australian employees are unlikely to recommend their workplace as a great place to work to friends and family, with a low national employee engagement score of -23%. This score was calculated by subtracting the percentage of 'detractors' (43%) from the percentage of 'promoters' (20%). Only 37% were found to be 'passives' or neutral.

"It's alarming how few Australians would recommend their current workplace as a great place to work to family and friends. Given the power of word of mouth, this has the potential to significantly and negatively impact an organisation's future recruitment prospects," said Roberts.

Workers also said they are disinclined to do more than what is expected in their day-to-day job, with an average discretionary effort score of just 5.8 out of 10.

Furthermore, employee loyalty to their current workplace was also low at just 55.3%.

"Worker discretionary effort is also low, with many staff not willing to do any more than what is expected of them during the normal nine-to-five working day.

"This is another alarm bell for organisations, as staff who give you discretionary effort are the ones who deliver customer and client experiences worthy of recommendation and find new ways

to increase efficiencies and reduce costs. Interestingly, the discretionary effort scores of promoters are 77% higher than those of detractors."

Roberts said there was a strong link between internal employee engagement and employee loyalty, with promoter employees almost three times more loyal than detractor employees.

"Given 43% of the population are classified 'detractors' of their workplaces, this is a real human resource issue for organisations that may result in greater costs to recruit and retrain new employees," he said.

"Employee-stated loyalty is low, which not only means that many are thinking of leaving, but you also have to wonder how productive an employee with this mindset is going to be while they're still working there."

Roberts said employers need to do more to truly engage their employees, which in turn will improve workplace recommendation, discretionary effort and loyalty.

"Staff engagement is more than just staff satisfaction; it's about ensuring staff feel genuinely valued, are having some of their core human needs met and understand the role they play in delivering organisation's business strategy.

"Ultimately, this boils down to the type of leadership in the organisation. Leaders need to understand exactly what is driving employee commitment, and then link the organisation's business strategy to employees' core needs, motivations and purpose to drive engagement."

A complimentary copy of The State of Employee Engagement in Australia is available to download from <http://engagedmarketing.com.au/downloads/state-employee-engagement/>.

COMPACT VISION SYSTEM FOR USB3 VISION CAMERAS

The NI CVS-1459RT is a small, rugged vision system with a quad-core Intel Atom processor and two dedicated USB 3.0 ports for USB3 Vision cameras. It is programmed with either LabVIEW system design software or Vision Builder for Automated Inspection (AI). Engineers have the option of using LabVIEW FPGA to further customise the FPGA-enabled I/O and tightly synchronise vision inspection results with other parts of industrial systems, such as encoders and proximity sensors.

The product is based on the LabVIEW reconfigurable I/O (RIO) architecture, an integral part of the NI graphical system design platform. A modern approach to designing, prototyping and deploying embedded monitoring and control systems, graphical system design combines the open LabVIEW programming environment with commercial off-the-shelf hardware to simplify development so engineers can combine powerful vision tools, I/O, industrial communication, data logging and human machine interfaces (HMI) into a single environment.

Features include: a rugged form factor for industrial applications up to 55°C; synchronisation with automation devices for camera and lighting triggering via onboard industrial I/O; the ability to use USB 3.0 ports with peripherals such as external storage for logging data; 64-bit NI Linux Real-Time OS; board-level versions available for OEM applications.

National Instruments Australia

www.ni.com/oceania

MAGNETIC TRACKING ANTENNAS

Aaronia has introduced the MDF series of magnetic tracking antennas. The compact, lightweight broadband magnetic antennas can be used for low-frequency signal tracking and field strength measurements.



The antennas are available in five different versions (two passive and three active) and cover a wide frequency range from 9 kHz up to 400 MHz. They also connect to all regular spectrum analysers, which then become professional field strength meters.

The special transformer factor of the antenna, in conjunction with a dBm-indicating power meter, gives a direct dBm display with the correct sign (power meter function). The device is suited to signal direction finding or locating illegal or unwanted interference sources.

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OLED DIGITAL MULTIMETER

The Keysight U1253B is a 4.5-digit, true RMS digital multimeter (DMM) that boasts a built-in programmable square-wave generator with selectable frequency and duty cycle. It is available to rent from TechRentals.

The handheld multimeter also comes with smoothing functionality and internal logging for 1000 points, with further logging possible to a PC with included data logging software.

Features include: up to 0.025% basic AC/DC voltage accuracy; 20 MHz frequency counter; OLED display with 160° viewing angle and 2000:1 contrast ratio; safety rating CAT III 1000 V and CAT IV 600 V.

TechRentals

www.techrentals.com.au



STORAGE CAPACITORS

Vishay Hybrid Storage 196 HVC ENYCAP Capacitors are high-energy storage capacitors that save space due to their high energy density (13 Ws/g). They support voltages ranging from 1.4 V (single cell) to 2.8/4.2/5.6/7/8.4 V (multiple cells) and are available as stacked through-hole (STH), radial), surface-mount flat (SMF) and lay-flat configurations (LPC) with wire and connectors.

Storage capacitors are a suitable alternative to rechargeable backup batteries and can hold 70% of their charge for as long as a month. Typical applications include: power backup for memory controllers, flash backup, RAID systems, SRAM and DRAM; power failure and write-cache protection for enterprise SSD and HDD; real-time clock power sources; backup power for industrial PCs and industrial controls; emergency lights and micro UPS power sources.

element14

au.element14.com

VECTOR SIGNAL GENERATOR MICROWAVE FREQUENCY OPTIONS

Rohde & Schwarz has added microwave frequency options to its R&S SMW200A high-end vector signal generator to support development applications requiring complex multichannel scenarios. The options cover microwave frequency ranges from 100 kHz to 12.75 GHz, 100 kHz to 31.8 GHz and 100 kHz to 40 GHz.

The 40 GHz version enables users to completely cover the K and K_a bands. The generator's integrated baseband offers an RF modulation bandwidth of 160 MHz with good I/Q flatness and EVM, making it possible to generate signals of high modulation quality. It is easy to generate CW signals with multiple carriers for component tests and wideband QAM-modulated carriers for satellite receiver tests.

The options enable the instrument to cover the frequency ranges that are currently the focus of 5G development. Its internal baseband section can handle important digital communications standards. The signal bandwidth can even reach 2 GHz when external I/Q signals are used. The LO coupling of the device makes it possible to set up a compact system with up to three phase-coherent outputs up to 40 GHz for beamforming applications used to measure active antenna systems.

The product also generates digitally modulated signals up to 40 GHz for direct microwave link applications. The instrument's integrated test case wizard enables users to configure complex WCDMA and LTE test scenarios at the push of a button. The 12.75 GHz frequency option offers a wear-free electronic attenuator.

Rohde & Schwarz (Australia) Pty Ltd

www.rohde-schwarz.com

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SATELLITE MODEM SUITE

ORBCOMM has released a comprehensive suite of OEM satellite modem solutions. The suite includes the OG2 modems (OG2-M and OG2-GPS) and an Isat Data Pro (IDP) L-Band modem (OG-ISAT), which provides global coverage over Inmarsat's satellite constellation. The company's turnkey OEM

solutions are intended for early integration into M2M applications targeted for the transportation and distribution, heavy equipment, oil and gas, maritime and government markets. The OG2-GPS modem features an onboard three-axis accelerometer and built-in GPS, while the OG-ISAT modem contains built-in GPS. With a footprint smaller than a credit card, the suite of modems is interchangeable, offering OEMs an M2M solution compatible with ORBCOMM's current OG1 satellite network and future OG2 services as well as with Inmarsat's L-Band IDP network.

The modems' design is said to offer improvements in latency, message size, performance and regulatory coverage. The modems feature a single wide-range power supply input, which provides flexibility for product designers. Their low power consumption improves longevity in battery-powered applications. The modems also utilise an industry-standard PCI Express physical interface for seamless integration. Integrators can additionally purchase the ORBCOMM Developer's Kit, which includes the OG2 or ISAT satellite modem, modem evaluation board, universal power supply, antennas, USB to serial adapter, Quick Start Guide CD with documentation, and PC interface software.

Combined with ORBCOMM's Multi-Access Point Platform (MAPP), satellite and cellular services and robust web applications, OEMs can utilise the company's components to create complete M2M solutions operating on a global platform.

OSCILLOSCOPE

The Tektronix DPO70000SX ATI Performance Oscilloscope features Asynchronous Time Interleaving (ATI) technology, which works by sampling the entire spectrum through two ADCs and averaging the data. This is said to result in low noise and high performance.

Other features include: 70 GHz analog bandwidth; 200 GS/s sample rate; 4.3 ps rise time (20/80); and >25 GHz edge trigger. The unit has a compact form factor of 5.25".

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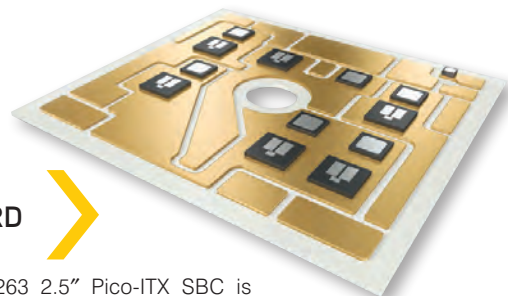
ON WWW.ELECTRONICSONLINE.NET.AU



EMBEDDED CONTROLLER

The AEC-6402 ultracompact embedded controller, from Aaeon, is a fanless embedded computer measuring 20 mm thick with a good amount of processing power.

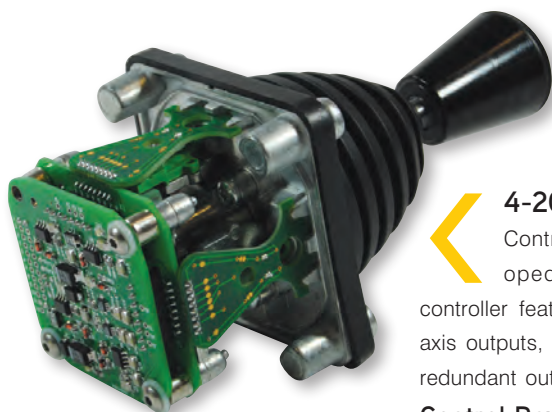
Interworld Electronics and Computer Industries
<http://bit.ly/1Qdnnzn>



SINGLE BOARD COMPUTER

Advantech MIO-2263 2.5" Pico-ITX SBC is designed for intelligent systems with quad core computing and high graphics and media performance.

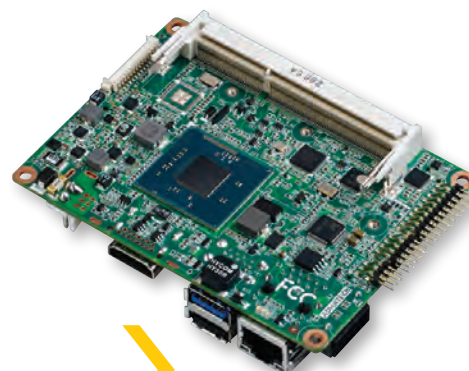
Advantech Australia Pty Ltd
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4-20 MA JOYSTICK

Control Devices has developed a 4-20 mA joystick controller featuring single- and dual-axis outputs, transient protection and redundant outputs.

