what's new in electronics

Big Performance Has Never Been So Small and Affordable

New RSA306 Spectrum Analyzer

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Tektronix

CONTENTS

COVER STORY

The RSA306 sets a new price/performance standard for spectrum analysers and features a broad 9 kHz to 6.2 GHz frequency range, 40 MHz real-time bandwidth and weighs in at just 0.59 kg.

When used with Tektronix SignalVu-PC software, it offers advanced analysis capabilities for such applications as budget-conscious research and development, mobile radio network installation, interference hunting and university-level lab classes. An open API allows customers to use their own custom Windows-based interface such as Matlab or Python to manipulate raw data coming from the instrument.

Using the latest in commercial interfaces and available computing power, the RSA306 separates signal acquisition from measurement, dramatically lowering the cost of instrument hardware. Data analysis, storage and replay is performed on the user's personal computer, tablet or laptop. Managing the PC separately from the acquisition hardware makes processing upgrades easy and minimises IT management issues.

Spectrum analysers are inherently expensive and often there are not enough instruments for everyone to use in many labs, field organisations and universities. The RSA306 puts the power of a Tektronix real-time spectrum analyser within reach for the entire technical team. In addition, Tektronix is providing its SignalVu-PC software at no cost, giving open access to powerful signal analysis tools that have previously been only available with the purchase of expensive bench instruments.

Vicom Australia Pty Ltd
www.vicom.com.au

IoT STRENGTHENS

COMPONENTS MARKET GROWTH

The rapidly evolving and growing smart home and Internet of Things (IoT) market will spark incredible growth in the electronic components market. Eric Lee, Head of Regional Technical Marketing Asia Pacific at RS Components, shares his views on opportunities and trends for 2015.

An increasing number of machines, smart mobile devices and household objects are wirelessly connecting to one another and to the internet. Market research firms predict that tens of billions of devices, each with its own unique IP address, will be connected to the internet by the turn of the decade.

There has been an increase in public interest, press coverage, start-ups and business strategies built around the IoT. The rise of IoT has also given a boost to the smart home technology market. Gartner's predictions showed that by 2022, the adoption of smart homes in developed countries is set to rise exponentially. According to Pew Research, 83% of technology experts and engaged internet users agreed that IoT and wearables would have widespread and beneficial effects by 2025. Furthermore, the lowered development costs of sensors and communications functions in consumer products will spur the industry towards greater heights.

Electronic components, the foundational building block of smart homes, will be a key driver in this development. In Australia, the smart home market is expected to reach $917 million by 2017; and in the APAC region, the revenue growth of smart homes is expected to reach $9.23 billion by 2020.

Smart homes and components

Smart homes, as the name suggests, is the connection of electronics with facilities that we use at home in our everyday lives with some degree of intelligence to provide convenience. For example, a highly effective network of sensors and processors to manage our residential facilities and family chores, so as to make our homes safer, more convenient, comfortable, aesthetically pleasing and environmentally friendly.

Imagine this scenario: On the way to work in the morning, a user hits the 'departure' button before leaving the house - this turns off the lights, air conditioner and floor heating functions, and switches the home to 'unoccupied' mode. As the sun strengthens, the light sensors beside the windows will scroll different sets of curtains to balance the needed sunshade onto the living room and maintain the lighting balance. In the evening, just as the user is about to return home, s/he hits the 'go home' button on a mobile phone app, which automatically restarts the functions that were previously shut down.

Factors such as cabling technology, network communication technology, smart home system design solutions, security technology, automatic control technology, audio and video technology, and the electronic technology and end-user devices related to smart homes all form a collective information processing hub. The sensing, data transmission and data processing functions in this hub involve extensive use of electronics components. In fact, smart homes are the ultimate result of the development of IoT, and electronic components form the most important nodes used to create this connected network.

Aiding development with components

Forming this increasingly intelligent IP-based network are trillions of sensors, billions of microcontrollers and millions of gateways right up to the cloud computing data servers and intelligent systems that handle 'big data'. The IoT can enable countless intelligent and controllable applications in building and home automation, such as smart lighting systems, or smart grids for power and water, or in industrial systems,

" FURTHER ENABLING ENGINEERS IN THE DEVELOPMENT OF IOT APPLICATIONS ARE DEVELOPMENT PLATFORMS SUCH AS MBED, ARDUINO AND RASPBERRY PI, JUST TO NAME A FEW, WHICH ARE NOW OFFERING EXPANDING CONNECTIVITY OPTIONS INCLUDING WI-FI AND BLUETOOTH. THERE ARE ALSO DIFFERENT TYPES OF SENSORS AND ANALOG COMPONENTS COVERING TEMPERATURE, MOTION, GYROSCOPE AND LIGHTING TO PROVIDE CIRCUMSTANTIAL INTELLIGENCE.

or in automotive and transportation markets. One example is home lighting, where it is cost-prohibitive to wire up control signals to individual lamps in every room in a house; the deployment of low-power sensors and actuators, wireless microcontrollers and the use of low-power wireless communications can enable smart, controllable and customisable lighting schemes.

Low-power wireless connectivity is key to this development: the 2.4 GHz ZigBee mesh network protocol, for example, has been widely adopted in machine-to-machine (M2M) applications and allows nodes to be easily added to a network, linking to a gateway device for low-data-rate (250 Kbps) links. The latest version of the protocol, ZigBee IP, moves to the IPv6 standard and allows the sensor nodes to be accessed directly from the internet. In addition, the Green Power version of ZigBee allows devices to be easily powered by energy harvesting. Another growing standard is the Weightless protocol that uses TV white-space frequencies and has been developed specifically for M2M applications. There are also new lower power versions of Wi-Fi and Bluetooth (Bluetooth low energy - LE) in varying states of readiness for development. Bluetooth LE has already seen acceptance in consumer markets and is likely to be an important technology to deliver longer battery life for wearable devices, for example.

Crucial to the IoT are low-power microcontrollers such as ARM Cortex microprocessor-based MCUs from silicon vendors such as Freescale, NXP, ST, TI and many others. For example, the latest Gecko microcontrollers from Silicon Labs use specially developed low-power modes, so that the controllers wait for a signal from the sensors before starting up, sending the data and shutting down again. These devices are being optimised for sensor networks or smart-grid power applications with batteries that run from 3.3 V and can run for 10-20 years. The power consumption is so low that the MCUs can be powered from solar cells or even via RF or thermal energy from the surrounding environment, negating the need for batteries.

Further enabling engineers in the development of IoT applications are development platforms such as mbed, Arduino and Raspberry Pi, just to name a few, which are now offering expanding connectivity options including Wi-Fi and Bluetooth. There are also different types of sensors and analog components covering temperature,

motion, gyroscope and lighting to provide circumstantial intelligence.

The mbed microcontrollers are a series of ARM-based development boards designed for fast, flexible and low-risk professional rapid prototyping. Packaged as a small 40-pin 0.1″ DIP form-factor convenient for prototyping with solderless breadboard, stripboard and through-hole PCBs, they include a built-in USB programming interface that is as simple as using a USB flash drive.

The mbed application development board includes a host of connectors and external interfaces such as mini-USB, LCD display, built-in temperature sensor and variable PWM frequency knob, thus eliminating the requirement for add-on boards and reducing valuable design time for engineers. Users have the option to plug in an LPC1768 Cortex M0 or M3 processor module to connect smart nodes through Wi-Fi or Bluetooth. Both the application board and the processor module are available from RS Components.

Arduino, on the other hand, is an open-source software and hardware electronics prototyping platform intended for artists, designers, hobbyists and anyone interested in creating interactive objects or environments. The latest Arduino TRE combines a Texas Instruments 1 GHz Sitara AM335x processor and an Atmel 16 MHz ATmega32u4 AVR microcontroller to deliver the highest performance board currently available for the Arduino developer community, while also leveraging the simplicity of the Arduino software experience.

Integration of the 1 GHz Sitara AM335x ARM Cortex-A8 based processor in the Arduino TRE means developers can obtain up to 100 times more performance than with the Arduino Leonardo or Uno, for example. This level of performance opens up new possibilities, including the ability to develop advanced Linux-powered applications such as high-performance desktop applications, processing-intensive algorithms or high-speed communications.

Meanwhile, Raspberry Pi is a small, powerful computer and development board to help

educate a new generation of programmers and electronics engineers. Developed by the Raspberry Pi foundation, the Raspberry Pi computer is a miniature ARM-based PC that can do many of the things a desktop PC can do like word processing, games or playing back high-definition video.
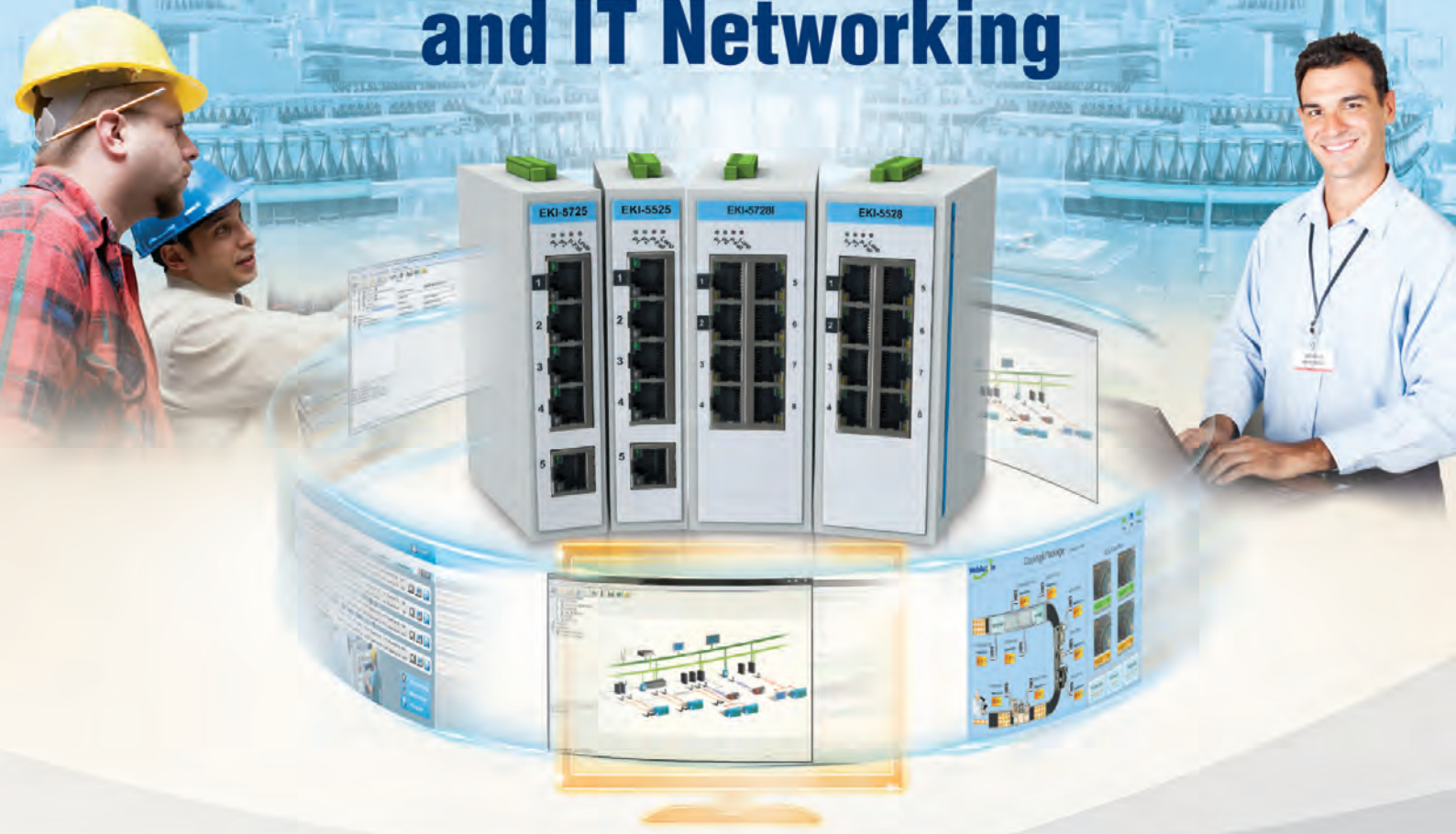
The latest Raspberry Pi Model A+ has the 40-pin GPIO connector introduced on the Model B+, with the same pin-out and mounting holes for standard Hardware Attached on Top (HAT) accessories, allowing users to add extra functions quickly and easily. With smaller board dimensions of 65 x 56 mm, the Raspberry Pi Model A+ is easily embeddable and suited to mobile or battery-powered applications.

