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WHAT'S NEW IN ELECTRONICS
NOVEMBER/DECEMBER 2015

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COVER STORY



Keysight Technologies has added six millimetre-wave models to its family of FieldFox handheld analysers. FieldFox can replace three or four single-function instruments — benchtop or handheld — that are typically used for maintenance and troubleshooting of systems that operate at or above Ka-band frequencies.

Three combination-analyser models cover 32, 44 or 50 GHz and provide spectrum analysis, vector network analysis and cable and antenna testing in a rugged, portable unit.

In all six new models, spectrum measurements are up to eight times faster than those made with comparable analysers.

The FieldFox family is optimised for field testing. The fully sealed enclosure — no fans or vents — is compliant with US MIL-PRF-28800F Class 2 standards and is also type tested to meet MIL-STD-810G requirements for operation in explosive environments (Method 511.5, Procedure 1). FieldFox analysers are also type tested to meet IEC/EN 60529 IP53 requirements for protection from dust and water.

The analysers offer a broad array of functionality that is software upgradeable, enabling users to choose the capabilities they need initially and add others later. Examples include: vector voltmeter, TDR cable measurements, built-in power meter, pulse measurements, spectrum analyser time gating, interference analyser with spectrogram and GPS receiver.

More information is available at www.keysight.com/find/first50.

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POWER SUPPLY REQUIREMENTS

FOR MEDICAL APPLICATIONS

Bianca Aichinger

In order to keep up with the latest medical technology developments, the International Electrotechnical Commission revised the IEC60601-1 standard for medical electrical equipment in 2012. The IEC also revised its IEC60601-1-2 collateral standard in 2014 with an aim to prevent any health hazards from EMC-related issues. This article provides insights on how power supplies are affected by these revisions.

Medical technical devices are designed to provide best patient care and to promote fast, and preferably full, recovery. The relevant safety requirements are laid down in the highly complex and comprehensive IEC 60601-1 standard 'Medical electrical equipment — Part 1: General requirements for basic safety'. As technology progresses, this standard is regularly revised and updated. A complete revision of the standard was completed in 2012.

IEC 60601-1 3rd edition

The 3rd edition of IEC 60601 focuses on the safety of operating personnel and patients. To assess medical electrical equipment, a new classification system (MOP — means of protection) has been introduced. The standard distinguishes between the safety of the operator and the safety of the patient, whereby the safety requirements for operators (MOOP — means of operator protection) are slightly less onerous than those for patients and correspond more or less to those laid down in EN 60950-1 'Information technology equipment — Safety'.

Much more stringent requirements apply to patient protection (MOPP — means of patient protection), especially as regards insulation (see table 1). To protect patients against electric shocks, two separate insulation barriers must be implemented in all medical electrical equipment.

Minimum leakage and stray currents

We all know that electric currents through the body are extremely dangerous and often result in death. For a healthy person, currents as low as 40 mA could be fatal. For a person who is anaesthetised or weakened by an illness, this threshold is likely to be much lower.

To protect patients, power supplies for medical devices must meet stringent requirements as regards leakage and stray currents. The limit values vary depending

on the type and nature of applied part (AP) that is brought into direct contact with the patient's body. Table 2 shows the applicable limits for normal condition (NC) and single fault condition (SFC).

Medical devices safety classification — CF, BF and B

Type CF (Cardiac Float) is the most stringent classification. It applies to all applications where the applied part is in direct conductive contact with the heart or could come into such direct contact in the event of a device fault. Such parts include, for instance, heart-lung machines and external pacemakers.

The next class is BF (Body Float), with slightly fewer onerous requirements. It covers applied parts other than CF parts that are in direct contact with the patient. In this class, we find incubators, ultrasound equipment and various diagnostic devices.

Class B (Body) covers applications where the equipment does not come into direct contact with the patient, such as LED lighting systems, medical lasers, etc.

Type B applied parts may be connected to earth, while Type BF and CF are 'floating' and must be separated from earth.

EMC regulations to become more stringent

When it comes to life-supporting or life-saving devices, faults and malfunctions caused by electromagnetic or radio interference could obviously be fatal. In order to prevent any such incidents, a completely revised version of the IEC60601-1-2 'Medical electrical equipment — Part 1-2: General requirements for basic safety and essential performance — Collateral standard: Electromagnetic disturbances — Requirements and tests' was introduced in early 2014.