Control Devices Australia
<http://bit.ly/1F0lZy4>



SILICON CARBIDE POWER MODULES

SEMIKRON offers full silicon carbide power modules in MiniSKiiP, SEMI-TOP and SEMITRANS housings, as well as hybrid silicon carbide modules in SEMITRANS and SkiM63/93 packages.

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The MPU-6555 is InvenSense's 6-axis (3-axis gyroscope + 3-axis accelerometer) activity detection device, working in conjunction with its Automatic Activity Recognition library (AAR) in a 3 x 3 x 0.9 mm (24-pin QFN) package.

Glyn Ltd
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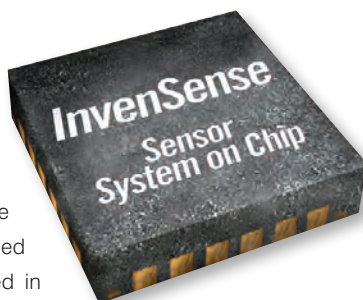
MultiTech's MultiConnect Conduit programmable gateway makes it quick and easy for OEMs and industrial companies to deploy and expand IoT networks.

Elecom Electronics Supply
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IP65 SEALED VERSION OF HANDHELD ENCLOSURE

The 1553W IP65 sealed version of the ergonomically designed 1553 handheld enclosure family, from Hammond Electronics, is intended for housing any electronics that will be used in environments where dust and water are likely to be present.

Hammond Electronics Pty Ltd
<http://bit.ly/1l6xCm4>



ENCLOSURES FOR IPAD AIR TABLETS

OKW has added two iPad Air front panels to its Interface-Terminal multifunction electronic enclosures range, enabling the tablets to be securely mounted to walls or desks or in a robust, handheld enclosure to help prevent damage or even theft.

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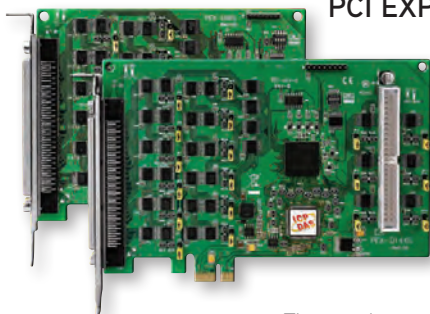
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PCI EXPRESS 96- AND 144-CHANNEL DIGITAL I/O BOARDS

ICP DAS has introduced its PCI Express 96- and 144-channel digital I/O boards, the PEX-D96S and PEX-D144LS.

The PEX-D96S provides a single high-density connector that reduces the installation space required for the card in the computer and has 96 digital I/O lines (twelve 8-bit bidirection ports) on a 100-pin SCSI II high-density connector. The PEX-D144LS provides an additional 50-pin box header that reduces the installation space required for the card in the computer and has 144 digital I/O lines (eighteen 8-bit bidirection ports). All ports are configured as inputs during power-up or reset.

The products also add a card ID switch and pull-high/pull-low resistors for the onboard digital input (DI). Users may set via the card ID on a board so the board can be distinguished by the ID via software when using two or more PEX-D96S/PEX-D144LS cards in one computer. The pull-high/pull-low resistors specify the digital input status; when the DI channels are unconnected, the DI status will remain in high or low status without being left floating.

The cards support various operating systems such as Linux, DOS, Windows 98, Windows NT, Windows 2000, 32-/64-bit Windows XP/2003/2008/Vista/7 and Windows 8. They also provide DLL and Active X control, and various language sample programs in Turbo C++, Borland C++, Microsoft C++, Visual C++, Borland Delphi, Borland C++ Builder, Visual Basic, C#.NET, Visual Basic.NET and LabVIEW to help users to quickly and easily develop their applications.

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HDD MODEL LINE

Toshiba Electronics Europe has added 512 native and advanced-format drives with 12 Gbps SAS interface to its 15,000 rpm Enterprise Performance Class HDD model line. The product will provide fast host transfer rates to applications such as online transaction processing (OLTP) and databases.

The AL13SX series is available in capacities up to 600 GB in a power-saving, low-latency 2.5" form factor. The form factor supports high storage density, saving rack space and reducing the mission-critical storage footprint and operational burden. The devices are designed for mission-critical workloads, delivering a 12 Gbps SAS host transfer rate and enhanced power management features for integration with rack-optimised data centres.

Models supporting 512 native sector length technology provide compatibility with industry-standard applications and operating environments. The 512n models offer industry migration to the high-performing, powerful and space-efficient 2.5" form factor (when used with appropriate form factor conversion hardware). Additional models supporting 4Kn or 512e advanced-format sector lengths provide effective performance and data integrity for environments that support these technologies.

Advanced-format models offer persistent write cache technology for improved data integrity in unaligned write scenarios. Models with self-encryption features are also offered.

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

COM EXPRESS TYPE 10 CPU MODULE

The NanoCOM-BT provides high performance and low power consumption in the embedded market. The product adopts the latest Intel Atom N2000/E3800 processor and the system memory deploys with onboard DDR3L 2 GB memory. Intel I211/i210 supports 10/100/1000Base-TX for fast network connections.

The model applies three PCI-Express, one LPC bus and one SMBus. Moreover, two SATA 3 Gbps are configured on the device. The module also equips six USB 2.0 and one USB 2.0/3.0 bus for flexible I/O expansions. The display supports CRT/LCD simultaneous/dual view display.

The COM Express Module is developed to cater to the requirements of automation, medical, ticket machine, transportation, gaming, kiosk and POS/POI applications.

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Image source: ISO

Elizabeth Gasiorowski-Denis

At a time when drones have become a regular feature in the news and are about to proliferate our airspace, it's a good idea to take a step back and examine some very basic and important questions.

Drones - also referred to as unmanned aircraft systems (UAS) - can range greatly in size, capabilities and cost. And the world market for this technology has grown by leaps and bounds in recent years. With such investment taking place, it's clear the world is taking notice and focusing more on this industry, and all its related elements. This includes the aircraft, the control station and the communication link, not just the vehicle itself.

We spoke to Cortney Robinson, director of civil aviation infrastructure at the Aerospace Industries Association (AIA) in the USA and new secretary of ISO/TC 20/SC 16 on unmanned aircraft systems. AIA, the premier trade association representing major aerospace and defence manufacturers and suppliers in the USA, manages the secretariat on behalf of ANSI (ISO member for the USA). Here, Robinson takes us through the trends facing both standards development and the industry.

Why did ISO create a subcommittee on unmanned aerial vehicles? And why now?

Standardisation in the field of UAS is a timely issue, due to the increasing market demand for civil unmanned aviation vehicles as well as aviation for usage in the monitoring of borders, forestry and fisheries, oil and gas pipelines, and the delivery of cargo into orbit.

This technology is also seeing increased interest and use in search and rescue operations, transport and agricultural aviation, forest fires, solving the problems of detecting and mapping the areas of natural and man-made disasters, monitoring the status of water bodies, highways, conservation and other objects, and the organisation of communication and the regulation of traffic in major cities.

There has been increasing public debate about the use of drone technology for recreational and commercial use, including its safety and security risks. That said, in what areas do you see effective use of UAS technology today?

The potential for commercial use is almost limitless, but if we had to prioritise, we should take a risk-based approach and balance the

most beneficial missions with the operational risk. That's the surest route to building a strong safety case for this new technology. In the USA, the movie and film industry has developed a solid argument for how UAS operations present increased safety over using helicopters on set. Of course, flight over people is higher risk, but the decision of the US Federal Aviation Administration (FAA) to ease restrictions for operations in the Arctic is a good start. More practically, though, agriculture will likely be the first major industry to undertake large-scale UAS integration into its operations. In its notice of proposed rulemaking (NPRM), the FAA lists an impressive number of conceivable applications.

What are some of the challenges posed by UAS technology for industry?

Depending on the national regulator, some within industry find developing and implementing appropriate policies and infrastructure to be most challenging. For UASs, the optimal infrastructure is digital, satellite-based communication, navigation and surveillance. With this in mind, the International Civil Aviation Organization and leading air navigation service providers, including the FAA, are influencing the development of International Standards towards UAS transformation by investing in infrastructure like NextGen that will allow efficient airspace access for all users while maintaining safety.

In what ways do you expect International Standards to address some of these challenges?

International Standards are critical in creating the global commercial market that many publicise widely. It is vital that these standards bring about a globally harmonised airspace for routine UAS access that will expand the commercial opportunities without compromising on safety and overall airspace efficiency. Critical standards under development are detect and avoid and command and control.

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ELECTRONIC RENTALS



GRAPHICAL-SCREEN DIGITAL PANEL METER

London Electronics has released a compact and easy-to-use panel meter that can be configured with a USB connection. Being graphical, it allows users to create digital and bar graph representations of their measurements. The sealed, IP65-rated front panel makes the device suitable for installation in wet areas.

All configuration settings can be saved to a file that also stores the meter's serial number, which is suitable for QA traceability. The meter accepts 24 VDC, 24 VAC, 110 VAC or 230 VAC and has the capability to give a 24 VDC output at up to 30 mA to power a 4-20 mA loop. A configurable alarm relay is provided and the product can customise the units of measure to suit the user's requirements.

The input signal can be averaged over a chosen timespan from 0.5 to 20 s. The alarm relay is rated 250 VAC 0.5 A resistive load. It can have a programmable delay from 0 to 3600 s to prevent nuisance alarming caused by short-term variations.

The meter is suitable for the following applications: temperature measurement; tank contents measurement; pressure measurement; DC current measurement via shunt; weight indication; tidal height indication; borehole water table indication; humidity measurement.

**AMS Instrumentation &
Calibration Pty Ltd**
www.ams-ic.com.au

INTEGRATED UV LIGHT SENSOR

Designed to convert solar UV light intensity to digital data in consumer, medical and industrial applications, the Vishay Semiconductors VEML6070 comes in a compact 2.35 x 1.8 x 1 mm surface-mount package. The integrated UV light sensor features Filtron UV technology for high UV sensitivity and linearity.

The device is optimised for UV detection in smartphones, health monitoring and fitness products, flame detectors and weather stations. The sensor incorporates the circuitry needed for these applications in one compact unit.

A robust refresh rate setting simplifies designs by eliminating the need for an external RC low pass filter. The product offers high dynamic detection resolution and good performance under long-term solar UV exposure, while an active acknowledge (ACK) feature with threshold window settings sends out UVI alert messages under strong solar conditions.

The built-in photo-pin-diode offers spectral sensitivity from 280 to 400 nm, with a peak sensitivity wavelength of 355 nm. The sensor provides fluorescent light flicker immunity, a software shutdown mode to reduce power consumption to <1 μ A and temperature compensation stability from -40 to +85°C.

The product features an operating voltage and I²C bus voltage range of 2.7 to 5.5 V. Offered in a lead-free OPLGA package, the device is RoHS-compliant, halogen-free and Vishay GREEN.