Finally, yet importantly, the SparqEE CELLv1.0 is a tiny development board that can also connect to the Arduino and Raspberry Pi via plug-in daughter cards or 'shields'. It provides wireless connectivity worldwide via 2G/3G cellular technology. Shipped with a global 3G SIM card that delivers worldwide coverage, SparqEE CELLv1.0 board users will be able to log in to a website and use their credit card to buy data or set up a direct debit for ongoing data usage. The increase in range permitted by cellular communications enables a number of potential applications for developers and is ideal for 'small data' projects that need to operate over very long distances, even potentially to another country or continent. Suitable projects are likely to be sensor-based low-bandwidth-data projects that will send low amounts of data over the internet.

It is apparent that the intense reliance on device interconnectivity of a smart home has created unprecedented opportunities for the electronics industry. Challenges and opportunities will always coexist but for electronics distributors, building up their product mix and unique services will help capture a dominant share of the growing IoT market.

© Sergey Nivens /Dollar Photo Club

NEW SPECIFICATION
FOR IoT AND M2M

ETSI's standardisation group dedicated to low throughput networks technology has just released the first three specifications of an Internet of Things (IoT) network dedicated to low throughput communications.

Low throughput network (LTN) technology is a wide area bidirectional wireless network with key differentiators compared to existing networks. It enables long-range data transmission (distances around 40 km in open field) and/or communication with buried underground equipment and operates with minimal power consumption allowing several years of operation even with standard batteries. This technology also implements advanced signal processing that provides effective protection against interference.

As a result, LTN is particularly well suited for low throughput machine to machine communication where data volume is limited and low latency is not a strong requirement. Applications include remote measurement, smart metering for water, gas or electricity distribution or smart cities applications such as air pollution monitoring or public lighting.

LTN could also cooperate with cellular networks to address use cases where redundancy, complementary or alternative connectivity is needed. Providing connections to the billions of connected objects projected to form part of M2M and the IoT networks is a major challenge. A great number of these objects need only low throughput connectivity, but they also require an efficient connection that is both cost effective and low energy consuming.

LTN IoT networks have a similar topology to existing networks used for high data rates and dynamically adapt power and frequency in the same way, but will also manage new requirements concerning power consumption and the number of base stations required to cover an entire country. Low power; very low throughput; long battery life; and simple, effective and robust radio communication principles are the key features of the first ETSI LTN specifications. The three new ETSI group specifications defining LTN are GS LTN 001 containing the use cases, GS LTN 002 describing the functional architecture and GS LTN 003 defining the protocols and interfaces.

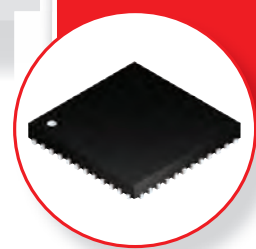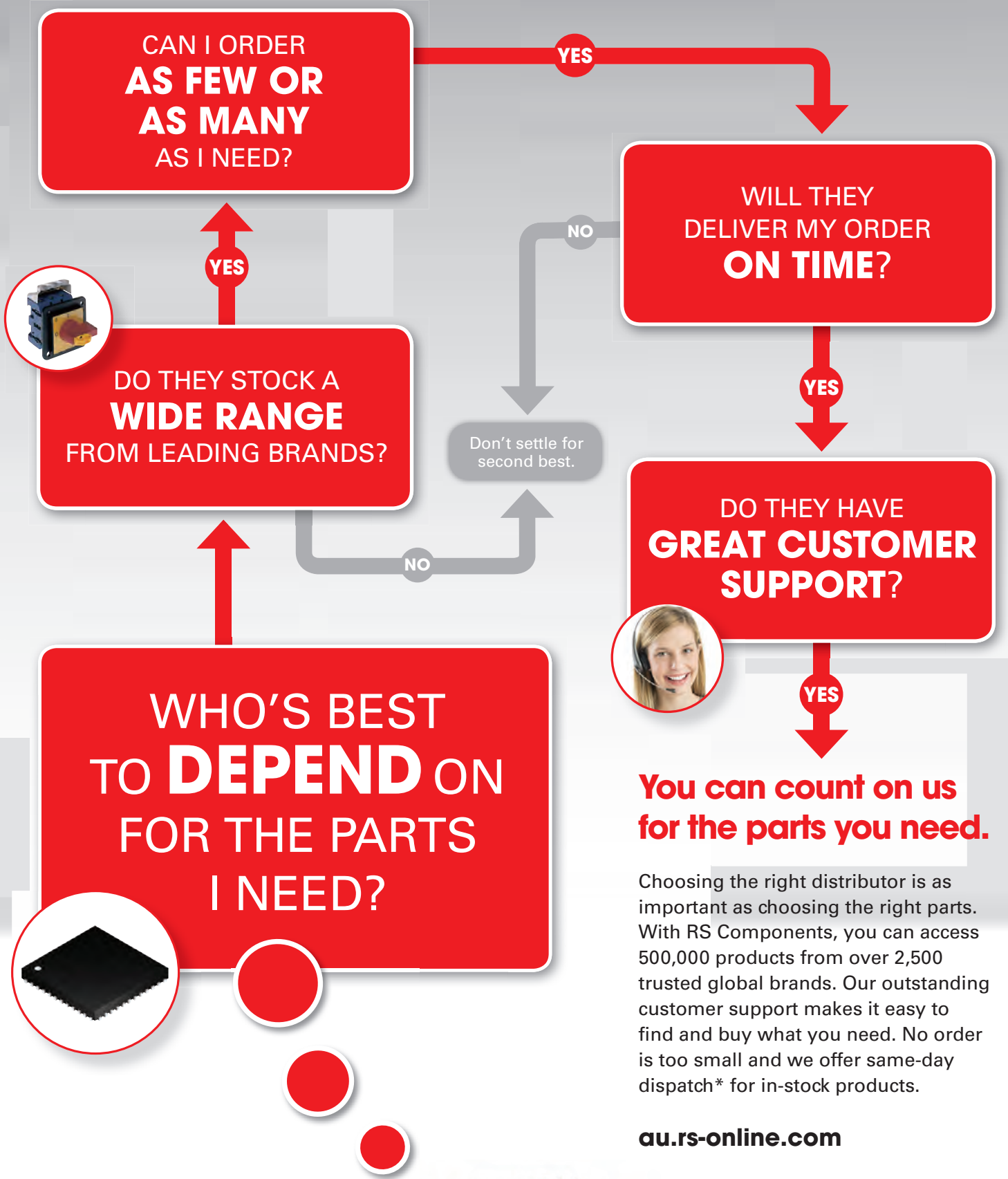## new PRODUCTS
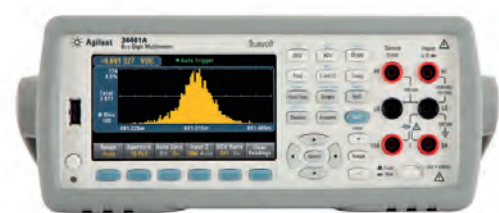
DIGITAL MULTIMETER

The Keysight 34461A is a precision 6½ digit multimeter with 11 cm hi-res colour display. Truevolt technology implements an analog-to-digital converter with a metrology-grade architecture to compensate for line noise, environmental noise, input bias current and injected current from the meter itself.

The product will measure AC RMS voltage (3 Hz to 300 kHz), DC and AC voltage (100 mV to 1000 V), resistance (100 Ω to 100 MΩ), frequency, period, continuity, diode (5 V), current and temperature.

Features include: graphical view of results with histograms and long-term trends; Truevolt technology for quality measurements; the ability to save data to PC via USB or LAN; 100% drop-in replacement for 34401A.

TechRentals
www.techrentals.com.au

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au.rs-online.com

* See website for Terms & Conditions.

RS

CONTRACT MANUFACTURING

Duet Electronics is a niche contract manufacturer servicing Australian and international export markets. The company provides short-run, volume manufacture and prototype services; assistance in design to manufacture; and full turnkey capabilities including end-to-end logistic support and supply chain management.

Duet Electronics supplies key products and services to a diverse range of users in a wide range of markets including automotive, defence, aerospace, information technology, telecommunications, security, medical, process control, industrial and commercial power. Its capabilities extend from circuit development to turnkey production with an emphasis on total quality control.

ISO 9000:2008 accreditation and the company's 100% trackability system allows Duet Electronics to provide good accuracy and repeatability. The company will work with its clients to streamline their products to ensure ease of manufacture, thereby lowering production costs.

Duet Electronics offers high-quality electronic manufacturing services and support, targeted specifically to meet the requirements and budgets of small to medium-sized clients.

Duet Electronics
www.duet.com.au

PLC PLATFORM

Using the Micro PLC platform from Maxim Integrated, designers now have the tools to implement Industry 4.0 with less power and fewer parts. The platform consists of five reference designs which can operate as stand-alone subsystems and be configured and tested with a laptop's USB port.

The product is said to process up to 70 times faster digital I/O, providing increased production throughput. It has greater than 50% power savings, allowing fanless operations and higher density of I/Os.

The device reduces component count and provides diagnostics to help keep a line up and running 24/7. Its compact size, with a 10 times reduction in form factor, brings the full capability of a modular PLC closer to the factory floor. The platform will thus reduce industry maintenance costs and increase uptime.

Maxim has developed multiple products that are interoperable with the platform: MAX11270, a 24-bit, 10 mW, delta-sigma ADC with integrated PGA offering high signal-to-noise and low power; MAX17515, a 5 A, 2.4 to 5.5 V input, complete switchmode power supply with built-in inductor that reduces energy loss and heat with 92% efficiency; and MAX17552, a 4 to 60 V, 100 mA, ultrasmall, synchronous step-down DC-DC converter, compliant to IEC61131-2 PLC standard, which reduces heat dissipation and enables up to 50% cooler operation.

Avnet Electronics Marketing
www.em.avnetasia.com

WAVEFORM GENERATOR

The Keysight 33612A is designed for those with communications, industrial or biomedical applications that require improved signal integrity from direct digital synthesis (DDS). It is available to rent from TechRentals.

The two-channel waveform generator has an 80 MHz bandwidth and will produce sine, square, pulse, ramp, triangle, Gaussian noise, pseudorandom binary sequence (PRBS) and arbitrary waveforms. Common signals such as modulation, sweep and burst are complemented by more advanced options such as waveform summing and combining.

Other features include: 1 ps jitter and 0.03% total harmonic distortion; 1 GSa/s sampling rate; 4 MSa memory; 14-bit amplitude resolution.
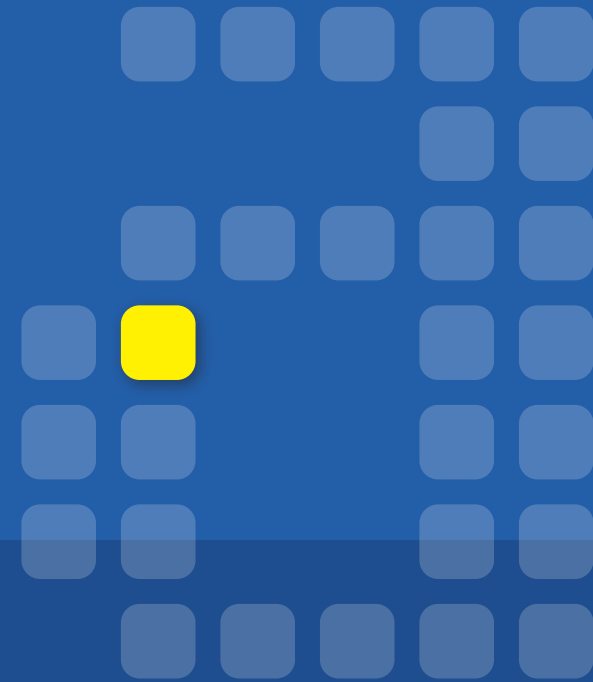
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REDUNDANCY BOX

Moxa announces the launch of its PT-G503-PHR-PTP series of redundancy boxes (RedBoxes). The RedBoxes are compliant with the latest IEC 62439-3 standard, making them suitable for electrical substation automation and process automation systems that require zero recovery time to ensure high system availability and data integrity.