Isolation requirements	MOOP			MOPP		
	Clearance	Creepage	Insulation voltage	Clearance	Creepage	Insulation voltage
Basis (1xMOP)	2,0 mm	2,5 mm	1500 VAC	2,5 mm	4,0 mm	1500 VAC
Reinforced (2xMOP)	4,0 mm	5,0 mm	3000 VAC	5,0 mm	8,0 mm	4000 VAC
Basis (1xMOP)	1,0 mm	2,0 mm	1000 VAC	1,0 mm	2,0 mm	1500 VAC
Reinforced (2xMOP)	2,0 mm	4,0 mm	2000 VAC	2,0 mm	4,0 mm	3000 VAC

Table 1: Insulation requirements for class up to 250 VAC and class up to 43 VDC or 30 VAC (grey boxes)

Stray current	Type B		Type BF		Type CF	
	NC	SFC	NC	SFC	NC	SFC
Ground	500 µA	1 mA	500 µA	1 mA	500 µA	1 mA
Housing	100 µA	500 µA	100 µA	500 µA	100 µA	500 µA
Patient	100 µA	500 µA	100 µA	500 µA	10 µA	50 µA

Table 2: Limit values for stray currents by device category

The US Food & Drug Administration (FDA) has already decided that the new rules are to be implemented in the national legislation, which will happen on 1 April 2017. In Europe, the European Committee for Electrotechnical Standardization (CENELEC) has made it clear that it intends to adopt the IEC standard as the basis for a new European standard. While no deadline has yet been set, it is expected that the new regulations will come into force in 2017/2018.

While the 3rd edition of the IEC standard on EMC distinguished between life-supporting and non-life-supporting equipment, this distinction is now gone. For the new standard, only the application environment of the equipment is relevant. It distinguishes between three such environments to which different limit values apply: healthcare establishments; domestic environment; special environments (eg, army, heavy industry).

The 4th edition stipulates much more stringent requirements as regards electromagnetic immunity. Equipment must now be immune to HF fields up to 2.7 GHz, an increase by 0.2 GHz. In addition, the standard wants to prevent damage caused

by electrostatic discharge, and the relevant limits have been increased accordingly. For contact discharge, the threshold went up from 6 to 8 kV. For air discharge, it has been increased from 8 to 15 kV. Table 3 provides an overview of the main changes affecting power supplies.

Risk management files

Apart from technical changes, the new standard now demands a formal risk analysis according to ISO 14971, which might pose a challenge to certain power supply manufacturers. Based on a risk index matrix, all risks that might potentially arise from the power supply must be analysed and weighed. The matrix must take into account the occurrence, probability (unlikely to frequent) and impact (insignificant to catastrophic) of the potential risk, based on a rating system from 1 to 5 in each category. If the risk index is ≤ 6 (probability x impact), the risk is deemed acceptably low. If the risk index is higher, suitable protection measures must be taken to reduce it.

For power supply manufacturers, these risks are often difficult to assess as the end device, which obviously has a major influ-

ence on the risk level, is often not known. When purchasing a power supply, medical devices suppliers are advised to obtain the respective risk management reports from the power supply manufacturer. Only if these documents are in place is it possible to deal with the power supply as a 'black box', which speeds up the certification process for the actual medical technical device.

Power supplies for medical technical equipment

In order to meet the above requirements, in particular with regard to insulation and leakage currents, a combination of high-quality AC/DC power supplies for medical application and DC/DC converters is often the most efficient solution. This approach makes it easier to meet the stringent requirements of double patient protection (2x MOPP).

RECOM offers a broad range of products that are certified for use in medical electrical equipment. Apart from DC/DC converters from 0.25 to 15 W, the company also manufactures AC/DC power supplies for power ranges up to 150 W. They are certified according to EN/UL 60601-1 3rd edition and EN/UL 60950-1, and do not contain any hazardous substances according to the RoHS2 and REACH Directives. Another plus is the 5-year warranty that RECOM grants on all these products.