Braemac Pty Ltd
www.braemac.com.au

ETHERCAT DATA ACQUISITION MODULES

Dewesoft has released Krypton, its latest ruggedised distributed EtherCAT DAQ modules. The modules are engineered to weather all conditions and to operate in cold, hot, dusty, mud, snow and water environments.

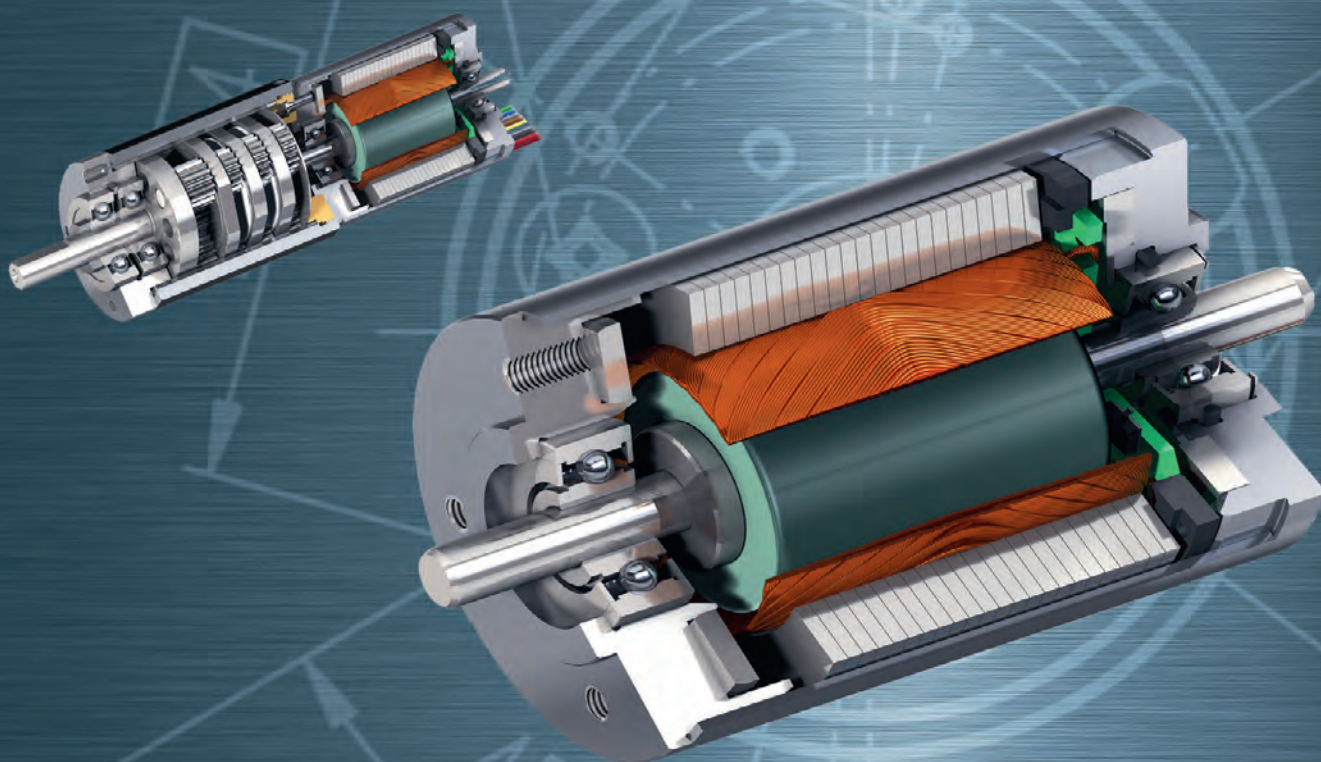
The modules are shock- and vibration-proof, milled out of a full block of aluminium filled with rubber. They are IP67 rated and operate at temperatures from -40 to 85°C.



As the modules are so small, they can be easily placed near the source of the user's data. They can connect with a single cable for data, power and synchronisation over a short distance, saving costs and improving on signal quality. The data link allows up to 100 m of distance from module to module, or they can be stacked up in blocks using a simple lock mechanism.

The modules are connected to the computer via an industrial standard ethernet connection (EtherCAT protocol), which provides a 100 Mb data link for hundreds of channels with a >10 kHz data rate per channel and good synchronisation between devices. It also automatically detects IP address configuration and allows the user to enjoy the full power of Dewesoft X Software, which is included with every module.

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ANTENNAS ON A CHIP

Gehan Amaratunga

University of Cambridge researchers have unravelled one of the mysteries of electromagnetism, which could enable the design of antennas small enough to be integrated into an electronic chip. These ultrasmall antennas - the so-called 'last frontier' of semiconductor design - would be a massive leap forward for wireless communications.

In new results published in the journal *Physical Review Letters*, the researchers have proposed that electromagnetic waves are generated not only from the acceleration of electrons, but also from a phenomenon known as symmetry breaking. In addition to the implications for wireless communications, the discovery could help identify the points where theories of classical electromagnetism and quantum mechanics overlap.

The phenomenon of radiation due to electron acceleration, first identified more than a century ago, has no counterpart in quantum mechanics, where electrons are assumed to jump from higher to lower energy states. These new observations of radiation resulting from broken symmetry of the electric field may provide some link between the two fields.

The purpose of any antenna, whether in a communications tower or a mobile phone, is to launch energy into free space in the form of electromagnetic or radio waves, and to collect energy from free space to feed into the device. One of the biggest problems in modern electronics, however, is that antennas are still quite big and incompatible with electronic circuits - which are ultrasmall and getting smaller all the time.

"Antennas, or aerials, are one of the limiting factors when trying to make smaller and smaller systems, since below a certain size, the losses become too great," said Professor Gehan Amaratunga of Cambridge's Department of Engineering, who led the research.

"An aerial's size is determined by the wavelength associated with the transmission frequency of the application, and in most cases it's a matter of finding a compromise between aerial size and the characteristics required for that application." Another challenge with aerials is that certain physical variables associated with radiation of energy are not well understood. For example, there is

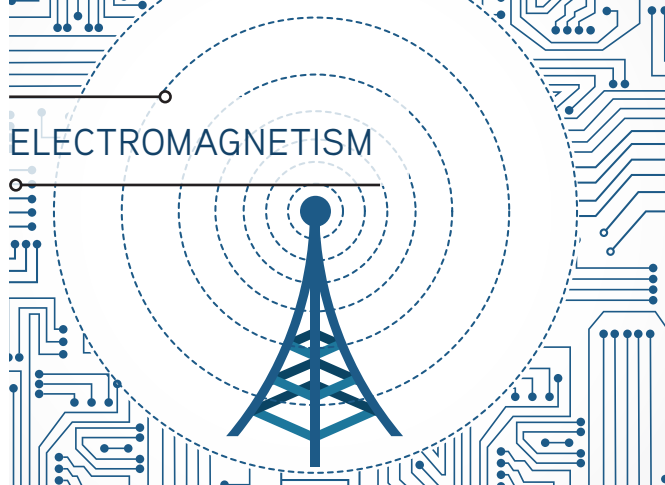
still no well-defined mathematical model related to the operation of a practical aerial. Most of what we know about electromagnetic radiation comes from theories first proposed by James Clerk Maxwell in the 19th century, which state that electromagnetic radiation is generated by accelerating electrons.

However, this theory becomes problematic when dealing with radio wave emission from a dielectric solid, a material which normally acts as an insulator, meaning that electrons are not free to move around. Despite this, dielectric resonators are already used as antennas in mobile phones, for example.

"In dielectric aerials, the medium has high permittivity, meaning that the velocity of the radio wave decreases as it enters the medium," said Dr Dhiraj Sinha, the paper's lead author. "What hasn't been known is how the dielectric medium results in emission of electromagnetic waves. This mystery has puzzled scientists and engineers for more than 60 years."

Working with researchers from the National Physical Laboratory and Cambridge-based dielectric antenna company Antenova, the Cambridge team used thin films of piezoelectric materials, a type of insulator which is deformed or vibrated when voltage is applied. They found that at a certain frequency, these materials become not only efficient resonators, but efficient radiators as well, meaning that they can be used as aerials. The researchers determined that the reason for this phenomenon is due to symmetry breaking of the electric field associated with the electron acceleration. In physics, symmetry is an indication of a constant feature of a particular aspect in a given system. When electronic charges are not in motion, there is symmetry of the electric field.

Symmetry breaking can also apply in cases such as a pair of parallel wires in which electrons can be accelerated by applying an



PIEZOELECTRIC MATERIALS CAN BE MADE IN THIN FILM FORMS USING MATERIALS SUCH AS LITHIUM NIOBATE, GALLIUM NITRIDE AND GALLIUM ARSENIDE.

oscillating electric field. "In aerials, the symmetry of the electric field is broken 'explicitly', which leads to a pattern of electric field lines radiating out from a transmitter, such as a two-wire system in which the parallel geometry is 'broken'," said Sinha.

The researchers found that by subjecting the piezoelectric thin films to an asymmetric excitation, the symmetry of the system is similarly broken, resulting in a corresponding symmetry breaking of the electric field, and the generation of electromagnetic radiation.

The electromagnetic radiation emitted from dielectric materials is due to accelerating electrons on the metallic electrodes attached to them, as Maxwell predicted, coupled with explicit symmetry breaking of the electric field.

"If you want to use these materials to transmit energy, you have to break the symmetry as well as have accelerating electrons - this is the missing piece of the puzzle of electromagnetic theory," said Amaratunga. "I'm not suggesting we've come up with some grand unified theory, but these results will aid understanding of how electromagnetism and quantum mechanics cross over and join up. It opens up a whole set of possibilities to explore." The future applications for this discovery are important, not just for

the mobile technology we use every day, but they will also aid in the development and implementation of the Internet of Things: ubiquitous computing where almost everything in our homes and offices, from toasters to thermostats, is connected to the internet. For these applications, billions of devices are required, and the ability to fit an ultrasmall aerial on an electronic chip would be a massive leap forward.

Piezoelectric materials can be made in thin film forms using materials such as lithium niobate, gallium nitride and gallium arsenide. Gallium arsenide-based amplifiers and filters are already available on the market and this new discovery opens up new ways of integrating antennas on a chip along with other components.

"It's actually a very simple thing, when you boil it down," said Sinha. "We've achieved a real application breakthrough, having gained an understanding of how these devices work."

The research has been supported in part by the Nokia Research Centre, the Cambridge Commonwealth Trust and the Wingate Foundation. Additional support was provided through the East of England Development Agency, Cambridge University Entrepreneurs and investment from Cambridge Angels.



WEARABLE ENCLOSURES RANGE

OKW's range of Ergo-Case wearable enclosures includes six smaller XS models, consisting of a top, base and intermediate ring. They are assembled with two self-tapping screws and can be specified with no eyelets, one eyelet for a lanyard or two lateral eyelets for fitting the device to a wrist strap or belt.

The extra-small cases are suitable for compact handheld electronic devices and have an ergonomically contoured design. Applications include personal electronics such as medical and wellness equipment, security devices, building access and dosage detectors.