The RedBox is a PRP/HSR all-in-one device that supports Gigabit, coupling and QuadBox for versatile and scalable zero-switchover-time networks that are easy to manage and deploy. These benefits enable efficient network management and fast error detection.

Other features include: hardware-based IEEE 1588v2 PTP supported; MMS server for integration with power SCADA; Fiber Check all fibre port monitoring; NERC CIP compliance.

Madison Technologies
www.madisontech.com

DIN RAIL POWER SUPPLIES

Mean Well has released the SDR-75-24 and MDR-40-24 DIN rail power supplies.

The SDR-75 series is a slim-line power supply that provides a high efficiency rating of up to 94%. Cooled by free air convection, it has no moving parts to fail. The product features the company's overload, overtemperature and overvoltage protections.

The MDR-40 series is a compact power supply that has a no-load power consumption of <0.75 W. It has built-in power factor correction and provides the same built-in protections as the SDR-75.

ADM Instrument Engineering Group
www.admtech.com.au
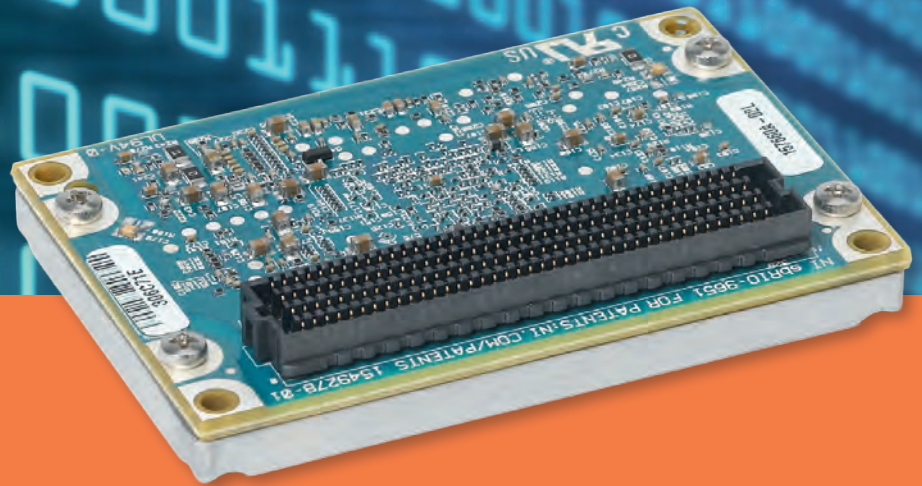
FUN WITH
FPGAs

Lauren Davis

Field-programmable gate arrays (FPGAs) have been growing in functionality and use over the years, yet according to a recent survey by UBM, many system designers avoid the devices due to perceived difficulty, expense or simple unfamiliarity. At the National Instruments (NI) Technical Symposium, held in Sydney, Arun Veeramani* sought to set the record straight.

An FPGA is essentially a chip with programmable logic cells and programmable interconnects, explained Veeramani. The user writes a software code, and this code is downloaded onto the FPGA to make the hardware behave in a way that it will execute the user's desired program. As Veeramani noted, "There is really no operating system - everything is running on hardware."

He continued to say that FPGAs, which originated as programmable logic blocks, are typically thought to be useful for Boolean logic but little else. "I think that is like thinking cell phones are used to make calls," he said, stating that FPGAs have evolved into full systems on chips. He referred to the Zynq chip, recently introduced by Xilinx, which features an ARM dual-core processor on the FPGA as well as "a bunch of DSP (digital signal processing) slices that can do the hard-core DSP operations".

A new way of thinking

Despite this expansion in functionality, many people continue to be wary of FPGAs because they find them difficult to code and program. Veeramani admitted that FPGAs work very differently to writing an application for a software-based system - especially if you're used to traditional processors.

"With a processor, you never really run out of processing power," he said. "With an FPGA, you only have so many gigs, so many logic slices. And so you have to optimise that and think of those things as well. Am I making use of the resources that are available correctly, in an optimised manner?"

NI acknowledges that FPGAs require a whole new way of thinking, which is why the company offers LabVIEW RIO Architecture.

Programmers who are familiar with LabVIEW for Windows will find the tool particularly easy to use, with Veeramani saying it allows you to easily manage FPGA resources; develop, compile and deploy your application; and simulate and debug your application. Furthermore, it will take your code and optimise it for you, thus avoiding the problem of limited processing power.

"We do all the heavy lifting for you," said Veeramani.

So once you know how to use an FPGA, what are the actual benefits? According to Veeramani, it comes down to three key factors.

Futureproofing your design

Veeramani referred to FGPAs as "custom COFS (commercial off-the-shelf) architecture", enabling users to adapt to changing requirements; change, enhance or remove functionality; and re-use hardware and code from project to project. This is unlike standard COFS architecture, where you're more or less stuck with the functionality you buy from the vendor.

"It essentially gives you insurance after you go into a project," Veeramani said. "It's almost like an FPGA is a Lego block, and you can take that and you can build a bridge, or you can build a tower. Sometimes a customer will tell you that he wants a bridge, but really he wants a tower."

Maximising reliability and determinism

Veeramani stated that most computers are "slave to the operating system and what it does". An FPGA, however, relies solely on hardware - and is more reliable as a result.

For example, said Veeramani, if you wanted to calculate something through a processor-based device, "it goes through the I/O,

> **FPGAs ARE SUITABLE FOR A BROAD RANGE OF AREAS SUCH AS TESTING, DATA ACQUISITION, AND EMBEDDED HARDCORE CONTROL AND MONITORING.**

the hardware, goes through multiple layers of software, before you actually get to the application software, do the computation, do the calculation, and then get back out" - a process which has a response time of around a microsecond. With an FPGA, however, the calculation moves directly from the application software to the hardware and the response time is at the nanosecond level.

Enhancing performance and improving functionality

Finally, FPGAs can enhance the user's current performance, providing improvements such as a fast closed-loop control or stimulus/response test, inline processing and customisation. Veeramani added that the devices can also be used to co-process with your existing processor, if some operations need to be offloaded.

"We all know that in a processor, even though multiple programs are running, nothing is running in parallel," he said. "It's running it in chunks; it's running it in series. Whereas in an FPGA, you get the dedicated resource, that dedicated slice, and so you're truly running it in parallel, and you get the performance benefits as well."

Conclusion

These factors will provide benefits to a variety of applications, with Veeramani saying FPGAs are suitable for a broad range of areas such as testing, data acquisition, and embedded hardcore control and monitoring. The technology can even be used to complement a user's existing PLC-based system, perhaps adding more functionality or making some parts of the system more efficient.

"In essence, what we are trying to say is: use FPGAs when needed," Veeramani said.

"We think it'll allow you to do more things, be more flexible and to do more critical things with your application.

"Your imagination is the limit."

National Instruments Australia
www.ni.com/oceania

*Arun Veeramani, Regional Program Manager, Embedded Control and Monitoring, Emerging Markets, National Instruments. Since joining NI in 2004, Arun has helped National Instruments create its Science and Big Physics Segment and has helped the company define its embedded computing platform.

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new PRODUCTS

MOTION CONTROLLER

Delta Tau presents the Power PMAC range, its seventh-generation motion controller. The flexible and powerful motion controller is suitable for high-end applications, enabling users to improve their cost-effectiveness, expand their product line and/or create more complex projects.

The device can control up to 256 axes and can be assembled in panel-mount format or the PMAC clipper, a standalone CPU board. The unit has high flexibility and can come with built-in amplifiers for either AC or DC motors.

Motion Technologies Pty Ltd
www.motiontech.com.au

BLUETOOTH TEST SET WITH V4.2 BLE DATA LENGTH EXTENSION

Anritsu introduces an option for its MT8852B Bluetooth Test Set that supports the Data Length Extension associated with Bluetooth Low Energy (BLE) as part of the latest Bluetooth Core Specification version 4.2.

With the option fitted, designers and manufacturers of Bluetooth Smart and Bluetooth Smart Ready devices will be able to use the test set to conduct radio layer tests in full compliance with the newly adopted Bluetooth 4.2 standard to improve product throughput and speed time to market.

The measurement option has been developed to support the extension of the data packet length in BLE from 37 to 255 octets. The test cases in the Data Length Extension option can be run as part of a test script to simplify the creation of test programs and reduce test times. For example, the MT8852B will complete a test script implementing Bluetooth Basic Rate, Enhanced Data Rate (EDR) and BLE measurements in under 15 s by pressing one key or sending a single remote command, simplifying production test programs.

The MT8852B BLE Data Length Extension option will be available from mid-February 2015.

Anritsu Pty Ltd
www.anritsu.com
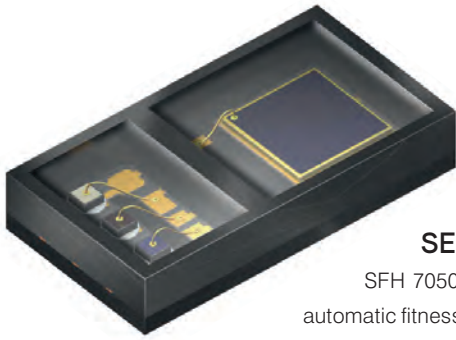
INTEGRATED OPTICAL SENSOR

SFH 7050 is an integrated optical sensor for automatic fitness tracking. The sensor is used in mobile devices, such as smart watches and fitness armbands, and simplifies personal heart rate or pulse rate measurements.

The sensor contains three light-emitting diodes with different wavelengths, based on highly efficient chip technology. This helps save power and also offers high signal quality for reliable measurements. A built-in photodetector receives the reflected optical signals and is separated from the emitters by an opaque barrier.

The photodiode integrated in the sensor (4.7 x 2.5 x 0.9 mm) has an active surface of 1.3 x 1.3 mm. The diode is therefore very sensitive to light and has high linearity and good signal-to-noise ratio. The infrared LED can also be used in combination with the photodiode as a proximity sensor to start or stop the measurement automatically as soon as the sensor touches or is removed from the skin. The integrated optical barrier prevents crosstalk from the three LEDs to the photodiode and therefore corruption of the optical signal or the entire measurement.

Osram Australia Pty Ltd
www.osram.com.au

POWER INDUCTOR SERIES

Bourns has introduced an SMD power inductor series that includes nine devices designed for automotive applications - the SDE0403A, SDE0604A, SDE0805A, SRF0703A, SRF0905A, SRF1280A, SRR0745A, SRR1210A and SRR6040A.

The series consists of non-shielded and shielded construction devices that are AEC-Q200 qualified. The series features inductance values from 0.47 to 6500 μH, has a heating current range up to 17.9 A and offers profiles as low as 3.2 mm. The power inductors are suitable for a broad array of automotive applications, including driver assistant devices, information/entertainment systems and lighting.
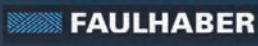
Digi-Key Corporation
www.digikey.com

PROGRAMMING POWER SUPPLY RANGE

The Durst Programming Power Supply (PPS) range is available in 70, 100 and 130 A, with custom high-current units also available. The company also supplies lower current versions for users wishing to demonstrate vehicle electronic features without running the engine or flattening the battery.

Long 2 m leads enable the product to be placed at a safe distance from the vehicle and a safety Piezo buzzer for accidental reverse polarity connection is standard on all models. The units are suitable for any workshop in the current industry - simply connecting a PPS to a vehicle while performing diagnostics is useful for the technician.