**Bianca Aichinger is Product Marketing Manager at RECOM Power GmbH in Gmunden, Austria. She studied at the Linzer Technikum HTL in Austria, where she qualified as a certified electrical engineer, majoring in Energy Technology and Industrial Electronics. She joined RECOM straight after graduation - she worked in the Technical Support and Marketing Divisions and provided technical marketing services. She is responsible for the scheduling of new product introductions, ensuring that the technical press has the latest information, technical articles and advertising in time for product releases. Besides organising RECOM's press releases, she regularly publishes her articles in well-known electronics magazines.*

RECOM Asia Pte Ltd
www.recomasia.com

Immunity Test	Standard	IEC 60601-1-2; 3rd Edition	IEC 60601-1-2; 4th Edition	
			Prof. Healthcare Environment	Home Healthcare Environment
ESD	IEC 61000-4-2	8kV Air Discharge (max) 6kV Contact Discharge	15 kV Air Discharge (max) 8 kV Contact Discharge	
Radiated Immunity	IEC 61000-4-3	3V/m - Non Life Support 10V/m - Life Support	3V/m	10V/m
		80MHz - 2.5 GHz 80% @ 1kHz AM Modulation	80MHz - 2.7GHz 80% @ 1kHz AM Modulation	80MHz - 2.7GHz 80% @ 1kHz AM Modulation
Magnetic Immunity (50/60 Hz)	IEC 61000-4-8	3 A/m	30A/m	
Conducted Immunity	IEC 61000-4-6	3V (0.15 - 80 MHz) 10V ISM Bands (life support)	3V (0.15 - 80 MHz) 6V (ISM Bands)	3V (0.15 - 80 MHz) 6V (ISM + Amateur)
Voltage Dips	IEC 61000-4-11	UT < 5%; 0.5 periods	UT = 0%; 0.5 cycle At 0, 45, 90, 135, 180, 225, 270 and 315 degrees	
		70% UT; 25/30 periods	0% UT; 1 cycle and 70% UT; 25/30 cycles Single phase: at 0 degrees	

Table 3: Changes in IEC60601-1-2 relevant to power supplies

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PERFORMANCE OPTIONS FOR DC POWER SUPPLIES

Keysight Technologies has introduced four performance options for its Advanced Power System (APS) N6900 Series DC power supplies. In conjunction with the power supplies' VersaPower architecture, the options boost test-system versatility and make it easy for test engineers to tune power supply capability.

The options include: an accuracy package, which adds a second seamless measurement range for current with full factory calibration; measurement enhancements, which add external data logging and voltage and current digitisers with programmable sample rates; source and speed enhancements, which add constant-dwell arbitrary waveforms and output list capability and provide improvement in up/down programming time; and disconnect and polarity-reversal relays, which allow engineers to switch voltages between positive and negative values.

The options are said to enable engineers to integrate and deploy their test systems faster while achieving test speeds that are up to 100 times faster than is possible with standard system power supplies. The faster throughput speeds can help manufacturers reduce test costs, while the smaller size of the power supplies saves rack space.

The power supplies allow engineers to characterise DUT power profiles. They can perform dual voltage and current measurements with DMM-like accuracy; make dynamic measurements with high-resolution digitisers for current and voltage (with measurement option); and measure power, peak power, watt hours and amp hours.

Keysight Technologies Aust Pty Ltd
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INDUSTRIAL M2M GSM ETHERNET ROUTER/MODEM

Providing high-end features specifically for industrial protocols, the Red Lion SN/RAM 3G/4G modems are built tough to withstand any industrial environment.



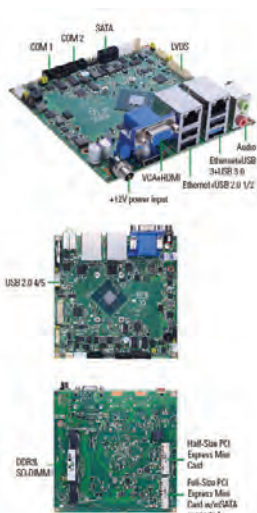
Web accessibility demands a high security level and is typically managed through third parties via VPN connections as a monthly fee. By offering self-managed VPN capabilities, Red Lion removes any need for third parties. Data encryption, stateful firewall configuration and other comprehensive router features are easily accessed and included.

With a robust DIN rail metal enclosure and the option of PoE power if required, the series can operate in extreme temperatures of -30 to +75°C. The series has the option of one or five ethernet ports, including 3G/4G connectivity, and accommodates industrial protocols such as Modbus/DNP3 pass-through.

In the event of the 3G/4G network failing, the RAM series will store critical site data via DNP3 registers until the cellular network is restored, repopulating the missing data back into SCADA and thereby ensuring the data's integrity is at the highest level.