The range includes four plan sizes - XS, S, M and L - with dimensions from 82 x 56 x 24 mm to 150 x 200 x 69 mm. The XS and S models are designed for wearing on straps or lanyards. The M and L models can be fitted to arm and belt straps or wall mounted using the accessory eyelets and wall-mounting elements. L models are also available with a clear display window.

Models feature a recessed area in the top for mounting a membrane keypad or product label. Screw pillars in the top section and location pillars in the base section are provided for fitting PCBs and battery assemblies. The enclosures are moulded in ABS (UL 94 HB) in off-white or black.

Accessories include belt clips, wrist straps, belt/arm straps, lanyards, eyelet kits, sealing kits, a wall-mounting kit and battery cradles. Customising options include custom colours, CNC milling and drilling of holes and cut-outs, silk-screen and tampo printing of legends and logos, EMC shielding and assembly.

ROLEC OKW Australia New Zealand Pty Ltd

www.rolec-okw.com.au





BLUETOOTH 4.0 BLE MODULE

The GWBMD0x is a Bluetooth 4.0 single-mode module based on the nRF51822 BLE protocol processor from Nordic Semiconductor. The nRF51822 is a powerful, flexible multiprotocol SoC suitable for Bluetooth Smart and 2.4 GHz ultralow-power wireless applications. It is built around a 32-bit ARM Cortex M0 CPU with 256 KB/128 KB Flash +32 KB/16 KB RAM.

GWBMD0x is an RF-designed module with almost full function as a Nordic nRF51822 chipset. Because of the programming flexibility in nRF51822, the 12 GPIOs in the module can be programmed as serial interfaces, PWM, analog, DIO, I²C, SPI, etc. This enables complete design flexibility associated with pin-out location and function. It is a suitable module for users wanting to use nRF51822 as their design solutions.

The product is FCC qualified with an embedded antenna. Performance is maximised with a 95 dB link budget compatible with Nordic SDK and its iBeacon reference design, providing an open and flexible development platform for developers to link their applications to iOS and Android devices.

The 15 x 15 mm module includes an integrated 16 MHz/32768 Hz crystal and DC/DC converter. Power consumption is 13 mA at peak, <0.5 μ A at power down and <2.5 μ A in idle mode. TX is -20 to 4 dBm, while RX is -92.5 dBm. Other features include GAP, GATT, L2CAP, SMP Bluetooth low energy profiles; rich and flexible peripheral IOs; and support for Master and Slave mode.

Elecom Electronics Supply
www.elecomes.com

SRAM

Cypress now offers the QDR-IV SRAM from the consortium-defined QDR product line. The range includes the QDR-IV Xtreme Performance (XP) and QDR-IV High Performance (HP).

A high-performing standardised networking memory, the device is suitable for next-generation networking, communication and high-performance computing systems. Its random transaction performance is said to be even greater than commodity memories and previous generations of QDR. Additional features include on-chip ECC and bidirectional data ports.

Future Electronics
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SURFACE-MOUNT GNSS GLOBAL POSITIONING MODULE

u-blox has announced the CAM-M8C, a small, low-profile GNSS positioning module with an integrated wideband chip antenna for reception across the entire L1 band. The module offers simultaneous GNSS operation for GPS/GLONASS, GPS/BeiDou or GLONASS/BeiDou to deliver accurate, jamming-resistant positioning anywhere in the world.

The product integrates a u-blox M8 satellite receiver, crystal oscillator, SAW filter and low-noise amplifier. It also has an input for an external active antenna; when using this option, the internal antenna acts as a backup. Due to its novel antenna design, the module maintains its performance regardless of physical orientation. This makes it suitable for mobile applications with frequent change of bearing.

The unit is footprint compatible with u-blox UC530 and UC530M modules, providing an easy upgrade path. To accelerate design and development, an evaluation kit, the EVK-M8CCAM, offers a quick way to become familiar with the CAM-M8C module and assess its performance in specific applications.

The u-blox M8 GNSS receiver antenna module is qualified to JEDS47 and ISO16750 standard 'Road vehicles - Environmental conditions and testing for electrical and electronic equipment'. The product is manufactured in ISO/TS 16949 automotive-certified production sites, ensuring high quality.

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

EMBEDDED COMPUTER

The MXE-200/200i Series, from ADLINK, is an ultracompact fanless embedded platform based on Intel Atom SoC E3845/E3826 processors. Its hardy aluminium housing is designed to withstand industrial-grade EMI/EMS (compliant with EN 61000-6-4, 61000-6-2) and is fully operable under harsh conditions. The series combines a controller and gateway function in one unit, reducing space/wiring and device costs. The series offers an operating temperature range of -20 to 70°C and vibration/shock resistance of 5 G_{rms} up to 100 G. Full support for the Intel IoT Gateway, integrated Wind River Intelligent Device Platform XT and McAfee Embedded Control, as well as ADLINK's SEMA Cloud solution, all maximise manageability and security for the platform.

The product features two GbE LAN ports, two COM ports, two USB 2.0 ports, one USB 3.0 port, four optional isolated DI, four isolated DO with interrupt support and dual mini PCIe slots, supporting communication with connections such as Wi-Fi, BT, 3G and LTE.

ADLINK Technology Inc
www.adlinktech.com



CUSTOM SUBSTRATES WITH SIDEWALL PATTERNING

Vishay Intertechnology has added a sidewall patterning capability to its custom thin film substrate offering. This allows the company to increase design flexibility and density for miniaturisation in military, aerospace, medical and telecom equipment.

The Vishay Dale Resistors Electro-Films product line offers SDWP substrates that accommodate die attach or wire bonding on side walls as well as the top side. Side-patterned connections have low inductance and therefore operate well at high frequency. This makes the devices suitable for custom circuits in electromechanical or electro-optical applications, high-frequency circuits in RF applications and high-bit-rate transceivers.

The capability enables designers to provide continuity between the top and bottom of a die, connect wire bonds to the traces on the side of the die or make contact with the side of the die with a pin. The substrates feature a plate thickness of $\leq 0.025''$, a minimum line width and gap of $\geq 0.003''$ and tight line width and gap tolerances down to $\pm 0.001''$. The substrates are available in a variety of metals.

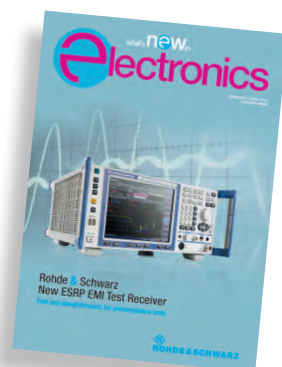
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PEAK CURRENT MODE CONTROLLER

The STMicroelectronics HV-LED001 Offline LED Controller is an enhanced peak current mode controller.

The product is capable of controlling mainly high power factor (HPF) flyback or buck-boost topologies in LED drivers with an output power up to 150 W. Some other topologies, like buck, boost and SEPIC, can also be implemented.

The company's innovative high-voltage technology allows direct connection of the controller to the input voltage in order to both start up the device and monitor the input voltage.

Mouser Electronics
www.mouser.com

TEMPERATURE SENSOR REFERENCE DESIGN

The MAXREFDES42# IO-Link temperature sensor reference design (RD), from Maxim Integrated, is a resistance temperature detector (RTD) for industrial control and automation. The design's highly integrated analog front end (AFE) measures temperature while detecting overvoltage, shorts and open circuits.

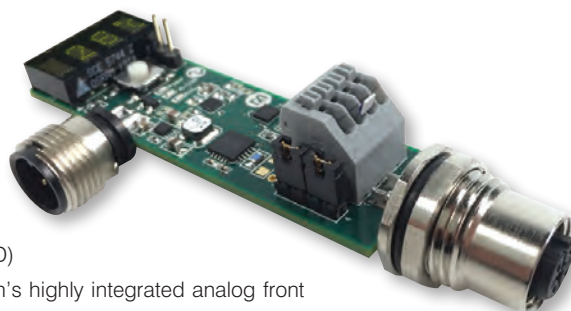
The reference design consumes minimal power and is said to provide better than $\pm 0.5^\circ\text{C}$ accuracy. The temperature appears immediately on an LED display for a quick snapshot of coarse temperature values.

The product fits in a standard industrial form factor and supports all three IO-Link speeds. It is available for use with a 2-, 3- or 4-wire PT100 RTD over a wide temperature range. Applications include air, gas and liquid temperature measurement.

The configuration software for the temperature detector was developed in collaboration with IQ² Development. The MAXREFDES42# uses an IO-Link device stack to communicate with any IO-Link version 1.1-compliant master. This software control enables fast set-up, diagnosis, event monitoring and maintenance from a PC, without a trip to the installation site.

During operation over a temperature range of -40 to 150°C , the system consumes less than 300 mW of power by utilising an industrial DC-DC step-down converter. Integrated into the front end is the MAX31865 RTD-to-digital converter, which provides flexibility, robustness and optimal performance for an IO-Link platform.

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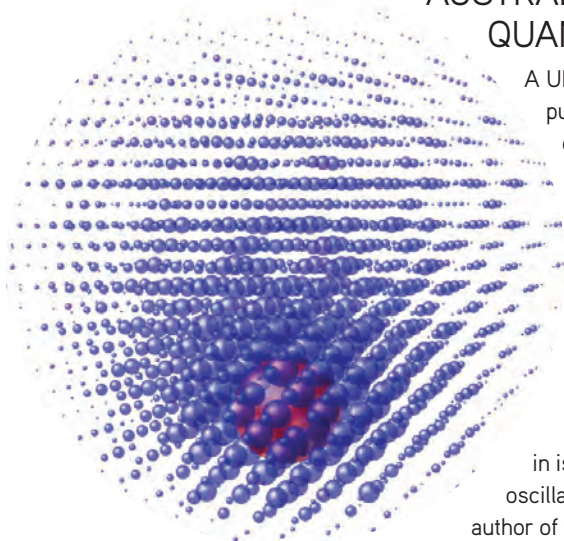
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AUSTRALIAN BREAKTHROUGH PAVES THE WAY TO LARGE QUANTUM COMPUTERS



A UNSW-led research team has encoded quantum information in silicon using simple electrical pulses for the first time, bringing the construction of affordable large-scale quantum computers one step closer to reality. Lead researcher, UNSW Associate Professor Andrea Morello from the School of Electrical Engineering and Telecommunications, said his team had successfully realised a new control method for future quantum computers.

Unlike conventional computers that store data on transistors and hard drives, quantum computers encode data in the quantum states of microscopic objects called qubits.

The UNSW team has already improved the control of these qubits to an accuracy of above 99% and established the world record for how long quantum information can be stored in the solid state, as published in *Nature Nanotechnology* in 2014.

It has now demonstrated a key step that had remained elusive since 1998.

"We demonstrated that a highly coherent qubit, like the spin of a single phosphorus atom in isotopically enriched silicon, can be controlled using electric fields, instead of using pulses of oscillating magnetic fields," explained UNSW's Dr Arne Laucht, postdoctoral researcher and lead author of the study. Associate Professor Morello said the method works by distorting the shape of the electron cloud attached to the atom, using a very localised electric field.

"This distortion at the atomic level has the effect of modifying the frequency at which the electron responds.