Durst Motor & Electric Industries Pty Ltd
www.durst.com.au

LONG-SIDE TERMINATION THICK-FILM CHIP RESISTORS

Vishay Intertechnology has extended its RCL e3 series of long-side termination thick-film chip resistors with devices in the 0406 and 1225 case sizes. For automotive electronic circuits and general-purpose applications, the RCL0406 e3 and RCL1225 e3 are said to offer enhanced thermocycling performance and provide increased power ratings to 0.25 and 2 W.

Qualified to AEC-Q200 Rev C, the resistors feature wide terminals that enable high power dissipation. The small 0406, 0612, 1218 and 1225 case sizes save space on densely packed PCBs and allow a higher number of temperature cycles, thus improving solder-joint reliability. The devices offer tolerances of 1 and 5%, TCR of 100 and 200 ppm/K, and a resistance range from 1Ω to 2.2 MΩ.

The resistors feature a protective overglaze and pure tin solder contacts on a nickel barrier layer for compatibility with lead-free and lead-containing soldering processes. The devices are compliant to RoHS directive 2011/65/EU and halogen free according to the JEDEC JS709A definition.

Arrow Electronics Australia Pty Ltd
www.arrowaustralia.com

UV-STABLE IP66 ENCLOSURES

ROLEC has launched the technoPLUS IP66-rated enclosures, offering the technical features of its diecast aluminium boxes in a range of UV-stable plastic housings. The series is manufactured from ASA LURAN so it does not degrade in sunlight, making it suitable for outdoor applications such as base stations, monitoring equipment and detection equipment.

The range has been developed with an optional mast/pole attachment, enabling it to be installed quickly and easily on lamp posts, poles or communications masts. Each enclosure is pre-moulded with screw ports at the rear for fitting the mast attachment so no machining is needed.

Hinged lid trims hide all the mounting and fixing screws for security and weather protection. The lid is recessed to enable accurate assembly of a membrane keypad or label. Retaining straps hold the lid in place and the enclosure can be installed with the lid closed, helping to protect any fragile electronics inside.

The enclosures are available with IP66 or IP67 protection ratings and in five sizes ranging from 130 x 90 x 70 mm to 270 x 170 x 90 mm. Case parts are moulded in UV-stabilised ASA LURAN with a 2° mould slope for casting ejection. They are fully insulated.

Standard colours are light grey with stone grey plastic polyoxymethylene lid trims. The pole/mast attachment is ASA LURAN, stone grey. The standard gasket is silicone (-50 to +140°C) and an EMC gasket (-55 to +160°C) is also available.

Accessories include the mast/pole attachment and an internal mounting plate. Customisation options include CNC milling and drilling; and silk-screen and tampo printing of legends and logos.

ROLEC OKW Australia New Zealand Pty Ltd
www.rolec-okw.com.au

SPINDLE DRIVE SYSTEMS

When it comes to rotary drive tasks, the conversion and optimal adaptation of mechanical torques to the respective application usually occurs by means of finely graduated reduction gearheads. The ball screws used in Series BS 32-2.0 spindle drive systems allow the rotational movement of micromotors to be converted to linear stroke or tensile movements with minimal travel variations of less than 5 μm over the absolute travel distance.

The combination with motors and mounted components, such as high-resolution encoders or integrated motion controllers, ensures maximum precision. This makes the product suitable for demanding positioning tasks such as optical filters, glass-fibre technology, lens adjustment in optical systems or micro actuators for medical technology.

The mechanical connection to the motors is implemented by means of a backlash-free coupling integrated into the lead screw. Numerous modifications, such as variable screw lengths, modified screw nuts or special lubricants, are available on request for use in special applications.

ERNTEC Pty Ltd
www.erntec.net

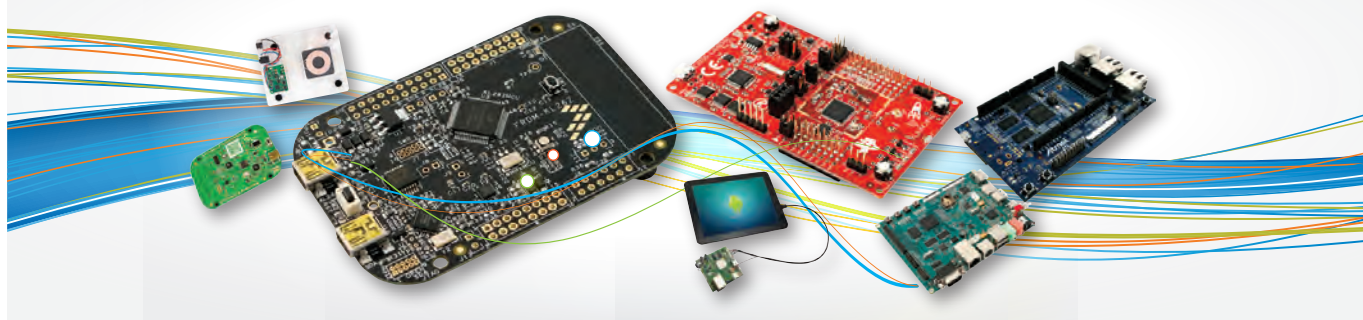## DEVELOPMENT AND EDUCATION BOARD FOR FPGA

The DE0-Nano board introduces a compact-sized FPGA development platform, suitable for prototyping circuit designs such as robots and portable projects. The board is designed to be used in simple implementation, targeting the Cyclone IV device up to 22,320 LEs.

The product has a collection of interfaces, including two external GPIO headers to extend designs beyond the board; onboard memory devices including SDRAM and EEPROM for larger data storage and frame buffering; and general user peripherals with LEDs and push-buttons.

The advantages of the board include its size, weight and ability to be reconfigured without carrying superfluous hardware. For mobile designs, where portable power is crucial, the product provides designers with three power scheme options including a USB mini-AB port, 2-pin external power header and two DC 5 V pins.

Digi-Key Corporation
www.digikey.com

new PRODUCTS

SWITCHING REGULATOR MODULE

Featuring a full 1 A of output, RECOM's R-78E-1.0 switching regulator module expands the power range of the R-78E series. The series of switching regulators offers high efficiency, a wide input range and accurate output voltage regulation.

Like its 0.5 A counterpart, the product carries short circuit protection. Measuring 11.6 x 8.5 x 10.4 mm, its compact TO-220-compatible SIP3 package saves valuable board space. With efficiencies of up to 91%, the higher power version of the R-78E does not require a heat sink.

With an available input range of 8 to 28 V and a wide operating temperature range of -40 to +85°C, the product is flexible enough to handle battery-operated systems, controls and sensors, positioning systems, robotics, medical-grade applications, cooling systems and fans, telecommunications and highly sensitive measurement equipment.

RECOM Asia Pte Ltd
www.recomasia.com

PIEZO SWITCH WITH RAISED SYMBOLS

The PSE HI (high-impact) switch can be delivered with raised symbols, letters and numbers in addition to various colours or legend inscriptions. The switch surface is made of anodised aluminium, which can be preformed with raised symbols to provide good user haptics.

The laser-etched legends or preformed raised symbols enable long-term protection against wear. Raised symbols can be numbers as well as characters from the Braille alphabet. This makes it possible to offer a variety of options to meet individual design requirements.

The piezo switches have an ingress protection class rating of IP67. The hermetic seal makes the switches suitable for use in areas that must be regularly cleaned or disinfected. Additionally, the switches offer a robust metal housing for use in harsh environments where there exists the potential for vandalism. The impact resistance according to DIN EN 50102 is IK06.

The piezo switch is rated 0.1 A @ 42 VAC/60 VDC. The piezo switching element offers a long service life of more than 20 million switching cycles. Applications requiring robust switch performance include pedestrian-crossing walks, elevators, truck lifts, material-handling equipment, safety equipment, ticketing terminals, petrol stations, food-service equipment and processing plants.

SCHURTER (S) PTE LTD
www.schurter.com

## LASER SYSTEM FOR MICROFLUIDIC APPLICATIONS

LPKF, in cooperation with Slovenian company Aresis and the University of Ljubljana, is developing processes for structuring of microcomponents. Maskless UV laser direct imaging (LDI) of photosensitive polymers (photoresists) offers advantages over classic mask projection techniques.

Research and development in the field of microfluidic devices and micromechanical systems benefit from fast prototyping processes such as LPKF-LDI. Lab-on-a-chip devices help miniaturise processes and reduce liquid sample sizes as well as waste. This opens up possibilities for the LDI process in medicine, biology, chemistry and physics. The applications are diverse: blood and cell analysis, medical diagnosis and screening, sensors (chemical, biological, environmental and weapons technology; automotive engineering), synthesis of chemicals and physical experiments.

With LDI, a scanner-guided laser beam writes structures directly, rapidly and precisely onto the photoresist without using a mask. This results in smooth side wall edges. The LPKF ProtoLaser LDI can be used for production of microfluidic devices as well as MEMS, BioMEMS, integrated optics and photonic experiments with microscale structures. In terms of precision, the method is claimed to surpass all comparable systems for mask projection. Investment costs are said to be lower than for electron beam lithography and for numerous mask alignment systems. LDI even enables structuring of elements with web widths of less than a micron.

Other features include: substrate exposure with a focused 375 nm TEM00 UV laser beam, which can also be used for standard UV resists; software-controllable laser focus (1-3 μm) for changing precision requirements; and an integrated camera for fine positioning of substrate and automated self-calibration, as well as stitching mechanisms for real-time manufacturing of large samples.

Embedded Logic Solutions Pty Ltd
www.emlogic.com.au
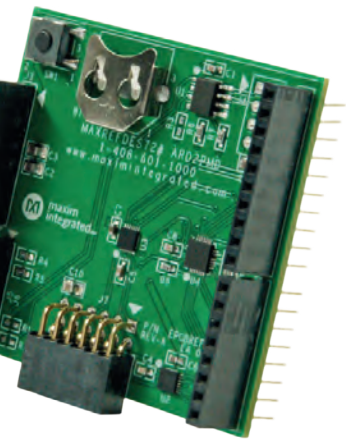
PMOD ADAPTER FOR ARDUINO PLATFORMS

Maxim Integrated's Pmod-to-Arduino adapter (MAXREFDES72#) allows any board with Pmod connections to plug easily into Arduino-compatible microcontroller platforms. The adapter is suitable for quickly creating Internet of Things designs and allows for convenient accessibility to a broad range of digital processors and applications.

The Pmod form factor has long allowed integration of professional-grade peripherals into engineering prototypes, especially on FPGA-based platforms. The adapter bridges the gap between the Pmod and Arduino-compatible form factors, creating greater accessibility to quality components and faster, easier designs.

The product is said to help designers achieve proof-of-concept faster, with no more struggling with the interface between boards. It quickly connects Pmod boards to Arduino-compatible microcontroller boards for evaluation.

Maxim offers 15 single-function peripheral modules and 13 reference design boards with Pmod connectors. Each is easily compatible with any Arduino-compatible development board.

Avnet Electronics Marketing
www.em.avnetasia.com

LONG-RANGE BLUETOOTH MODULE

The BLE121LR is Bluegiga's latest edition to its Bluetooth Smart module range, offering extended range capabilities in excess of 250 to 450 m with current-generation tablets and smartphones while maintaining low power operation commensurate with Bluetooth Smart technology.

The product has an RF transmit power of +8 dBm, receive sensitivity of -98 dBm, a peak current consumption of 38 mA and sleep current as low as 0.5 μA. It is fully Bluetooth, CE, FCC, IC and Japan qualified.

The latest version of the Bluegiga Bluetooth Smart software, with full support for the BLE121LR Bluetooth Smart Long Range Module, is also available.