The modems are suitable for deployment in industrial M2M networks such as water/wastewater, transportation, energy utilities, logistics, manufacturing, mining and energy management. With consistent network extensions to remote locations, the product saves wiring time, space and cost by combining separate functions into one cellular device.

Control Logic Pty Ltd
www.control-logic.com.au



MOTHERBOARD

Axiomtek has released NANO840, a compact, low-power Nano-ITX board based on the quad-core SoC Intel Atom processor E3845 or dual-core E3827 with one DDR3L 1066/1333 up to 8 GB memory.

The Intel Bay Trail industrial motherboard is capable of operating under wide temperatures from -40 to +80°C in fanless operation, which is designed for working in harsh environments. It comes with multiple display outputs — HDMI, LVDS and VGA — with visual experiences enhanced for dual-view supported.

The 120 x 120 mm embedded board requires 12 VDC power input. It is suitable for applications requiring a power-optimised and rich-I/O platform, such as high-end medical imaging, digital signage, kiosks/POI, thin clients and gaming machines.

The fully integrated motherboard provides two PCI Express Mini Card expansion interfaces for network connection. One of the PCI Express Mini Card slots supports an mSATA interface to provide an additional storage option. The board not only provides protection against dust and noise, but also the flexibility to design rugged systems.

The single-board computer comes with five USB 2.0 ports, one USB 3.0 port, one RS232/422/485, one RS232, dual gigabit LAN ports, SATA-300 port, two PCI Express Mini Card slots and HD audio. The built-in watchdog timer keeps the system running smoothly. The platform runs well with Windows 7 and 8 operating systems.

Braemac Pty Ltd
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The PBI6C Series feature single channel output powers of 50W to 150W, in outputs of 12V, 15V, 24V and 48V with universal input voltage. The unit operates at full load at 50°C and can operate up to 71°C with its standard Convection Cooling.

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HIGH-SPEED CONNECTOR DESIGN

Ryan Satrom, Signal Integrity Engineer, Omnetics Connector Corporation

PART 1

High-speed digital connectors have the same requirements as any other rugged connector — for example, they must meet specifications for shock, force, insertions and vibration. There are, however, additional requirements that must be addressed in order to ensure proper performance for high-speed applications.

With gigabit data rates through connectors now commonplace, the parameters that impact high-speed digital performance must be understood by both connector manufacturers and connector users. This is the first in a series of three articles that aim to help readers better understand the critical concepts and parameters that must be considered for high-speed connector design.

Introduction

Breakdown of the old order

For low-speed signals, the connector and cable can be adequately modelled as a small resistor. This resistor will accurately represent the loss that is created due to the length and diameter of the path. As speeds approach the high-speed regime (generally 100 Mbps+), a small resistor will no longer accurately model the electrical performance. Being able to understand and accurately predict the performance will require a paradigm shift in how electrical signals are viewed.

Paradigm shift

Electrical signals are actually electromagnetic waves that traverse down a signal path. At low speed, the electromagnetic waves can be simplified by using circuit theory — the wave can be modelled as a voltage across/current through the path, with an instantaneous transfer rate. This is modelled with the simple

resistor discussed above. This model, however, breaks down at high speed, and understanding this requires a new way of thinking about electrical signals.