"Therefore, we can selectively choose which qubit to operate. It's a bit like selecting which radio station we tune to, by turning a simple knob. Here, the 'knob' is the voltage applied to a small electrode placed above the atom."

The findings suggest that it would be possible to locally control individual qubits with electric fields in a large-scale quantum computer using only inexpensive voltage generators, rather than the expensive high-frequency microwave sources. Moreover, this specific type of quantum bit can be manufactured using a similar technology to that employed for the production of everyday computers, drastically reducing the time and cost of development.

The device used in this experiment was fabricated at the NSW node of the Australian National Fabrication Facility, in collaboration with the group led by UNSW Scientia Professor Andrew Dzurak. Key to the success of this electrical control method is the placement of the qubits inside a thin layer of specially purified silicon, containing only the silicon-28 isotope. "This isotope is perfectly non-magnetic and, unlike those in naturally occurring silicon, does not disturb the quantum bit," Associate Professor Morello said. The purified silicon was provided through collaboration with Professor Kohei Itoh from Keio University in Japan.

ACES SETS PACE FOR ADDITIVE MANUFACTURING REVOLUTION

The ARC Centre of Excellence for Electromaterials Science (ACES) at the University of Wollongong is helping to set the pace in the next revolution in additive manufacturing.

Researchers have started to develop 3D-printed materials that morph into new structures, post-production, under the influence of external stimuli such as water or heat - hence the name, 4D printing.

So, as in 3D printing, a structure is built up layer by layer into the desired shape, but these new materials are able to transform themselves from one shape into another, much like a child's Transformer toy.

This science promises advancement in myriad fields - medicine, construction, automation and robotics to name a few. ACES researchers have turned their attention to the medical field of soft robotics, manufacturing a valve that actuates in response to its surrounding water's temperature.

ACES Professor Marc in het Panhuis said it was the cleverness of the valve's creation that was remarkable.

"There's no other assembly required." The materials scientist said the valve, a 3D printed structure, possessed actuators that are activated solely by water.

"So it's an autonomous valve, there's no input necessary other than water; it closes itself when it detects hot water," he said.





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AUSTRALIAN START-UP'S BREAKTHROUGH CAPTURES ATTENTION OF AIRBUS AND BOEING

Monash University and its spinoff Amaero Engineering have developed a 3D printed jet engine. Their technology captured the attention of major international players like Airbus, Boeing and Raytheon at the recent Australian International Airshow in Avalon.

Their technology enables fast and efficient production of complex metallic components in a single operation instead of many separate steps. It allows them to make and test parts in days instead of months, which is a potential game changer not only for the development of new technologies such as jet engines but also for their through-life sustainment.

Amaero Engineering received a grant from the Australian Government that assisted it in commercialising its new technology, building its internationally competitive capability and developing the market in Australia and worldwide.

"The funding has been crucial to establishing Amaero. At a time when finding venture capital has been very difficult in Australia, the knowledge that the investor's capital can leverage matching support from the government was a major factor in winning the support of our key investor. The investor was reassured that the Australian Government had vetted and approved the project and was prepared to back it financially. And it is not only the capital - the guidance and support that has been provided by our commercialisation adviser has been an important contributor to our success. They opened up new networks and have been very flexible in working with us as the business has grown," said Daniel Pollock, chairman, Amaero Engineering.

CHINESE INVESTMENT HELPS ANU DEVELOP NEW ELECTRONIC DEVICES

China's Guangdong Fenghua Advanced Technology Company will invest \$1.75m in the Australian National University (ANU) over the next five years to develop the next generation of small electronic devices.

The Chinese electronic device manufacturer's investment will fund the ANU-Fenghua Joint Research and Development Centre. The research from this centre will be used in various small device applications.

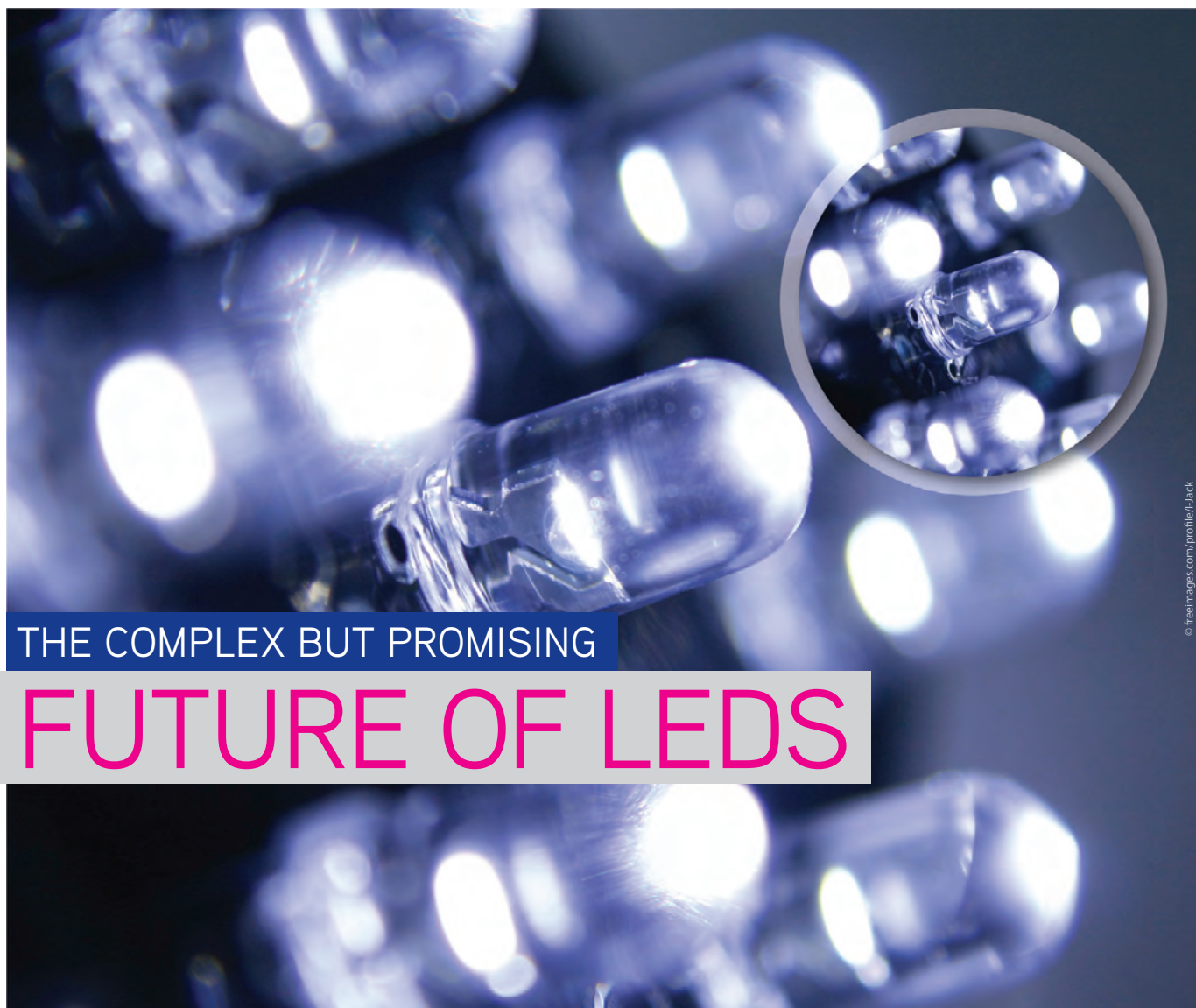
The ANU-Fenghua Joint Research and Development Centre will be based at the Research School of Chemistry and be headed by Professor Yun Liu. It will develop materials for use in small electronic devices.

Acting ANU Vice-Chancellor Professor Marnie Hughes-Warrington said the centre represents the university's commitment to cutting-edge research and its ability to work with industry to get research into the hands of the world's consumers.

ANU has memorandums of understanding, student exchange agreements and cooperative agreements with a total of 45 Chinese institutions. Furthermore, over 3000 students from China studied at ANU in 2014, Professor Hughes-Warrington said.

A delegation from the Guangdong Province was recently at ANU for the opening of the centre. The delegation was led by the Vice-Governor of Guangdong Mr Yunxian Chen and included senior Guangdong government officials, the president and vice-president of the Guangdong Fenghua Advanced Technology Corporation and education officials.





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THE COMPLEX BUT PROMISING

FUTURE OF LEDS

“The LED market is a complex but promising market,” said Pars Mukish, business unit manager, LED, OLED and Sapphire at Yole Développement (Yole). This year, companies are not relying on technical breakthroughs, except at the module level - where integration remains an important issue. “However, there is still overcapacity,” said Mukish.

“This is causing many changes in the supply chain, first at the chip level, then at the module/system level. The spin-off Royal Philips announced in July 2014 of its LED business, which grew from its acquisition of Lumileds in 2005, is one example.”

The LED industry’s complexity results from numerous technical issues, its many players and a multitude of lighting applications. Its promise comes thanks to especially large-volume lighting opportunities, stressed Yole in its latest reports. Yole, the ‘More than Moore’ market research and strategy consulting company, foresees a global business reaching almost \$516 million at the system level by 2016.

Today, LED technology’s average penetration rate is from 10-20% depending on geographic area. Each country has its own policy and has set up different measures to help LED implementation. For example, in Japan, penetration has reached 30% thanks to government involvement.

Governmental measures are clearly welcome as the technology is still considered expensive by the public. “Even though we saw a real breakthrough for LED technology from 2006 to 2014, up-

front LED costs are still high compared to existing technologies,” explained Mukish. “Today, the real growth is in external lighting applications where LED technology is partially implemented. Commercial and industrial lighting players are also considering LED technology but today implementation is still developing. In 2015, technical issues are different to previous years. They are mainly located at the LED module level. LED market leaders are therefore developing answers to packaging and integration needs. In the report entitled LED Packaging Technology and Market trends (Sep. 2014, Yole Développement), Yole has detailed the positive impact of advanced packaging technologies on LED manufacturing, especially LED packaging materials.

Mukish added: “In 2015, we clearly see the value moving later in the supply chain. It was initially at the LED chip level, but we have identified strong investments at the module and system level to develop smart solutions in terms of packaging technologies and functionalities.” In this context, Yole is focusing its 2015 activities on analysing new technologies at the LED module level.

The company is investigating the impact on the supply chain and determining key players’ strategies (LED module, related technologies and equipment report: available mid-2015).

Mukish is newly appointed to the management of Yole’s business in the LED, OLED and Sapphire areas. He is in charge of developing consulting activities and producing technology and market analysis at Yole.

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TOWARDS PRINTED

ORGANIC SOLAR CELLS AND LEDs

Flexible optoelectronic devices that can be printed roll-to-roll - much like newspapers - are a highly promising path to cheaper devices such as solar cells and LED lighting panels.

Scientists from the TREASORES (Transparent Electrodes for Large Area Large Scale Production of Organic Optoelectronic Devices) project have developed prototype flexible solar cell modules as well as novel silver-based transparent electrodes that outperform currently used materials.

The EU-funded project, led by Empa researcher Frank Nüesch, aims at developing and demonstrating technologies to facilitate roll-to-roll (R2R) production of organic optoelectronic devices such as solar cells and LED lighting panels.