Glyn Ltd
www.glyn.co.nz

CONNECTOR SOLDERING

Joseph Haimovich
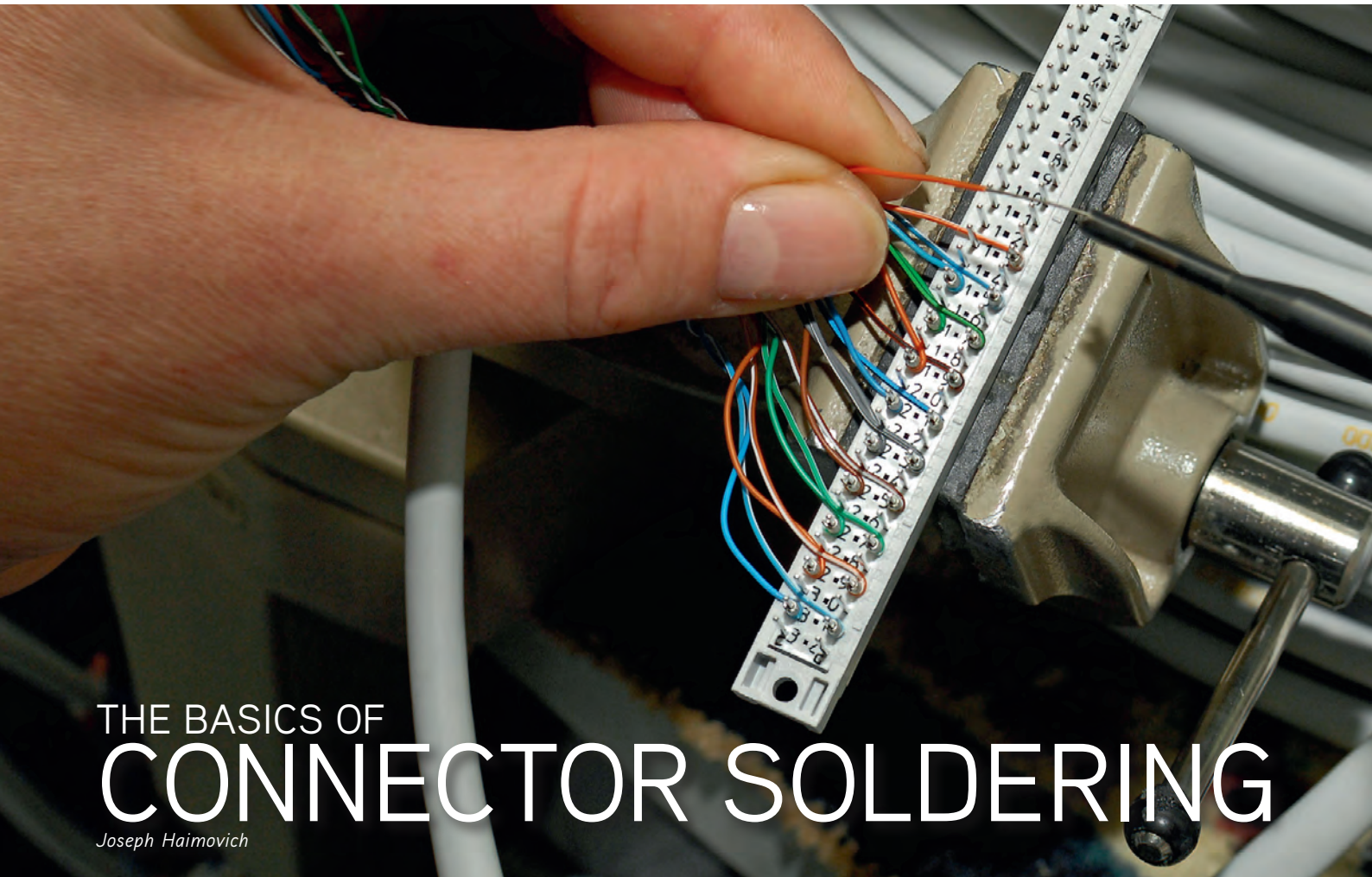
The quality of the joining processes undergone by some connectors can be a key factor in component performance. The article below by APEX Electrical Interconnection Consultants covers the basics of connector soldering.

Many connectors and related components are subject to joining processes, which primarily involve soldering. Less commonly used joining processes include welding, brazing and use of organic compounds, both conductive and non-conductive (epoxies, 'organic solders', etc).

The distinction between soldering and brazing is somewhat arbitrary. Both processes use a filler alloy to join two surfaces without melting the substrates themselves. The basic distinction between brazing and soldering is based on the melting point of the solder (or more generally, on the temperature of the liquidus - the point when the solder is completely liquid). This boundary is commonly set at 450˚C; below this temperature the process is considered soldering and above it is considered brazing.

Wetting and spreading

At the initial stages of soldering, flux is applied to the substrate to be soldered; the purpose of the flux is to remove any oxide, which enables the molten solder to wet the clean substrate metal. This creates an interface between the liquid solder and the solid substrate that has lower interface energy than the clean metal/flux interface that metal/solder interface replaces. This difference in the energy compensates for the increase in the energy caused by the larger surface area of the solder that occurs due to spreading. It is this decrease in the total energy of the solder/substrate system that drives the wetting of the substrate by the solder. An alternative way of explaining the wetting process uses surface tension instead of surface and/or interface energy; this approach explains wetting and spreading in terms of balance of forces. In order for solder to wet the substrate, the surface tension of the substrate/flux interface must be larger than the vector sum of the surface tensions of the solder/substrate and solder/flux interfaces.

The molten solder interacts with the solid metal of the substrate, dissolving some of it. Dissolution rates vary a lot depending on the solder/substrate combination. These rates increase exponentially with the temperature of the solder. Solder metal also reacts with the substrate metal, forming intermetallic compounds (IMCs). The most common examples of such reactions are tin-copper and tin-nickel IMCs. The specific combination of solder-substrate metals will result in a particular IMC formation. One can identify the potential IMCs that form in a system by consulting the appropriate phase diagram. In case there are several possible IMCs, more advanced analytical techniques might be required, such as X-ray diffraction (XRD) or scanning electron energy dispersive X-ray analysis (SEM EDAX) to identify the actual phases that form under particular conditions.

Solder joint quality

Successful connector soldering usually presents more challenges than other PCB components because of the connectors' larger size and greater thermal mass. Connectors may necessitate a higher processing temperature and/or longer dwell time in order to obtain adequate melting of the solder and wetting of the substrates. Higher process temperatures and longer dwell times will put more stress on the board and the rest of the components being soldered.

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part of the soldering process, which results in oxide formation on the surface of the finish. This oxide may increase contact resistance to an unacceptable level, especially in the case of low-current and low-voltage applications. The most typical example of this is copper diffusion through gold.

Yet another issue in soldering is component solderability, particularly as it relates to shelf life, where issues such as diffusion, intermetallic compound growth and corrosion come into play. Items to be soldered - terminations and solder tails on components, pads and plated thru-holes on printed circuit boards - must retain their solderability from the time they are produced until the time they are soldered. This is less of a concern if no significant storage time is involved (such as with just-in-time manufacturing).

However, if the parts and components are stored for any significant amount of time, their solderability can be affected. This is especially true if storage conditions that are not climate controlled (for temperature and humidity) or parts are transported (especially by ship) with no climate-controlled storage. Presence of corrosive agents in the atmosphere during storage aggravates the situation. If doubts about solderability exist, parts may be tested prior to assembly, either by a simple dip-and-look method or by using a wetting balance (meniscograph). If parts must be stored for a prolonged time prior to use, appropriate accelerated ageing tests may be performed to predict their performance after the storage.

Lead-free process

Lead-free plating and soldering presents many additional problems to an already complex and demanding process. First, there is not a single 'drop-in' composition that could replace tin-lead solder. While a large amount of research data exists for tin-lead solders, the process-applicable research on lead-free soldering is still rather limited, especially compared to a large volume of research on leaded solders. Lead-free solders generally do not wet as well as the standard 60% tin-40% lead solder. Lead-free solders also fully melt at higher temperatures compared to the tin-lead solder, except for some specialty solders that tend to be expensive. Therefore, lead-free solders require higher processing temperatures, which could negatively affect all components. Because of higher processing temperatures, process controls must be much tighter. In addition, lead-free contact finishes that must be used in conjunction with lead-free solders are generally either less solderable or introduce other problems such as joint embrittlement by gold and tin whisker growth with pure tin finishes.

Robust soldering and joining processes are essential to the reliability of most electronics and electrical equipment.

Bishop & Associates
www.connectorindustry.com

These undesirable effects can be minimised by strict control of process parameters.

Solder joints must perform both mechanical and electrical functions. Ideally, the solder joints must be free of both external and internal defects. A good soldering process must produce solid joints with uniform appearance and good wetting of substrates and terminations. An inadequate soldering process can leave the joints vulnerable to a number of problems, resulting in low reliability. Poor and/or incomplete wetting at the interface due to oxide or contamination can lead to delamination. Internal defects, such as voids or excessive intermetallic growth, can result in cracking of solder joints. Any such defects will negatively affect the reliability of a solder joint, making it vulnerable to fatigue failure (either thermal or mechanical). Excessive intermetallic compound growth weakens the solder-substrate interface and may lead to cracking at the interface as well as delamination; some intermetallic compounds (such as gold-tin IMC) above a critical concentration could also result in embrittlement of solder.

Other issues

There is another important requirement for a soldering process: it must not negatively affect the performance of the contact springs at the separable contact interface. Soldering temperature is usually too low and exposure time too short to affect the mechanical properties of the connector springs; however, some finishes could be vulnerable and may be affected. Extremely thin finishes can be affected by diffusion of the base metal during the high-temperature

Joseph Haimovich, senior consultant at APEX Electrical Interconnection Consultants, has more than 28 years' experience in the connector industry. He specialises in the metallurgy of base materials, contact coatings, solders and finishes, particularly tin and tin alloys, as well as lead-free finishes. He contributes to the development of new and improved types of contact coatings such as hot-air levelled tin (HALT) and initiatives supporting RoHS. Joseph provides technical support in development of new products, surface-mounting/solder reflow, failure analysis and technical training.

For more information, please contact Robin Pearce, Bishop & Associates via email at rpearce@bishopinc.com.

SYNCHRONOUS STEP-DOWN CONVERTER

The Texas Instruments LM5160 Synchronous Buck/Fly-Buck Converter is a 65 V, 1.5 A synchronous step-down converter with integrated high-side and low-side MOSFETs. The constant-on-time control scheme requires no loop compensation and supports high step-down ratios with fast transient response. An internal feedback amplifier maintains ±1% output voltage regulation over the entire operating temperature range.

The on-time varies inversely with input voltage resulting in nearly constant switching frequency. Peak and valley current limit circuits protect against overload conditions. The undervoltage lockout (EN/UVLO) circuit provides independently adjustable input undervoltage threshold and hysteresis.

Texas Instruments Australia Ltd
www.ti.com

FULL-SIZE SINGLE-BOARD COMPUTER

iBase's IB980 PICMG 1.3 full-size CPU card utilises Intel's Q87 chipset to support 4th Generation Intel Core processors. The platform meets the high-performance requirements of demanding applications such as medical imaging, industrial automation, network security, gaming and digital signage.

Designed to support Intel 4th Generation Core processors manufactured on 22 nm process technology with 3D Tri-Gate transistors, the integrated Intel HD Graphics provides low latencies to provide good gaming and enhanced visual experiences. The device also features two DDR3-1600 long DIMM slots for a maximum of 16 GB of system memory and versatile I/O configurations including four serial ports (jumperless selection on COM1 for RS232/422/485), four SATA III, four USB 3.0 and up to five USB 2.0 ports.

The product supports iSMART green technology to provide power saving and environmental performance through power on/off scheduling and power resume functions. The SBC also features dual Gigabit Ethernet, digital I/O, iAMT 9.0 and Intel Trusted Platform Module 1.2 (TPM) for secure data encryption and restore features.
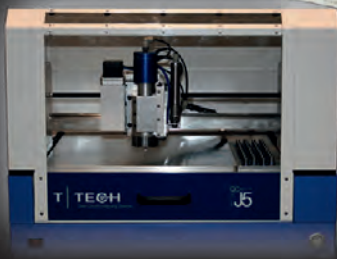
Backplane Systems Technology Pty Ltd
www.backplane.com.au

BIPOLAR TRANSISTORS IN LFPAK

NXP Semiconductors has released what is claimed to be the industry's first bipolar transistors in LFPAK56 (Power SO-8). The transistors, in a low-profile LFPAK56 (SOT669) SMD power plastic package, are said to deliver thermal and electrical performance comparable to bipolar transistors in much larger power packages such as DPAK on less than half the footprint.