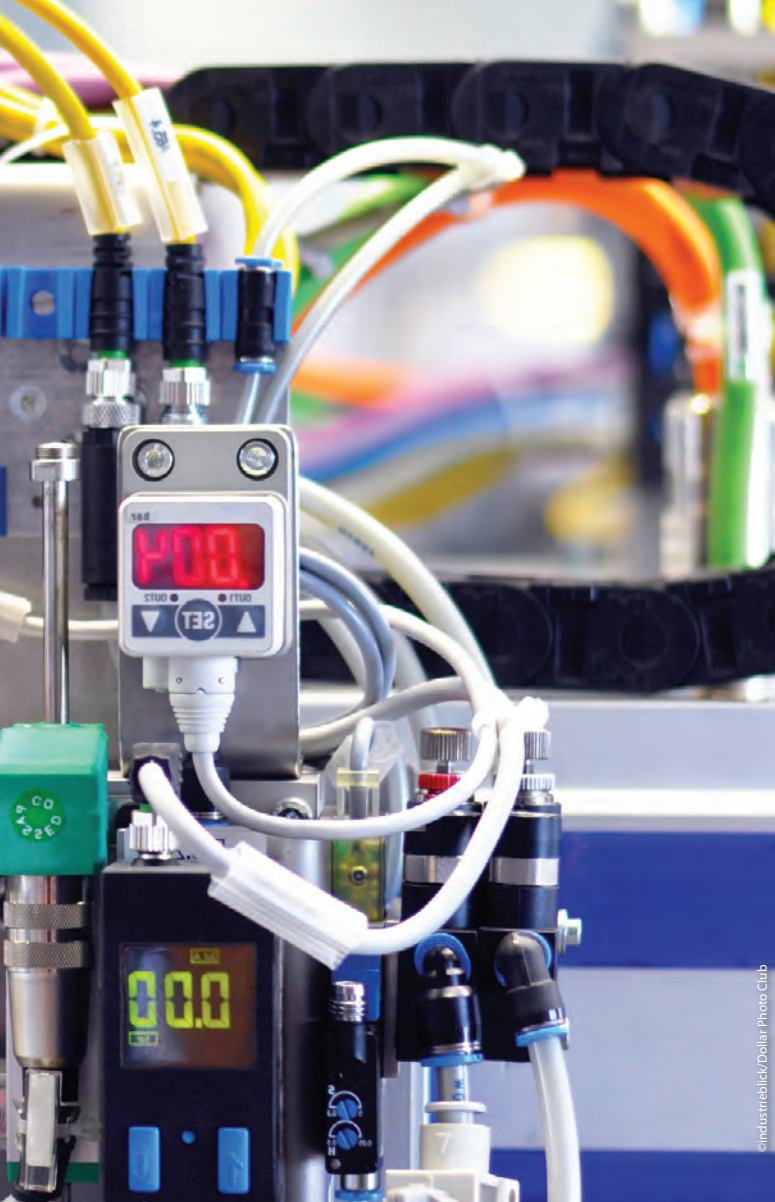
Fluid flow analogy

High-speed signals must be viewed as waves. A simplified understanding of this signal-as-a-wave concept can be obtained by using a fluid flow analogy. As a wave travels through a pipe, a portion of the wave will reflect back every time the pipe diameter changes. Thus, optimal fluid flow is achieved with a pipe that has a constant diameter. If the pipe diameter is constantly changing, large portions of the wave will reflect and the efficiency of the pipe will decrease.

The performance of the pipe is analogous to the performance of a high-speed signal path in a cable/connector assembly, with the critical parameter in a signal path being impedance instead of diameter.

What is impedance?

In its most basic definition, impedance is the ratio of the voltage to the current of a signal path. Like the diameter of the pipe in the fluid flow analogy above, the impedance of a signal path is defined by the cross-sectional geometry at any point along the path. This is an important point that bears repeating — impedance is specific to each point along a signal path. An ideal signal path maintains a constant impedance — like a



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constant diameter of a pipe — throughout the path. The optimal impedance is defined by each specific application, but the most common impedance is 100 Ω .

Analog and digital specifications

We live in a digital world. From phones to tablets to automobiles, digital electronics are everywhere. Our world is so strongly shaped by digital electronics that analog electronics are often considered a thing of the past. This perception, however, is untrue.

Every piece of digital information was at some point converted from an analog signal. The relationship between digital and analog signals must be understood in order to interpret many of the latest high-speed connector specifications. Since there is no standard method for specifying connector high-speed performance, some connectors are specified as analog frequencies (MHz/GHz), while other connectors are specified as digital data rates (Mbps/Gbps). This often leads to much confusion among those who are trying to procure the proper connector for their application.

Determining frequency specifications

Maximum frequency specifications are determined from insertion loss measurements. Insertion loss measures the amount of a signal that transmits through a path across all critical frequencies, typically expressed in decibels (dB). Specifications are



SINCE THERE IS NO STANDARD METHOD FOR SPECIFYING CONNECTOR HIGH-SPEED PERFORMANCE, SOME CONNECTORS ARE SPECIFIED AS ANALOG FREQUENCIES (MHZ/GHZ), WHILE OTHER CONNECTORS ARE SPECIFIED AS DIGITAL DATA RATES (MBPS/GBPS).

determined by the maximum frequency that can pass a signal with a predetermined amount of loss, typically between -3 and -8 dB.