The TREASORES project recently completed its mid-term review and has already achieved some major milestones. The international team that comprises researchers from 19 labs and companies from five European countries has, for instance, developed an ultrathin transparent silver electrode that is cheaper than, and outperforms, currently used indium tin oxide (ITO) electrodes.

The researchers could also demonstrate a record efficiency of 7% for a perovskite-based solar cell using such novel transparent electrodes. What's more, their first fully R2R-produced solar cells already achieved commercially acceptable lifetimes when tested in the field. The next step, said Nüesch, is to scale up and improve the most promising technologies identified so far, say, to produce barrier materials and transparent electrodes in larger quantities, ie, in rolls of more than 100 metres in length.

In its second half, the TREASORES project will also continue to develop other promising technologies such as transparent and flexible electrodes based on woven fabrics, nanowires and carbon nanotubes (CNTs). "We are working on the most crucial issues in large-scale organic optoelectronics. Our new low-cost electrode substrates already outperform existing conductive oxide electrodes in many ways," said Nüesch. "But we must further improve the resulting device yields from large-scale production by reducing the defect density of the substrates." The new materials have been thoroughly tested using special instruments for mechanical, electrical and optical testing and their performance in practical devices has been characterised eg, for lifetime and quality of illumination.

Silver nanowires were used to produce flexible electrodes with a sheet resistance of below 20 Ω/sq - a measure for the electrical conductivity of thin films - and an optical transmission of 80%. Copper nanowires were even better, yielding a sheet resistance of below 10 Ω/sq and an optical transmission of 90% on glass. They clearly outperformed current ITO electrodes, which typically have sheet resistance values of 100 Ω/sq and above for such high transparency. Solar cell devices with an energy conversion efficiency of over 3% have been made on these substrates with copper electrodes. CNT electrode performance likewise made significant progress during the first half of the project, reaching a sheet resistance of 74 Ω/sq with an optical transmission of 90%. The organic solar cells that were produced with these electrodes reached an energy conversion efficiency of 4.5%.

All these electrode technologies suffer, however, to some extent from waviness or roughness and require a flattening layer to allow defect-free deposition of optoelectronic device stacks. That is why the researchers set out to develop yet another electrode technology, which uses thin silver (Ag) films sandwiched between two metal oxide (MO) layers. These films turned out to be much flatter. MO/Ag/MO electrode stacks provide a sheet resistance of 6 Ω/sq with an optical transmission of 85% and allowed the construction of more efficient optoelectronic devices compared to the other electrode technologies, which is due, at least in part, to the low peak-to-valley roughness of about 20 nm. With these ultraflat electrodes, record efficiencies of up to 7% were obtained for organic solar cells using commercially available materials for light harvesting. Using the very same electrode materials, the team achieved 17 lm/W for the production of white light organic LEDs (OLEDs) and more than 20 lm/W for organic light-emitting electrochemical cells (OLECs). Although not quite record values for flexible OLED and OLEC devices, Nüesch stressed, "all electrodes were produced by an R2R process in an industrial environment or with industrially relevant processes on large areas of the polymer substrate. We can thus say that the processes we used are robust and reproducible."

BISY SINGLE-LINE ESD PROTECTION DIODE

Vishay Intertechnology has released a bidirectional symmetrical (BiSy) single-line ESD protection diode for portable electronics in the ultracompact CLP0603 package. Measuring 0.6 x 0.3 x 0.27 mm, the Vishay Semiconductors VBUS05B1-SD0 is suitable for the protection of high-speed data lines and antennas against transient voltage signals.

The product's chip-level package in the 0603 case size requires three times less board space than packages in the 1006 case size. Due to its short leads and small package size, the diode's line inductance is very low, allowing fast transients such as an ESD strike to be clamped with minimal over- or undershoots.

With low load capacitance of 0.29 pF typical and 0.4 pF maximum, the diode can be used for the protection of high-speed data ports like HDMI, USB 3.0 and Thunderbolt in smartphones, digital cameras, MP3 players and portable gaming systems. The device features a low maximum leakage current of <0.1 μ A at the working voltage of 5.5 V, a breakdown voltage of 8.8 V typical at 1 mA and a maximum clamping voltage of 18 V at 2.5 A.

The product provides transient protection for one data line as per IEC 61000 4 2 at ± 16 kV (air and contact discharge). It offers a moisture sensitivity level of 1 in accordance to J-STD-020 and a UL 94 V-0 flammability rating. The unit also supports reflow soldering to +260°C for 10 s per JEDEC STD-020.

Future Electronics

www.futureelectronics.com

HEAT SINKS

Zipper fin heat sinks from Advanced Thermal Solutions (ATS) protect components from the dangers of excess heat.

Zipper fins are machined from thin sheet metal, typically aluminium or copper, and are formed into a shape. The sheets are designed to interlock with a very narrow space between sheet layers. The fin assembly is wave soldered to a metal base forming a rigid, lightweight heat sink. The heat sinks can also be designed in high aspect ratio fin profiles, enabling taller, thinner and more tightly packed fins for higher cooling performance.

The heat sinks can be designed with integral ducts that contain and optimise the airflow. This improves thermal performance, particularly with active sinks that receive airflows from fans and blowers. For some of these designs, the top surface of the heat sink can also be used as a heat spreader for hot components.

Because zipper fin heat sinks allow a combination of copper and aluminium materials, the copper base allows for optimal heat spreading while the aluminium fin profile ensures the heat sink will be lightweight. With the benefits of high performance and a light weight, the heat sinks are being used to cool LEDs, as well as hot components in telecom, datacom, military and embedded electronics industries.

Digi-Key Corporation

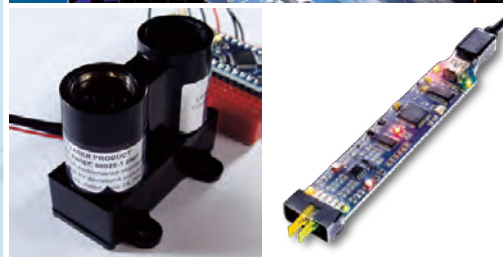
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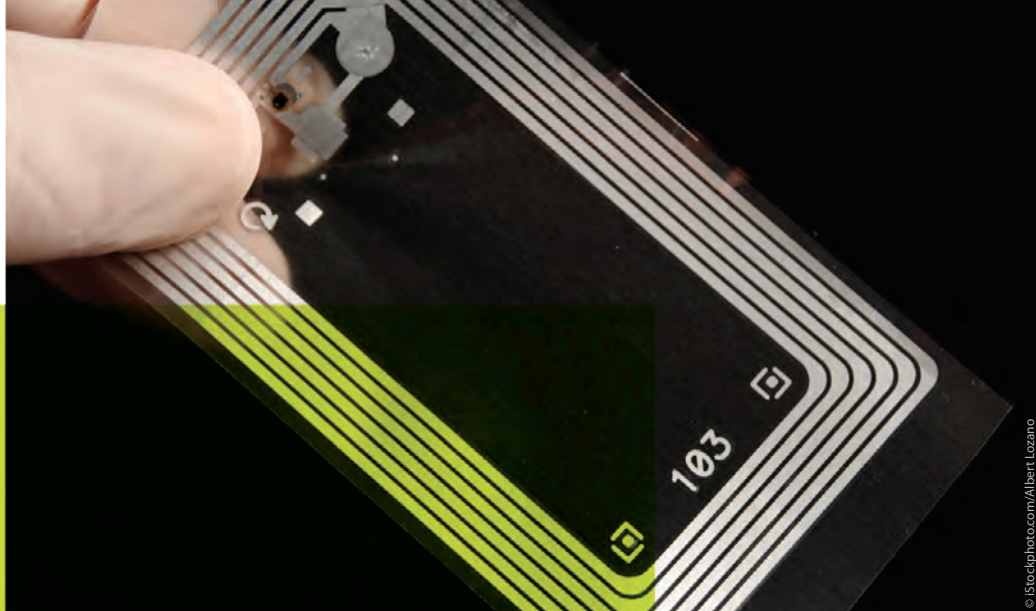
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BETTER, CHEAPER CHIPS

Computer chips, solar cells and other electronic devices have traditionally been based on silicon, the most famous of the semiconductors, that special class of materials whose unique electronic properties can be manipulated to turn electricity on and off the way faucets control the flow of water.

There are other semiconductors. Gallium arsenide is one such material and it has certain technical advantages over silicon - electrons race through its crystalline structure faster than they can move through silicon.

But silicon has a crushing commercial advantage. It is roughly a thousand times cheaper to make. As a result, gallium arsenide-based devices are only used in niche applications where their special capabilities justify their higher cost. Mobile phones, for instance, typically rely on speedy gallium arsenide chips to process the high-frequency radio signals that arrive faster than silicon can handle.

Now Stanford researchers have invented a manufacturing process that could dramatically reduce the cost of making gallium arsenide electronic devices and thus open up new uses for them, notably inside solar panels.

"Solar cells that use gallium arsenide hold the record when it comes to the efficiency at which they convert sunlight into electricity," said Bruce Clemens, the professor of materials science and engineering who led this work.

But silicon-based solar cells are so much cheaper to make that gallium arsenide solar cells are relegated to exotic applications such as satellites. There, the main cost is launching the satellite into orbit, so gallium arsenide solar panels pay their freight by virtue of their greater photon-to-electricity conversion efficiency.

Clemens, who is the Walter B. Reinhold Professor in the School of Engineering, said the Stanford process could make gallium arsenide solar cells more practical on Earth.

Writing in the journal *MRS Communications*, Clemens and co-author Garrett Hayes, who recently earned his doctorate in materials science from Stanford, describe this new manufacturing process.

Silicon and gallium arsenide both begin their progression from raw crystal to electronic device similarly. Both materials are fashioned into what electronics manufacturers call wafers. These are flat, circular platters of purified material.

Subsequent manufacturing steps create computer chips, solar cells or other electronic devices on top of these wafers. But it can cost about \$5000 to make a wafer of gallium arsenide 8" in diameter, versus \$5 for a silicon wafer, according to Aneesh

Nainani, who teaches semiconductor manufacturing at Stanford. The new Stanford process seeks to lessen this thousand-to-one cost differential by re-using that \$5000 wafer.

Today the working electronic circuits in a gallium arsenide device are grown on top of this wafer. Manufacturers make this circuitry layer by flowing gaseous gallium arsenide and other materials across the wafer surface. This material condenses into a thin layer of circuitry atop the wafer. In this scenario, the wafer is only a backing. The thin layer of circuitry on top of this costly platter contains all of the electronics.

To make the wafer re-usable, the Stanford process would add several steps to the manufacturing process. The researchers demonstrated the technique in their experiments.

First they covered the precious wafer with a layer of disposable material. Then they used standard processes of gas deposition to form a gallium arsenide circuit layer on top of the disposable layer.

Next, using a laser, they vaporised the disposable layer and lifted off the circuitry layer like a flapjack on a greased griddle. They mounted this thin circuitry layer on a more solid backing and cleaned the costly gallium arsenide wafer to make the next batch of circuits.