The AEC-Q101-qualified, bipolar transistors are suitable for applications in power management, load switch, linear mode voltage regulator, backlighting and automotive applications, as they support high-temperature operations of up to 175°C. Key features include: high power dissipation; dimensions of 5 x 6 mm with a low profile of 1 mm; mechanical ruggedness due to a solid-copper clip with no wires; high energy efficiency due to low heat generation.

element14
au.element14.com

SAFETY CONTROLLERS

The Banner XS26-2 series of safety controllers feature expandable I/O for flexibility and integrated LCD for easy troubleshooting. The safety controller has been designed with the ability to add up to eight expansion models, easily adapting to the user's changing automation requirements. Six expansion models are available with a variety of safety inputs, solid-state safety outputs and safety relay outputs.

The product provides a simple and flexible safety solution for machine safeguarding. It serves as a suitable alternative for multiple safety relay module applications or when a safety PLC is excessive. The user can program in minutes with easy-to-use, free configuration software, customising the safety design with several logic and function blocks.

The safety controller interfaces with a wide selection of safety devices and its innovative LCD screen allows for fast error status and troubleshooting. Diagnostics enable active monitoring of I/O on a PC.

Micromax Pty Ltd
www.micromaxsa.com.au

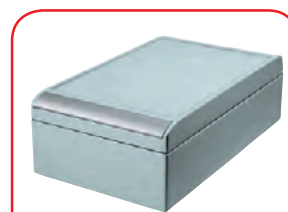## SINGLE-BOARD COMPUTER AND EMBEDDED BOX PC

Advantech has announced two industrial-grade solutions: the 3.5″ MIO-5271 MI/O Extension single-board computer and the ultraslim ARK-1550 embedded box PC. Both have fanless designs which employ 4th generation Intel Core i5-4300U 1.9 GHz/Intel Celeron 2980U 1.6 GHz processors, with smart and fast CPU performance, rich media support, up to three independent displays and improved security. The dust-free, noiseless devices have long MTBF and long life cycles, making them suitable for IoT, intelligent systems and embedded markets.

The MIO-5271 MI/O Extension SBC comes in a 146 x 102 x 24 mm form factor. It was designed with high ESD protection, 100% solid capacitors and rich I/O functions, and can operate in 0 to 60°C temperatures. It incorporates the MIOe unified connector which extends additional interfaces - DisplayPort, PCIe x1, LPC, SMBus, USB 2.0/ 3.0, audio line-out and power - to simplify development.

ARK-1550 is a panel-mountable embedded box PC. Measuring 223 x 46.6 x 133 mm, it supports -20 to 55°C wide temperature operation and carries complete certifications (CE/FCC/UL/CCC/CB/BSMI) and rich I/O. Its lockable I/O design supports a hot-swappable 2.5″ drive bay and optional easy mounting brackets for VESA, DIN rail and wall mount.

The products support multiple communication interfaces such as dual GbE, mini PCIe slots and SIM holder for 3G/4G LTE mobile modules. Advantech SUSIAccess provides a remote management API so users can monitor, configure and control a large number of terminals with centralised real-time maintenance. SUSIAccess also supports System Recovery, System Protection and Remote KVM. With iManager technology, intelligent, self-management, cross-platform firmware monitors system status for problems and takes action if required.

Advantech Australia Pty Ltd
www.advantech.net.au

GIGABIT ETHERNET SWITCH

The G101 Gigabit Ethernet switch comes with a 29 Gb switch matrix and delivers high-speed communication. Specifically designed for rugged mobile communication in harsh environments, the switch conforms to the EN 50155 railway standard.

The device's 25 Gb Ethernet ports can all be connected to the rear or three can be used on the front, either as three robust M12 connectors or as two RJ45 connectors and a 2.5 Gb SFP interface. This interface can be used as a high-speed uplink via fibre technology.

The switch matrix incorporates different software protocols to ensure high speed and high efficiency, and the large software pool enables various protocols like security, synchronous Ethernet and stability. The product supports IEEE1588v2 on ports 1 to 12 and EEE (Energy-Efficient Ethernet) on all ports.

The switch is fault tolerant and restores itself on its own. If a link is temporarily unavailable, frames are sent via backup/redundant links (spanning a tree protocol/link aggregation), avoiding any data loss. The high bandwidth of the switch matrix, robust design and wide operating temperature of -40 to +85°C make the product suitable for railway applications.

OEM Technology Solutions
www.oem.net.au

TROLLEY JUMP STARTER

Durst Industries has released a revamped version of its BJT-75 12V Trolley JumpStarter. The product is suitable for the mining and defence industries and has been designed to be a good fit in workshop environments. The device is 100% portable and can be safely lifted into service vehicles as required.

High-current, maintenance-free AGM cells provide maximum cranking power, even in adverse weather. The jump starter is capable of starting all petrol and diesel engines with ease, while the long-lasting reserve capacity means the user can start multiple vehicles between charges.

The units are fitted with Piezo buzzers and high-current fuses to ensure no damage from over-cranking and reverse polarity connections. Long 1.8 m leads mean the product can be parked at a safe distance from the vehicle. High-quality clamps ensure no drop in cranking power and the included Durst SmartCharger ensures fast and correct charging of the unit to maximise life span.

Durst Motor & Electric Industries Pty Ltd
www.durst.com.au

COAXIAL ROTARY JOINT

The AMCORJD-Ku dual-channel coaxial device has been designed for use in the low-profile antennas that are a key element of Ku-band satellite-on-the-move (SOTM) high-data-rate communication systems. The systems are typically deployed on military or commercial mobile platforms such as vehicles or aeroplanes.

The rotary joint is equipped with right-angled coaxial connectors to minimise the vertical space required for cables. It offers high-current capability on the receive channel, which means that both the antenna's LNB and the motors that keep the antenna locked on to the satellite can be powered via the rotary joint, eliminating the need for additional slip rings and saving space.

The transmit channel has a frequency range of 13.75 to 14.5 GHz, with a power rating of 40 W CW, a maximum VSWR of 1.4:1 and a typical insertion loss of 0.6 dB. The receive channel can handle DC to 2.15 GHz at a microwave power of up to 1 W CW, while typical VSWR and insertion loss are specified as 1.5:1 and 0.5 dB respectively. Maximum current rating for the receive channel is 2 A at 24 VDC.

The body of the device is fabricated from aluminium with an Iridite finish and measures 36 mm in diameter and 31.6 mm in height. It incorporates a 63.5 mm-diameter bulkhead flange.

Allied Technologies Pty Ltd
www.alliedtech.com.au

OSCILLOSCOPES

TRIO T&M has introduced two oscilloscope families with 30 models from 500 MHz to 8 GHz.

The Infiniium S-Series offers high signal integrity, with its 10-bit digitiser, long memory and high sample rate coupled with an advanced user interface that displays results quickly and clearly. The product comes with a wide range of capabilities that enable good measurement accuracy.

The InfiniiVision 6000 X-Series features bandwidths up to 6 GHz.

TRIO Test & Measurement Pty Ltd
www.triotest.com.au

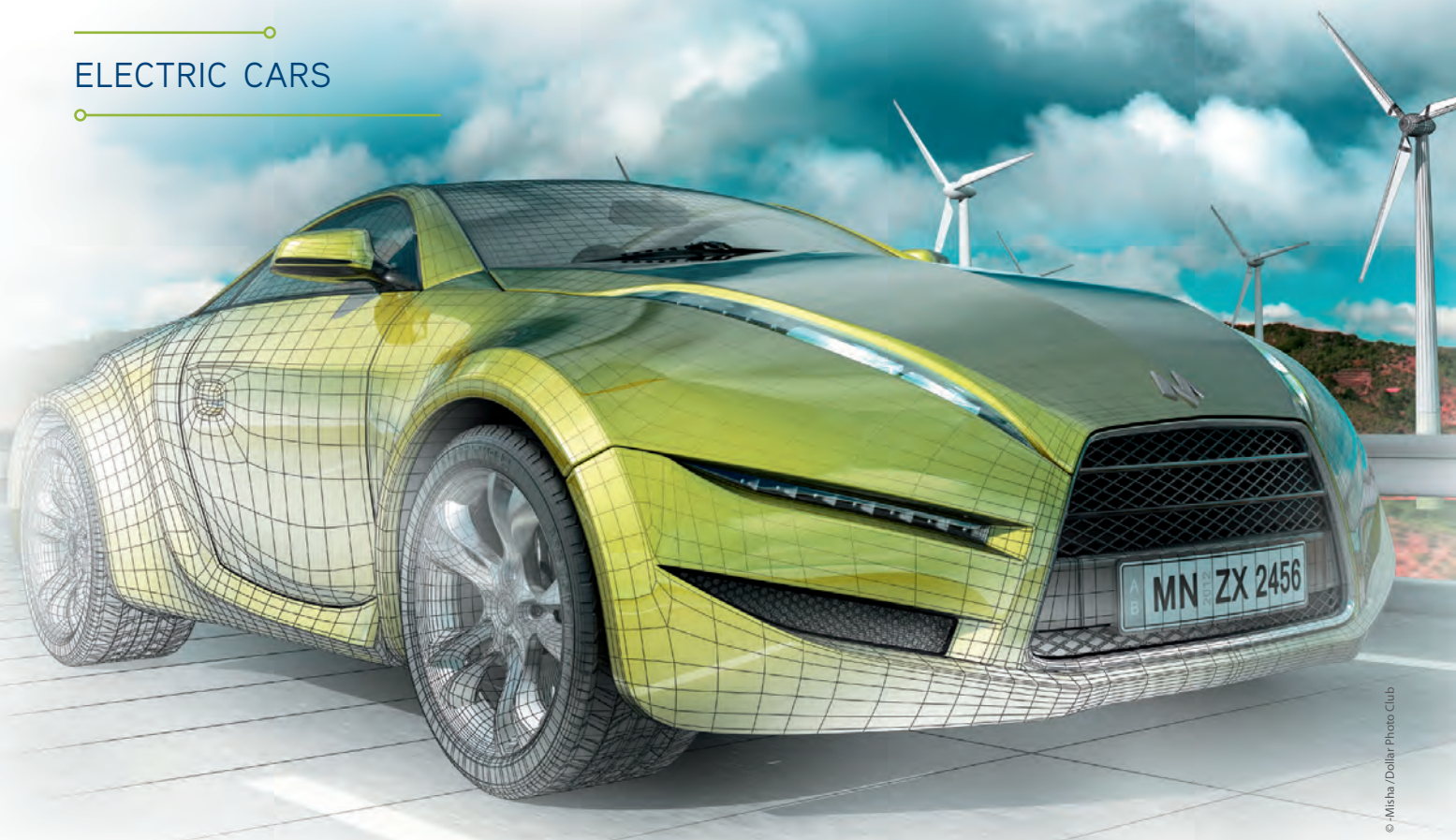© -Misha /Dollar Photo Club

PANEL-POWERED CAR
COULD SOON BE A REALITY, SAYS QUT

A car powered by its own body panels could soon be driving on our roads, according to researchers at Queensland University of Technology (QUT).

QUT researchers have developed lightweight 'supercapacitors' that can be combined with regular batteries to dramatically boost the power of an electric car. The supercapacitors - a 'sandwich' of electrolyte between two all-carbon electrodes - were made into a thin and extremely strong film with a high power density. The film could be embedded in a car's body panels, roof, doors, bonnet and floor - storing enough energy to turbocharge an electric car's battery in just a few minutes.

The discovery was made by postdoctoral research fellow Dr Jinzhang Liu, Professor Nunzio Motta and PhD researcher Marco Notarianni, from QUT's Science and Engineering Faculty - Institute for Future Environments, and PhD researcher Francesca Mirri and Professor Matteo Pasquali, from Rice University in Houston, in the United States. The findings, published in the *Journal of Power Sources and the Nanotechnology*, mean a car partly powered by its own body panels could be a reality within five years, Notarianni said.