Deriving data rate specifications

Maximum data rate specifications are derived from insertion loss measurements. Data rate specifications cannot be explicitly measured, so deriving data rate specifications requires approximations. For most applications, specifications are approximated by multiplying the maximum frequency by a factor of two.

Performance varies based on application

Specifications are best used as first order approximations. Creating a specification requires the manufacturer to make assumptions about the end application. There are four main application-specific variables that must be understood:

1. **Path topology.** Specifications must assume a particular path. Some specifications represent a cable/connector assembly, while others depict a mated connector pair without a cable.
2. **Maximum allowable loss.** Specifications must assume a specific amount of loss through the assembly, but this loss value likely differs from the loss required for a specification application. With allowable loss varying from less than 1 dB of loss all the way up to 20 dB, the actual loss requirement will have a significant impact on the maximum data rate.
3. **Actual cable length.** Specifications must assume one specific cable length, but the length used will likely differ from the actual length. Shorter cable lengths will increase the maximum data rate, while longer cable rates will decrease the rate.
4. **Expected output waveform.** Most specifications assume a somewhat rounded output waveform, but some applications have more sensitive circuitry that require an output that more accurately represents a square wave. For these waveforms, the maximum data rate is often derived by multiplying the frequency by a factor smaller than one.

Since each connector manufacturer specifies performance differently, it is important that the both the specification values and the characterisation methodologies are both understood and scrutinised. Some manufacturers use conservative specification methods, while others use aggressive. A higher specification value does not necessarily mean a higher performing connector.

Clarke & Severn Electronics
www.clarke.com.au



QUAD-CORE INDUSTRIAL MINI-ITX MOTHERBOARD

Axiomtek has launched the MANO842 industrial Mini-ITX motherboard, featuring quad-core SoC, fanless design and 12 VDC/STD ATX power input. It is equipped with a quad-core Intel Celeron J1900 processor with Intel HD Graphics engine, delivering good computing, graphics and media performance.

The industrial-grade motherboard utilises high-bandwidth DDR3L-1333 SO-DIMM with system memory up to 8 GB and a rich set of I/O features. With 12 V single-voltage DC power or STD ATX jack, the device can be applied to automation and embedded industries, including health care, in-vehicle infotainment, kiosk, digital entertainment, digital signage, POS and much more.

Measuring 170 x 170 mm, the device is tailored for space-concerned applications and thermal solutions. With one PCIe x1 slot, one PCI Express Mini Card interface and one mSATA socket, the motherboard can fulfil a range of expansion needs. Various display interfaces support dual-view via VGA, HDMI and 18-/24-bit dual-channel LVDS to meet the demand of high-quality output.

The product is suitable for handling demanding HD video formats for immersive multidisplay applications and environments. The board offers good connectivity, including six USB ports, six COM ports, one PS/2, one digital I/O and two Gigabit Ethernet ports. The built-in watchdog timer controls the embedded board, recovering and resuming playback from power, network or other disruptions to successfully avoid permanent crash.

Braemac Pty Ltd

www.braemac.com.au



INTEGRATED FADER FOR LTE-A

Anritsu has integrated channel-fading simulation into its 4G LTE-Advanced Signalling Tester (base station simulator), the MD8430A. The digital baseband fading options convert the product into a full-featured fading simulator supporting industry-standard 3GPP-defined fading profiles.

The fading options can be combined with the

MD8430A, cutting the need for investment in additional hardware to perform signalling tests under realistic radiofrequency (RF) conditions. This is the first LTE-Advanced signalling solution with built-in fading supporting the 4x4 MIMO downlink configuration, according to the company.

Using internal digital baseband processing, the MD8430A applies multipath effects during test execution, and the Rapid Test Designer (RTD) software provides testers with an integrated environment for creating and running fading simulation tests. Support for LTE-Advanced features, such as Carrier Aggregation and MIMO, make the product suitable for helping chipset designers build the next generation of high-performance mobile devices.

In addition to testing devices over an RF connection, the MD8430A with fading option also supports a slow-clock digital interface to verify designs in a simulation environment before starting ASIC production.