Nainani estimates that this re-use could create gallium arsenide devices that would be 50 to 100 times more expensive than silicon circuits - still a big differential but much less than what exists today.

Clemens thinks the Stanford process could rekindle interest in gallium arsenide electronics. Silicon is inexpensive today because, over time, the electronics industry has focused all of its ingenuity on making silicon cheaper. Silicon wafers are \$5 today because manufacturers compete to satisfy the world's ever-increasing appetite for silicon wafers, and over the course of decades, that competition has driven prices down.

It all boils down to economies of scale, Clemens said. "Once it becomes possible to make gallium arsenide more cost-effectively, other people will jump in to improve other parts of the process," Clemens said. "And with each advance, more uses will open up, especially in solar energy generation where gallium arsenide has clear efficiency advantages."

C COMPILER FOR AUTOMOTIVE MICROCONTROLLERS

Altium has announced v2.2r1 of its TASKING C compiler suite for the RH850 architecture from Renesas Electronics, delivering support for the microcontroller variants RH850/C1x, RH850/D1x, RH850/E1x, RH850/P1x and RH850/R1x. The compilers are suitable for automotive applications like powertrain, body control and chassis control, including safety-critical applications.

The toolset provides support for the Renesas E1 On-Chip debugging emulator, next to the Instruction Set Simulator debugger. The debugger's GUI is seamlessly integrated into the Eclipse-based IDE and accessible through the debugger perspective. This brings to the developer a single coding and debugging front-end for RH850 application development. Code generation optimisation includes MIL linking and code compaction (reverse inlining).

The microcontroller family offers rich functional safety and embedded security features for automotive applications. Altium supports these features through its ISO 26262 Support Program, which includes solutions to help users achieve certification for functional safety standards such as ISO 26262 and others. As part of the certification process, a manufacturer has to assess the required level of confidence in software tools such as the TASKING RH850 toolset. Altium enables this through the availability of a Compiler Qualification Kit as well as optional ISO 26262 Compiler Qualification Services.

Altium Limited

www.altium.com

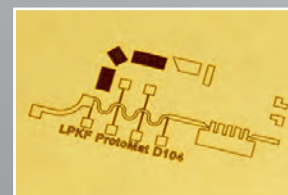


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Discover a new level of accuracy and efficiency! The new benchtop system LPKF ProtoMat D104 features an integrated UV laser tool – in addition to 15 mechanical tools. PCB track widths of 50 µm and spaces of 30 µm can now be achieved on FR4 materials. Become independent from the board house and reduce your time to market. www.lpkf.com/prototyping



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Embedded Logic Solutions Pty. Ltd. Ph. +61 (2) 9687 1880 Email. sales@emlogic.com.au

CONFIGURABLE POWER SUPPLY

Powerstax has announced a configurable power supply that can be built to meet a user's exact requirements without the lead times and costs associated with a customised solution. The Powerstax A3600 provides up to 3600 W of power, with multiple, isolated and configurable 1.5 to 58 VDC outputs from a universal AC input.

The device is designed around power module technology and packaged in a 19", rackmount unit. By using a standard enclosure format and modular approach, prototype units can be supplied in a matter of days. There are no approval issues since the power modules used are fully approved for medical and industrial applications.

The product allows users to individually adjust, enable, parallel or even stack the outputs to provide a versatile power source. In addition, each output can be adjusted via a signal voltage. Other features include high efficiency, zero load operation, CE marking and compliance with relevant EMC/EMI standards.

Westek Electronics Pty Ltd
www.westek.com.au



SELF-LOCKING MICRO THREADED INSERTS

Electronics engineers now have access to enhanced electronics performance - including fastener resistance to vibrational loosening, drop shock and high heat - due to STANLEY Engineered Fastening's self-locking Spiralock internal thread form design in micro threaded inserts.

The product securely attaches components in compact electronic assemblies, improving fastener re-usability and reducing assembly costs by eliminating the need for nylon patch or chemical adhesive application on screw threads. The inserts can be used in a full range of electronics - from handheld mobile devices to mainframes including smartphones, tablets, laptops, desktops and monitors - in sizes as small as M1, in any size thread or pitch necessary.

The thread form solves thread loosening and joint integrity issues by changing the physics of how the threads interact. The threads accept standard male fasteners, eliminate the need for other locking devices, provide extensive re-usability, streamline assembly since they are free spinning and reduce the potential for fatigue failure compared to standard threads.

Infastech Australia

www.infastechaustralia.com.au

COMPARATORS

The LTC6752 is a family of high-speed comparators capable of supporting toggle rates up to 280 MHz. The comparators exhibit low propagation delays of 2.9 ns and fast rise/fall times of 1.2 ns. The range comprises five different products, with different options for separate input and output supplies, shutdown, output latch, adjustable hysteresis, complementary outputs and package.

The comparators have rail-to-rail inputs that operate from 2.45 up to 3.5 or 5.25 V, depending on the option. The outputs are CMOS and the separate supply options can operate down to 1.71 V, allowing for directly interfacing to 1.8 V logic devices.

The low propagation delay of 2.9 ns, combined with low dispersion of 1.8 ns (10 to 125 mV overdrive variation), makes the comparators suitable for critical timing applications. Similarly, the fast toggle rate and the low jitter of 4.5 ps RMS (100 mV-P, 100 MHz input) make them suitable for high-frequency line driver and clock recovery circuits.

element14

au.element14.com

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SWITCHMODE FAN SPEED CONTROLLER

The TC649 is a switchmode fan speed controller for use with brushless DC motors. Temperature-proportional speed control is accomplished using pulse width modulation (PWM). A thermistor (or other voltage output temperature sensor) connected to VIN furnishes the required control voltage of 1.25 to 2.65 V (typical) for 0% to 100% PWM duty cycle.

The product automatically suspends fan operation when measured temperature (VIN) is below a user-programmed minimum setting (VAS). An integrated start-up timer ensures motor start-up at turn-on, coming out of shutdown mode or following a transient fault.

In normal fan operation, a pulse train is present at SENSE, Pin 5. A missing-pulse detector monitors this pin during fan operation. A stalled, open or unconnected fan causes the product to trigger its start-up timer once. If the fault persists, the FAULT output goes low and the device is latched in its shutdown mode.

The controller is packaged in a space-saving 8-pin PDIP, MSOP or an SOIC package and is available in the industrial temperature range.

RS Components Pty Ltd
www.rsaustralia.com

GNSS RECEIVER

The NV08C-RTK is a fully integrated multiconstellation satellite navigation receiver with embedded RTK functionality. The receiver is fully compatible with L1 GPS, GLO-NASS and future global navigation satellite systems (GNSS) GALILEO and BeiDou.

In addition to providing easy-to-integrate GNSS with 32 channels of combined GPS L1 and GLONASS L1 code and carrier phase tracking, the receiver offers velocity and time information. It also uses space-based augmentation system (SBAS) corrections from services such as WAAS, EGNOS, MSAS and GAGA.

The device is specifically designed for use in high-accuracy applications that require low cost, low power consumption, small form factor and good performance. Suitable for construction, mining and industry, it can be used in a wide range of applications including structural and environmental monitoring; land surveying, 3D cartography and air photography; machine control and automation; and robotics and intelligent machines.

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www.m2mconnectivity.com.au



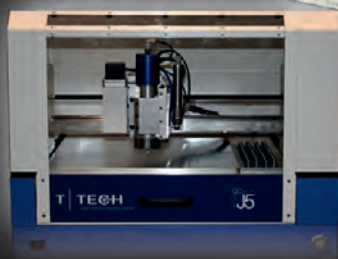
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The 300 W TDK-Lambda iEH series of isolated DC-DC converters, featuring digital nonlinear adaptive control, provide good dynamic performance and system stability with a reduced component count.

Operating from a 48 VDC nominal input, the series can provide output voltages of 9.6 to 12 V with currents up to 33 A. The series is designed to meet a wide range of applications, including ICT equipment, semiconductor manufacturing equipment, measuring equipment and general industrial equipment.

The converters are in the industry-standard eight-brick package and include a baseplate with mounting holes for use with an external heatsink. Optimisation of components using digital control enables up to 192 W of output power with only 200 LFM airflow at 85°C.

Input to output isolation is 2250 VDC and input to baseplate is 1500 VDC. All models feature remote on/off as well as overcurrent, undervoltage, overvoltage and overtemperature protection.

TDK Australia
www.tdk.com.au



BUILDING BLOCK SYSTEM FOR EXTREME ENVIRONMENTAL TEMPERATURES

To enable passively cooled standard hardware to be operated in extreme environments, ICOP Technology has developed the ICE Box, a modular building block system with IP67 protection and active heating, which automatically activates if the temperature drops below a configurable minimum temperature (standard value is -20°C).

OEMs can order their individual ICE Box-PCs in numerous different configurations. Any required system configuration can be ordered from batch sizes of just one, including individual I/O covers and laser engraving of the housing. Applications can be found in outdoor, vehicle and marine deployment, as well as in refrigerated warehouses.

The product features passive cooling and active heating, plus around 20 different CPU components with SFF, low-power DM&P Vortex86 processor technology and power supplies, plus numerous I/O extensions for ethernet and wireless (IoT) interfaces, USB, digital and analog I/O, fieldbuses and motion control applications.

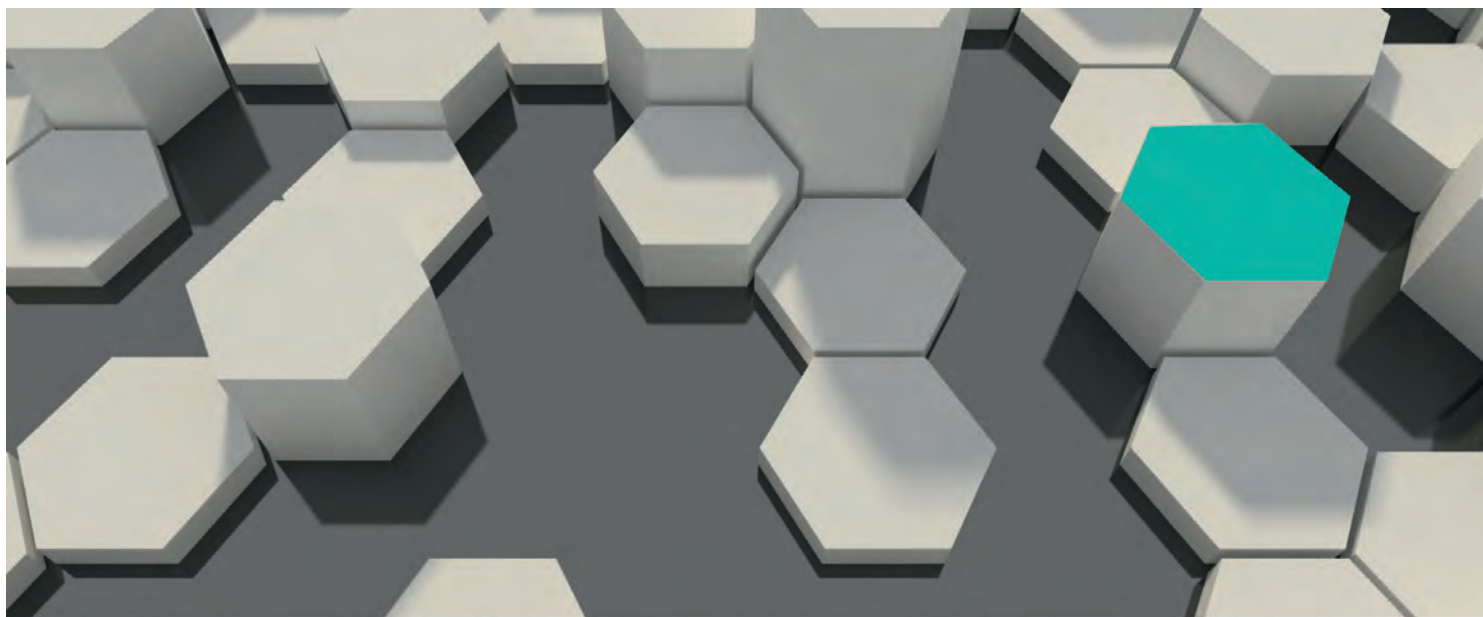
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WHY YOU NEED TO ATTEND

ELECTRONEX 2015

More than 80 companies will be showcasing and demonstrating their products at this year's annual electronics design and assembly expo, ElectronEX. The event will be held on 9-10 September at Melbourne Park Function Centre.