"Vehicles need an extra energy spurt for acceleration, and this is where supercapacitors come in. They hold a limited amount of charge, but they are able to deliver it very quickly, making them the perfect complement to mass-storage batteries," he said.

"Supercapacitors offer a high power output in a short time, meaning a faster acceleration rate of the car and a charging time of just a few minutes, compared to several hours for a standard electric car battery." Dr Liu said currently the 'energy density' of a supercapacitor is lower than a standard lithium ion (Li-Ion) battery, but its 'high power density', or ability to release power in a short time, is 'far beyond' a conventional battery.

"Supercapacitors are presently combined with standard Li-ion batteries to power electric cars, with a substantial weight reduction and increase in performance," he said. "In the future, it is hoped the supercapacitor will be developed to store more energy than a Li-ion battery while retaining the ability to release its energy up to 10 times faster - meaning the car could be entirely powered by the supercapacitors in its body panels.

"After one full charge this car should be able to run up to 500 km - similar to a petrol-powered car and more than double the current limit of an electric car."

Dr Liu said the technology would also potentially be used for rapid charges of other battery-powered devices. "For example, by putting the film on the back of a smartphone to charge it extremely quickly," he said.

The discovery may be a game changer for the automotive industry, with significant impacts on financial, as well as environmental, factors.

"We are using cheap carbon materials to make supercapacitors and the price of industry scale production will be low," Professor Motta said.

"The price of Li-ion batteries cannot decrease a lot because the price of lithium remains high. This technique does not rely on metals and other toxic materials either, so it is environmentally friendly if it needs to be disposed of."

The researchers are part of QUT's Battery Interest Group, a cross-faculty group that aims to engage industry with battery-related research.

MOULDING UNIT

The Kappa 1000 is a horizontal-injection, single-station machine featuring a four-post die set for larger parts. A separate high-volume melt tank enables easy access and interchangeability.

Dual palm buttons and light curtains are employed for operator safety and the large PLC interface ensures easy operation. Precise temperature control is achieved with three thermal control zones, while a large clamping stroke gives the operator easy access for loading and unloading parts. An additional cylinder can be added to increase the clamping force to 10 tonnes for even larger parts or more cavities.

The unit also features a 7″ touch screen operator interface with a multi-language PLC; and a mechanical ejection system and control for pneumatic ejection. Critical components (gear pump, valve and nozzle) are made overseas.

Tarapath Pty Ltd
www.tarapath.com.au

TRENCH PT AND FS IGBT PLATFORM

Vishay Intertechnology has introduced its trench IGBT (insulated-gate bipolar transistor) platform featuring punch-through (PT) and field-stop (FS) technologies.

Designed to increase efficiency in motor drives, UPSs, solar inverters and welding machine inverters, the semiconductor devices, provided as bare die, offer low collector-to-emitter voltages and fast and soft turn-on and turn-off for low conduction and switching losses while providing breakdown voltages to 650 V. Available in various die sizes with collector current ratings from 30 to 240 A and breakdown voltages of 600 and 650 V, the IGBT chips include trench PT and FS devices, each available as sawn or unsawn die.

Offering low conduction losses, the trench PT devices feature a negative temperature coefficient for low collector-to-emitter voltages down to 1.07 V at 50% rated current and 1.34 V at full rated current and 125°C. The IGBTs are said to offer a smaller size than planar devices, providing high current density and low thermal resistance. They are optimised for low switching frequencies to 1 kHz.

Ramelec Pty Ltd
www.ramelec.com.au
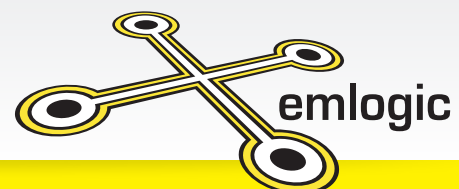
ULTRACOMPACT OUTPUT SIGNAL CONDITIONER

The Mini MCR-SL-IDS-I-I output signal conditioner, with a narrow 6.2 mm design, transmits and electrically isolates 4 to 20 mA signals from the controller to a load in the field, such as I/P converters, control valves or displays.

The electrical isolation is between the input, output and supply. HART data protocols can be transmitted bidirectionally in order to obtain or transmit additional information from the field device. This allows the user to permanently monitor the state of the control valves, for example.

The modules can be supplied with a voltage of 19.2 to 30 V DC via the connection terminal blocks or in combination via the DIN rail connector. When supplied via the DIN rail connector, they can also be used on a termination carrier. This cabling solution enables up to 16 output signals to be quickly and smoothly connected to control systems.

The narrow design of the signal conditioners means significant space savings and therefore lower costs. Modules with screw or spring-cage connection technology are also available.

Phoenix Contact Pty Ltd
www.phoenixcontact.com.au

TERMINAL INLINE CONNECTION SYSTEM

The MXP120 Sealed Connector System is a high-performance 1.20 mm terminal inline connection system for automotive and commercial vehicles. The use of 1.20 mm terminals minimises the connector interface and connector package size versus larger 1.50 mm terminals.The product is said to offer more current-carrying capacity and robustness in assembly than is possible with the use of 0.64 mm terminal systems.

Connectors in yellow housings are validated to meet T3-V2-S2 performance level for in-vehicle safety system applications. Black housings with standard USCAR polarisation options will follow. The housings are being validated to meet T4-V4-S3 specifications (per GMW3191) for high-performance (temperatures up to 155°C/vibration up to 300 m/s^2) for use in space-constrained powertrain applications. The connectors will also be suitable for many industrial and consumer applications where sealing is required and package size is a constraint.

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

I/O MODULES

ICP Electronics Australia has released ICP DAS's USB-2000 series of I/O modules for laboratory research, testing and field applications. Users can easily build up their own highly flexible PC-based control solutions to acquire or output data.

The USB modules are powered by the PC USB port, allowing a single cable to supply power and carry data. The modules feature a dual watchdog to monitor the operation of the module and issue a reset command if a failure occurs in the hardware or software.

The series of modules can be configured with a Power On Value or a Safe Value, and some have individual channel LED indicators to help monitor the status of I/O ports. The modules are true plug-and-play and support 'hot swapping'.

The I/O modules are designed for harsh environments of -25 to +75°C. They have 4 KV ESD protection and up to 3750 VDC intra-module isolation.

The series are available with different configurations of digital, analog and pulse I/O. A USB I/O utility and SDK are provided with each module.

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

SIGNAL AND SPECTRUM ANALYSER

Rohde & Schwarz has released the FPS signal and spectrum analyser and the SGT100A vector signal generator - two products which are fast, compact, combinable and easy to integrate.

The R&S FPS is a fast and compact signal and spectrum analyser for performance-oriented users. In production and in monitoring systems, only 2 HU of rack space is required - a reduction of 50% compared with traditional instruments.

The product features high measurement speed, 160 MHz signal analysis bandwidth and wide range of analysis packages for analog modulation methods and wireless/wideband communications standards. It is said to be up to five times faster than comparable signal and spectrum analysers and provides measurement routines optimised for speed and high data throughput.

The R&S SGT100A is an RF vector signal generator with an integrated baseband generator. It has been optimised for use in production and automated applications. Designed as a fast and compact, space-saving solution, it provides high speed to ensure optimised throughput and fits into any test system. The product is focused on automated environments.

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

ENCLOSED SWITCHMODE POWER SUPPLY

The Mean Well RST-5000 is a series of single output industrial switchmode power supplies with built-in PFC function and three-phase AC input, providing outputs of 24 and 48 VDC. The device features high efficiency of up to 91% and, due to the built-in fan, can provide full load output under an ambient temperature of 50°C.

Other features of the industrial power supply are the remote sense function, the remote on/off control, the 12 V/0.1 A auxiliary power, the alarm signal output for AC fail, DC ok, fan fail and overtemperature protection. Applications include automation equipment, industrial control equipment, laser engravers, telecommunication systems and any applications which need high operating power.

RS Components Pty Ltd
www.rsaustralia.com

INTEGRATED EQUIPMENT

CONNECTING FUTURE SOLDIERS

Wes Morgan*

With continuing developments in technology, a soldier's equipment must stay that much more ahead of these advances. Here are some big ideas for keeping the future soldier connected.

Utilising modern technology to build efficient integrated equipment, electronics manufacturers ensure that the future soldier maintains constant contact to receive crucial, mission-critical information. Today, it is imperative that military technology supports emerging high-speed protocols; and creates connectors that are faster, smaller and lighter-weight, with increased power and bandwidth for better transfer of intelligence - ultimately to maximise their chance of mission success.

Here are three of the most prevalent interconnect trends that are connecting the future soldier:

A movement towards miniaturisation/smaller form factors

Depending on the mission, today's soldiers carry an average load of 87 to 127 pounds on extended foot patrols. This, according to the Department of Defense, has resulted in increased musculoskeletal injuries. For every one-pound decrease off their equipment loads, they can shave two seconds off their time. In combat, those seconds can mean life or death.

The trend towards miniaturisation, including smaller form factors and low-profile connectors, allows for a soldier's physical load and cognitive burden to be significantly lighter, which can increase response time and range of motion and decrease fatigue. Design solutions for military applications should include customised interconnects made to the smallest form, so they fit into tighter spaces and accommodate a lighter equipment load without compromising power, performance, reliability and durability. ITT Cannon's Nano DD double-row connectors are used for military applications requiring high-bandwidth data transmission.

High-bandwidth transmission

Most military transmissions today require high bandwidth to deliver robust data applications. Connectors need to provide the electrical characteristics to deliver exceptional high-bandwidth performance in a durable, rugged design that withstands harsh, high-shock and high-vibration environments. Many connectors require 100% sealing for reliability in the harshest environments. Soldiers are rarely in one spot, and the industry is continuously moving towards more portable gear that can keep a soldier connected to a central communications hub. From GPS to thermal imaging, delivering reliable power and more mission-critical data in a lightweight, robust and integrated package helps lighten a soldier's physical load and helps her/him maintain contact with her/his team.

Future applications

There is an inherent need to continuously keep an eye on the future to ensure that connectors are also evolving and maturing with the latest technology. What is next in military applications? For a long time, the military has envisioned the implementation and use of wearable technology for a soldier's on-body gear that is still lightweight, durable, reliable and powerful. One of the most innovative applications in development is 'smart textiles' - more specifically, smart vests. The focus is on connectors integrated into the fabric of the vest, where most of a soldier's network is housed, further reducing weight and complexities of current military vests. Embedding customised lightweight connectors into clothing enables emerging applications such as biometric sensors and other bidirectional location applications.

A soldier's need to focus on the battlefield spurs innovation geared towards safety and greater mobility. By developing advanced technologies that offer reliable, robust, durable and powerful applications for the future solider, s/he can stay safe in the battlefield and improve mission success. The trends towards miniaturisation, high bandwidth transmission and development of future applications such as smart textiles help keep the future soldier connected so s/he can accomplish the objectives of a mission while keeping her/him out of harm's way.

*Wes Morgan is the director of product management at ITT Cannon and has been with the company for more than 10 years. Morgan has more than 20 years of experience in the aerospace industry, specialising in high-bandwidth interconnect systems, and holds degrees in industrial/data network engineering and business administration.

For more information, please contact Robin Pearce, Bishop & Associates via email at rpearce@bishopinc.com.

RUGGED TABLET

ADLINK Technology announces its IMT-1 Android 4.2 tablet, integrating the TI OMAP5432 1.5 GHz dual-core ARM A15 processor for high-performance computing power. Built-in WLAN or optional WWAN connectivity enables the product to access information in a wide variety of workplace scenarios.

The device features a 10.1″ capacitive touchscreen and built-in megapixel cameras on the front and rear. It is fully ruggedised, with IP54-rated structure delivering the durability to withstand drops up to 1.2 m (with optional protective housing). The display's ultrastrong Gorilla Glass is said to be virtually impervious to damage, able to flex on impact without shattering or scratching.