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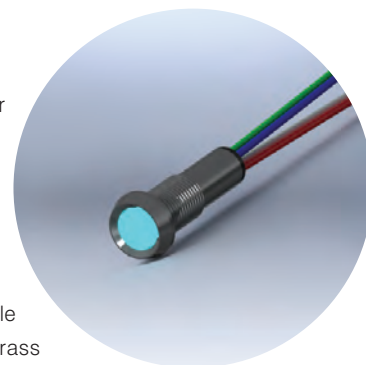
LED PANEL INDICATOR

The Marl 525 Series LED panel indicator is suitable for a wide range of security and flood lighting applications, eg, task lighting of door areas in small industrial units. Its dimensions are 300 x 90 mm, excluding a sturdy adjustable mounting bracket which is supplied with each unit.

The multicoloured, high-intensity LED range is available in several colour options. It features nickel-plated brass housing, a white diffused flat lens and four coloured flying leads. The vibration-resistant, vandal-resistant units are sealed to IP67.

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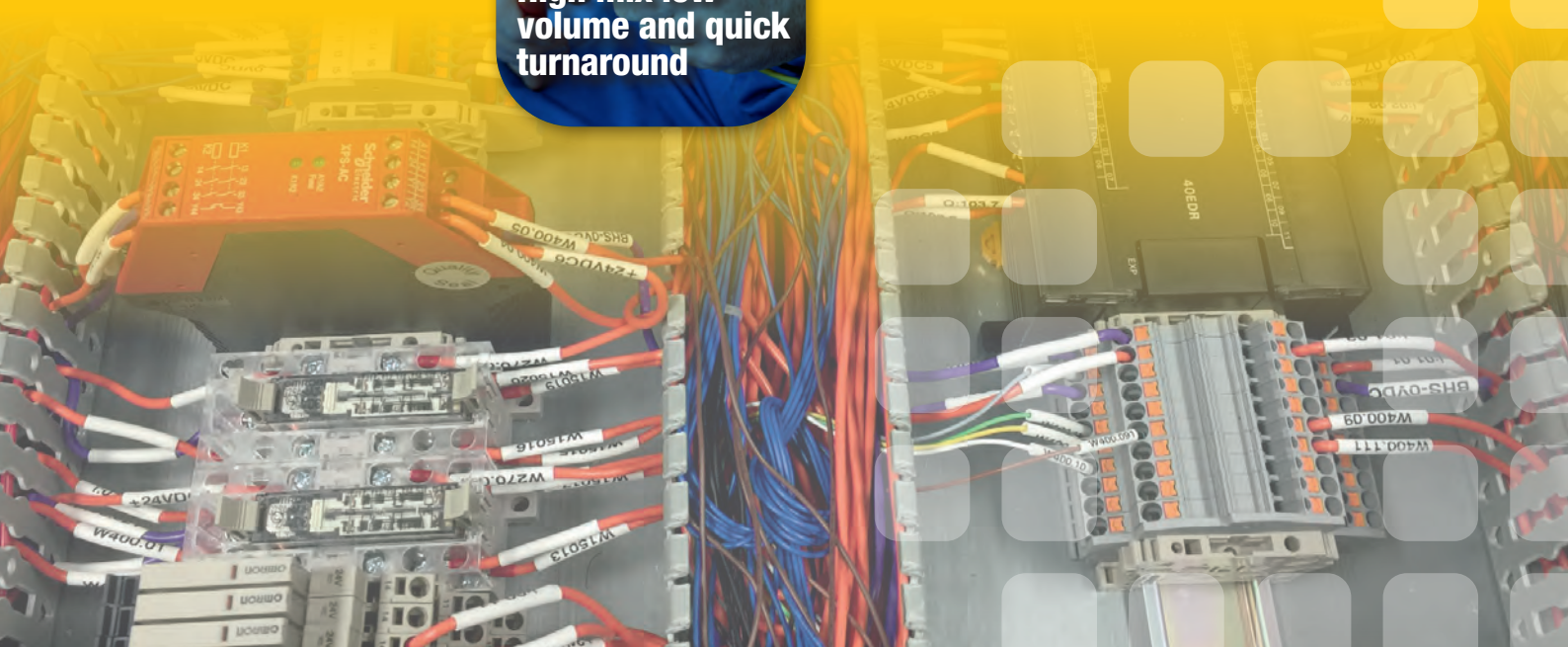
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DC-DC FRONT-END MODULE

Vicor Corporation has introduced its VIA BCM K=1/8 DC-DC bus converter module. Operating from a 380 VDC nominal input and delivering an isolated SELV 48 V output, the product provides functional integration in a 9 mm-thin, thermally adept module incorporating EMI filtering, transient protection and inrush current limiting.