This year's event will reflect the move towards niche and specialised manufacturing applications in the electronics sector and will also cater for the increasing demand from visitors for contract manufacturing solutions. Last year, the exhibition witnessed a high demand for 3D manufacturing technology and the event organisers expect to attract new exhibitors from this sector.

ElectronEX is a must-attend event for design, electronic and electrical engineers along with OEM, scientific, IT and communications professionals and service technicians. Alternating annually between Melbourne and Sydney, the event is designed

to help professionals across an array of industry sectors to learn about the latest technology developments for systems integration and production electronics.

ElectronEX will be held in conjunction with the SMCBA Electronics Design & Manufacture Conference. Local and international guest speakers will share information critical to successful electronic product and system engineering. The conference will include presentations on: flexible electronics - thin film solar cells through large-scale printing; control of noise, signal integrity and EMI in high-speed circuits and PCBs; and enabling implementation of advanced technologies.

Over 1000 trade visitors are expected to attend the expo and conference over two days. For further information on the conference, please email pollocka@smcba.asn.au or visit www.smcba.asn.au. For exhibition information and free trade registration, visit www.electronex.com.au.

PSR FLYBACK CONTROLLER

Texas Instruments' UCC28730 isolated-flyback power supply controller provides constant-voltage and constant-current output regulation without the use of an optical coupler, plus signal detection to improve transient response to large load steps. A minimum switching frequency of 30 Hz facilitates achieving less than 5 mW of no-load power.

The device processes information from the primary power switch and auxiliary flyback winding for precise control of output voltage and current. The monitoring works with a secondary side alarm device to deliver rapid response to heavy load steps using minimal output capacitance.

An internal 700 V start-up switch, dynamically controlled operating states and a tailored modulation profile support low standby power without sacrificing startup time or output transient response. Control algorithms are said to allow operating efficiencies to meet or exceed applicable standards. Discontinuous conduction mode operation with valley-switching reduces switching losses. Modulation of the switching frequency and primary current peak amplitude (FM and AM) keeps the conversion efficiency high across the entire load and line ranges.

Texas Instruments Australia Ltd
www.ti.com



POWER SUPPLY FOR RVS AND CARAVANS

The Power Source Model 1240 has been specially designed so that it can be mounted safely in caravans and recreation vehicles. The power supply has been fully tested and carries Australian Safety Approvals.

The device has a universal full-range AC input range and an output of 12 VDC @ 40 A. The built-in power factor correction function (PF>0.95%) delivers an efficiency rating of up to 84%.

The power supply has built-in protections against short circuit, overload, overvoltage and over temperature. It has been designed for easy installation, with easy-to-access screw-mounting holes on the base.

ADM Instrument Engineering Group
www.admtech.com.au

SIMULATION SOFTWARE

MathWorks has announced the latest version of MATLAB, which includes an updated graphics system, big data capabilities and improved collaboration features for packaging and sharing code and for source control integration. With these capabilities, engineers and scientists in major industries can more easily analyse and visualise their data.

The updated default colours, fonts and styles in the graphics system make it easier to interpret and gain insight from data. New syntax for changing properties of graphics objects makes it simpler to customise visualisations. Other features include rotatable tick labels, support for multilingual text and symbols, and automatic updating of date and time tick labels. Additional big data capabilities provide efficient ways to process data sets that don't fit into memory. These include simplified ways to access and analyse big data text files and databases, and support for the MapReduce programming technique. These capabilities also scale for use on big data platform Hadoop. The software offers Git and Subversion source control system integration through the Current Folder Browser, including the ability to sync from web-hosted repositories such as those on GitHub. Custom toolboxes can be packaged as single, installable files. This makes it easier to distribute install and manage the shared code.

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DIRECT-SOLDER TERMINALS

Suitable for tight packaging constraints, low-profile SolderRight direct-solder terminals enable right-angle connections onto a PCB. The product enables soldering in a world where electronic systems, products and packaging are becoming smaller.

Until now, users were forced to either solder a bare wire into a PCB and bend it over (resulting in poor reliability and a high-profile termination) or use a two-piece connector system. SolderRight crimp terminals are said to offer reduced wire connections, permanently connected circuits and high standards of reliability.

Molex Premise Networks Pty Ltd
www.molexpn.com.au

MINI PCI EXPRESS MULTIPROTOCOL RS232/422/485 SERIAL CARDS

Interworld Electronics has released the mPCle-COM-xSM Mini PCI Express communications cards, featuring high-performance 16C950-class UARTs. Available in 4- and 2-port versions, each port is capable of communication speeds up to 921.6 Kbps in RS232 mode and up to 3 Mbps in RS422/485 modes. Each UART features 128-byte deep transmit and receive FIFOs to reduce CPU utilisation and eliminating data loss in multitasking operating systems. The integrated circuit and pre-scalar support a wide variety of standard and custom baud rates.

RS232, RS422 or RS485 modes can be software selected per port, and the selection is stored in non-volatile memory for future use. Users who don't need that much flexibility can order versions with only RS422/485 or pure RS232. The RS232 ports are 100% compatible with every other industry-standard serial COM device and support TX, RX, RTS and CTS. The differential modes support both RS422 and RS485 2- and 4-wire modes.

The serial ports on the device are accessed using a low-profile, latching, 6-pin Hirose connector. Optional breakout cables bring each port connection to a panel-mountable DB9-M connector.

Interworld Electronics and Computer Industries
www.ieci.com.au







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the **GRUMPY** page

Mike Smyth, specialist technical writer

Why is it we don't take science and research half as seriously as many of us take footballers who are paid obscene amounts of money just to kick a misshapen ball around a field in front of a hysterically screaming crowd?

Somewhere our priorities have slipped when world-class organisations such as the Garvan Institute have to rely on donations as part of their income to survive and carry on work that most governments should be proud to support.

Our very own CSIRO struggles each year with progressive cuts to its budget yet still it comes up with groundbreaking developments that often put much larger countries to shame.

It seems we have a two-pronged problem. Not enough young people are being attracted to the world of science and research and not enough governments are seeing science and research as an investment in the future and therefore worth supporting.

Science, certainly, is not a favourite flavour with school students perhaps because it is perceived as being overly laden with mathematics and blackboards full of mysterious equations. Perhaps it is still associated with white coats and horn-rimmed glasses on a face that never smiles. Perhaps it is the prospect of relatively low salaries coming at the end of arduous study.

This is a great pity because Australia has a long and proud heritage of invention, from the stump jump plough to a blood test to prevent stillbirths. In between, with electronics sharing a good part of the limelight, have come the bionic ear, ultrasound and the heart pacemaker.

Adding to the formidable list are the black box flight recorder, Jindalee over-the-horizon radar, the electric drill and the refrigerator. Even Wi-Fi has its roots in Australia, having been developed at the CSIRO although now the trademark is held by the Wi-Fi Alliance in America.

There are many other inventions including the tank, an idea that was offered to Britain in 1912 but rejected until 1916 when South Australian Lance de Mole asked to be recognised as the inventor of the machine. He was eventually awarded £987 and given the army rank of honorary corporal for his contribution to saving life on the Western Front.

For a country this size, we have made an enormous contribution to the world of medicine from the already mentioned pacemaker to cancer treatments and vaccines to antivenenes for the various nasties that lurk around us. Yet, in spite of these achievements we are not good at following through on the legal side and protecting what we do from the global sharks who are only too eager to snap up our ideas and benefit from them because we failed to protect them with a simple patent. Neither are we good at persuading industry to reach for their wallets.

When it comes to getting the best from limited resources, we seem to have a fragmented and ad hoc approach to both directing and funding science and research. There are lots of 'cells' of activity, each clamouring for money, but no overall guiding hand as to where our priorities might be. Commercialism plays a major role in what is seen as a desirable line of research. Of course, organisations want to recover the often huge costs of development and testing and one of the best ways is to sell the product but retain the patent rights.

But despite all these downsides, there is still plenty to inspire the would-be scientist - but interest is languishing. Fewer school children are opting for it as a career and governments' fickle funding of research institutions from universities to small highly specialised centres does nothing to give confidence for long-term programs or long-term employment. Emissions control and climate change are two dominating issues. But we vacillate and dicker around.

We need governments to take science seriously. We once had in parliament, Barry Jones who, as a former teacher, realised the importance of science starting at the school level, but he was shackled in what he could do as the rest of the government became focused on what it saw as more important issues and pushed science out of sight. Governments require men of vision, passion and knowledge coupled with enthusiasm to inspire other governments into treating science with the importance it deserves. So far no one has put up his or her hand.



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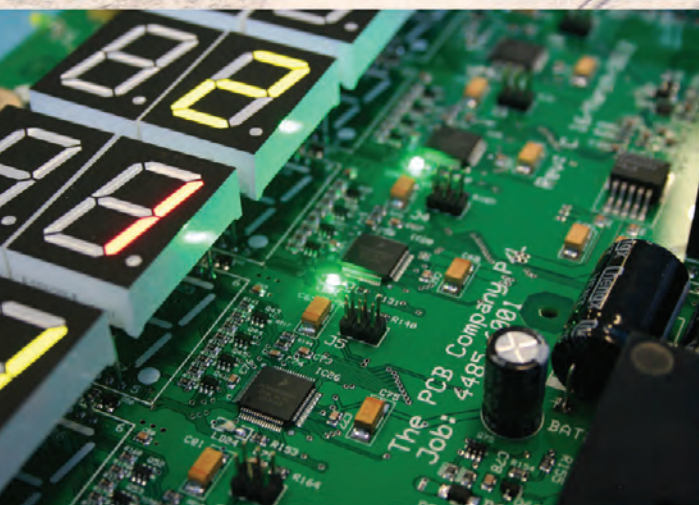


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