The unit supports 802.11 a/b/g/n protocols for fast wireless connectivity. The data-only modem supports the product on optional high-speed 3.5G HSPA+ or 4G LTE cellular connections. In the office or out in the field, with WLAN or optional WWAN connectivity, the tablet supports speedy data transfer and processing. The sunlight-readable display enables clear easy viewing even in bright outdoor environments.

The product's NFC reader/writer supports recognition of RFID tags (13.56 MHz) and a built-in standard SAM (secure access module) slot secures communication of encrypted data for sensitive and confidential applications.

ADLINK Technology Inc
www.adlinktech.com

WIRELESS LAB INSTRUMENT MANAGEMENT SOFTWARE

In traditional basic teaching labs, connecting instruments to a network is challenging. Building an internal network through cables is tedious, and most of the instruments do not have a LAN port. Tektronix TekSmartLab connects instruments to a network by converting USB ports to Wi-Fi ports.

The wireless lab instrument management solution supports up to 120 instruments (30 benches) on a single platform. Centralised configuration allows professors to load different course requirements and distribute them to up to 120 instruments with a single mouse click. Professors can easily check the instrument status and measurement contents to help with a specific test bench remotely and to save a student's measurement results into a report.

The product also improves overall lab management. In conventional teaching labs, asset managers must manually check and record information such as instrument model numbers, serial number and location. The solution automatically records and displays asset information every 30 s, including usage time. Just one click archives the asset and usage information.

A typical classroom test bench consists of an oscilloscope, function generation, digital multimeter and power supply. Most Tektronix and Keithley instruments intended for education applications are supported by TekSmartLab.

Vicom Australia Pty Ltd
www.vicom.com.au

EXTREME FANLESS RUGGED SYSTEM

Perfectron's EBX Extreme Rugged Fanless System, the SR100, is based on the Intel Haswell QM87 chipset and powered by Intel 4th generation Core i7/i5/i3 processor onboard. The product can operate effectively in harsh environments under temperatures from -20 to 60°C and is suitable for military, transportation, factory automation and digital signage applications.

The device is based on an EBX form factor with stackable PCIe/104 and FPE expansions, onboard Nano SATA(3.0)16/32 GigaByte SSD and Swissbit XR-DIMM up to 8 GB. It supports triple-display with 2x DisplayPort and 1x DVI-I, plus 2x GIGA LAN ports, 4x USB, 1x COM port and 2x mPCIe expansion slots. It supplies wide power voltage from 9 to 36 VDC and is designed for use in a range of industrial applications.

The product has soldered critical components, which can enhance its antishock and antivibration capabilities. The PCIe/104 and FPE connectors are suitable for high-end electronic equipment and use in extreme environmental conditions. With easy connect/disconnect and blind mating, the product has a functional life greater than 10,000 mating cycles.

The unit features I/O functionality by stacking with SK401, a PC/104 Universal Bus of Type 2. There are four-set SATA signals on the SK401 functioning through 2x main SATA signals. The SK401 supports operating systems including of Windows 7, Windows XP, Linux and DOS. The product supports DC input 9-36 V that protects the system from damage caused by unexpected voltage and current, ensuring it operates normally.

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

HART CONVERTERS, GATEWAYS AND I/O MODULES

The HART Field Communications Protocol extends the 4-20 mA standard to enhance communication with smart field instruments. The protocol preserves the 4-20 mA signal and enables two-way digital communications to occur without disturbing the integrity of the signal. Unlike other communication technologies, the protocol can maintain compatibility with existing 4-20 mA systems with a backward-compatible solution.

ICP DAS has developed a range of products, including HART converters, HART gateways and HART I/O modules. The converter can be used to access HART devices via COM, USB or ethernet interfaces. The gateway can integrate HART communication to different protocols such as Modbus and Profibus. The I/O module can be used to access or control HART devices directly.

The products allow users to easily and quickly integrate HART devices, allowing data acquisition into SCADA, HMI or PLC systems. This design feature allows users to widely integrate this device into a number of applications such as remote data acquisition, control, process automation and factory automation.

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

MULTI-OCTAVE SPIRAL ANTENNA

Steatite Q-par Antennas has released an ultrasmall multi-octave wideband 1-18 GHz left and right hand circularly polarised spiral antenna, suitable for applications where space and gain requirements are at a premium.

At a diameter of 78 mm, the antenna provides good return loss; gain and axial ratio over the full 1-18 GHz operational band; and suitability for satisfying challenging applications including ELINT and COMINT systems, radar warning receivers systems and spectrum management antenna arrays.

Test & Measurement Australia
www.tandm.com.au

SMPM AND SMP RF CONNECTORS

The increasing need for higher density and lighter weight electronics within today's systems requires compact connections. Molex's SMPM RF Blind-Mate board-to-board and cable connections deliver the required density in a high-performance connector. Providing good frequency performance from DC to 65 GHz, the SMPM connector also compensates for the axial and radial misalignment issues inherent with board-to-board mating.

The company's SMP subminiature connectors offer good performance from DC to 40 GHz. PCB-mount, cable-mount and in-series adapters provide an interconnect solution for board-to-board and blind mate applications while maintaining package density. SMP connectors are also available in multiport solutions. Interface styles include smooth, limited detent and full detent to cover a wide range of applications.

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

the GRUMPY page

Mike Smyth, specialist technical writer

Going to the cinema used to be an evening of excited anticipation before electronic technology came in and blurred the boundary between showmanship and technical wizardry. Once upon a time you got a whole evening's entertainment with two or three films. Admittedly, most of the films were in black and white and the screen was small. Sound came from a couple or more of casually placed large public address speakers that carried no threat of damage to the human auditory equipment. Yet despite this comparatively low tech, an allusion was preserved.

A colour film was an event indeed and a blockbuster with well-known actors usually attracted queues round the building. They were the days when cinemas had commissionaires, resplendent in outrageous uniforms with enough gold braid to make African dictators look badly underdressed.

Inside was hushed opulence with thick carpet and lot of gold and red. The box office was a discrete window behind which sat a uniformed girl in front of a flat metal desk that opened its tiny mouth and disgorged a ticket that was then pushed to you after money had been exchanged. Smart, uniformed usherettes held open the doors to the auditorium and another girl armed with a torch would escort you to a seat to which you shuffled in front of those already seated making apologies and banging knees as you went. There was a fug of cigarette smoke, which the projector somehow managed to penetrate, and there was the constant rustle of confectionery being unwrapped and low undertones of conversation.

The cheapest seats were at the front of house and prices gradually increased the further you were from the screen until the dress circle was for the man impressing his girlfriend for the first time.

The back seats of the stalls were unofficially reserved for the testosterone-charged couples who could entwine and quietly cavort without disturbing those behind them and not care if there was a film or not.

The average cinemagoer sat back and enjoyed two full-length films, a newsreel and perhaps a short feature on some obscure topic such as beekeeping for the suburbanite living on the tenth floor of a block of units. Then, very occasionally, up through the floor appeared the Wurlitzer organ, lit up like a fairground and already playing, followed by a short performance that enraptured the audience. And while all this was going on, the prettiest usherette with a spotlight full on her would be trolling the aisles offering ice creams, confectionery and cigarettes.

As technology moved on, along came the wide screen, which was impressive so long as you were not in the first few rows - in which case you went home with more or less permanent damage to your neck. Then we had stereo sound and 3D pictures for which we wore those awful glasses. And now we have surround sound, set at a volume that brings pain to the ears and a reverberating bass that shakes the whole body and fills your mouth with tooth fillings or dental plates. Clever it may be, but does the audience really care about the sound running up the aisles or is this the Luddite speaking?

If the beginnings of today's films are tedious, the ends are positively boring. At the start we are shown the name of the major studio followed by 'presented by' followed by 'in collaboration with' followed by 'a film by' ... well you get the picture (so to speak). The program begins and then over the action come the credits of director and producer and main players in a sequence that can go on for minutes - an irritating distraction. And in the end who cares?

But the end of the program is another story with up to five minutes of closely worded and barely readable credits, including accolades to such worthies as best boy, chief wrangler, carpenter, animal trainer and the name of the catering company that fed the crew during filming. This religious ritual is usually played out to an auditorium that has long been abandoned by the audience. Maybe more films and fewer promotions would bring back some of the past glory of the cinema or is that going too far?

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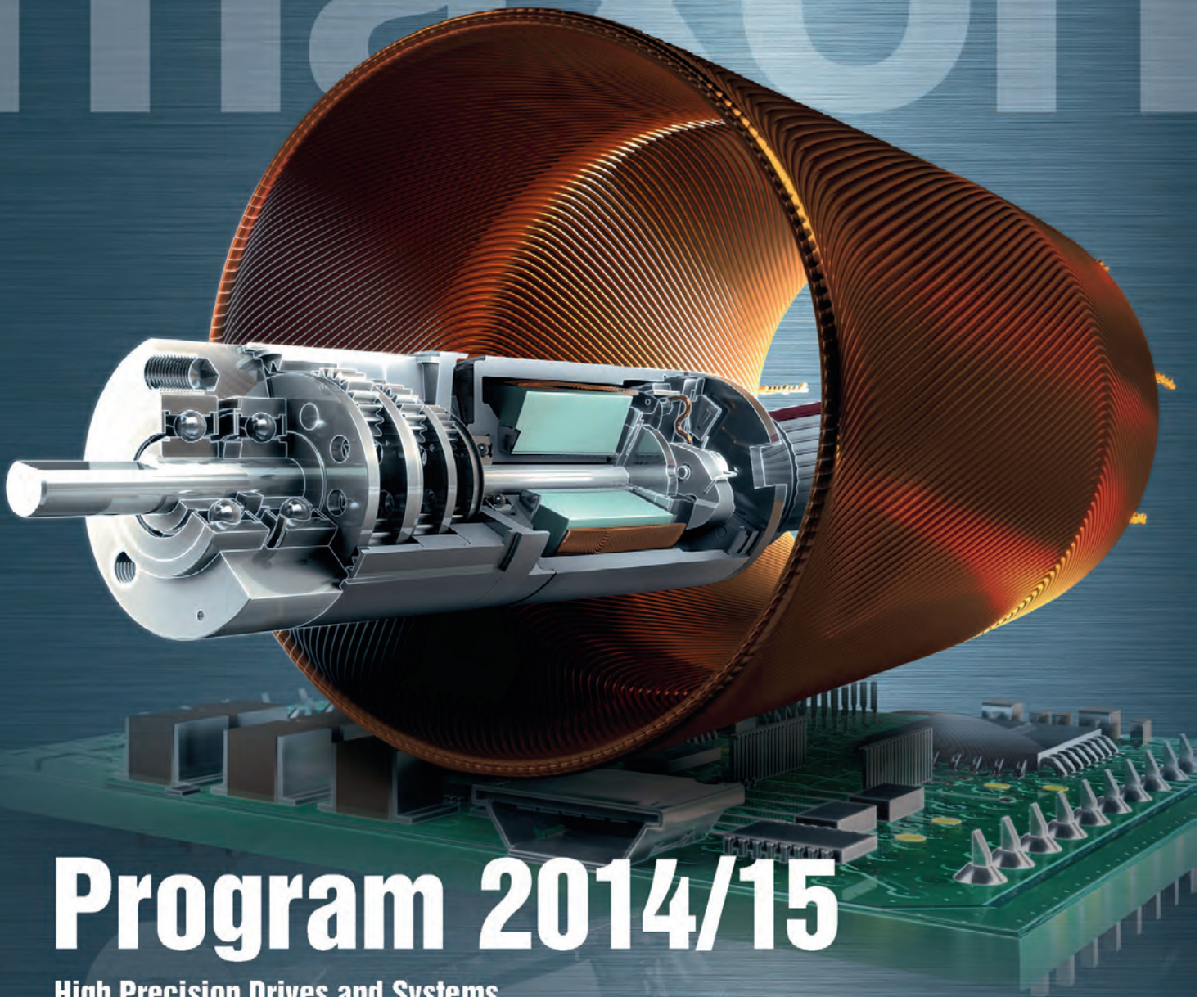38 Testing/Certification (eg NATA)
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