The company's MHz frequency, soft-switching bus converter technology enables DC-DC front ends with good density and efficiency. The modules can be paralleled to provide multi-kW arrays, provide bidirectional power processing and support PMBus digital communication capabilities. Utilising robust high-voltage DC (HVDC) power conversion technology, the modules are suitable for HVDC distribution in data centres, microgrids, ICT equipment, ATE and industrial systems.

The modules enable designers to create dense, efficient, flexible and scalable power systems. They integrate system functions including EMI filtering, transient protection and inrush current limiting to reduce design time and design risk. Available in chassis-mount and PCB-mount configurations, the power modules support a variety of mechanical mounting and thermal management options.

Vicor Corporation

www.vicor-asia.com



TOOL MODULES FOR INDUSTRIAL ENGINEERING PROFESSIONALS

RS Components has announced an extensive portfolio of tool modules offering a professional solution for electrical engineers, mechanics and maintenance engineers working in environments such as garages, workshops and factories. The range includes a selection of toolset modules, making it easy to populate a trolley-type storage cabinet to suit individual user requirements.

There are 18 tool modules available in the range, with options such as a 39-piece screwdriver and bit set, 29-piece socket set and a 16-piece spanner set, as well as other modules including pliers, crimpers/strippers, files and hex keys, among others. All the toolsets are stored in double-colour EVA-foam material modules and feature individual cut-outs for each tool, so it is easy to spot if a tool is missing.

Rounding out the portfolio are two RS-branded toolkits: a 43-piece kit that comprises tools such as screwdrivers, pliers and spanners, as well as chisels, a hammer and a hacksaw; and a 31-piece electrician's toolkit that has a range of VDE 1000 V insulated tools including pliers, a series of screwdrivers and a voltage tester.

RS Components Pty Ltd

www.rsaustralia.com

3D PRINTER

The Airwolf AXIOM 3D printer combines the versatility of printing in over 40 thermoplastic materials and a build volume of over 16,000 cm³ to offer a high-performance desktop 3D printer for manufacturing high-precision prototypes and custom functional parts.

AXIOM's fully enclosed chamber and heated bed ensure a consistent heat environment and minimal warpage when printing large parts and enable a high-resolution output with layer heights as low as 40 µm. The product's 315°C hot end supports a range of over 40 thermoplastics — from low-temperature materials like TPU and PLA through to high-temperature materials like nylon and polycarbonate.

Ease of use has been paramount in the design. Prior to every 3D print, the product's four-point print bed auto-levelling system automatically calibrates the print bed, ensuring the proper initial layer height and orientation, and then actively maintains that levelling throughout the entire print process. The Easy Feed filament system automatically draws filament into its print head, reducing jamming and blockages. The CoreXY motion control system is said to allow faster movement than gantry systems, providing a print speed of 250 mm/s and precise control of the print head.

Emona Instruments Pty Ltd

www.emona.com.au





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In 2016, for the first time, Comms Connect Wellington, in association with the Radio Frequency Users Association of New Zealand, joins the line-up, ensuring users and industry across the region have access to some of the very latest technologies and expertise currently available.

We are seeking case studies and technology presentations for inclusion in conference programs throughout 2016 and would like to hear from you if you are interested in sharing your knowledge and expertise with attendees.

First and foremost, we seek New Zealand-focused case studies for Comms Connect Wellington, 14-15 April 2016, Museum of New Zealand Te Papa Tongarewa.

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FIRST OPTICAL RECTENNA

CONVERTS LIGHT TO DIRECT CURRENT

The first optical rectenna, a device that combines the functions of an antenna and a rectifier diode, can convert light directly into direct current.

The device, developed by researchers at the Georgia Institute of Technology, could provide a new technology for photodetectors that would operate without the need for cooling, energy harvesters that would convert waste heat to electricity and ultimately, for a new way to efficiently capture solar energy.

"We could ultimately make solar cells that are twice as efficient at a cost that is 10 times lower, and that is to me an opportunity to change the world in a very big way," said Baratunde Cola, an associate professor in the George W. Woodruff School of Mechanical Engineering at Georgia Tech.

"As a robust, high-temperature detector, these rectennas could be a completely disruptive technology if we can get to 1% efficiency. If we can get to higher efficiencies, we could apply it to energy conversion technologies and solar energy capture."

In the new optical rectennas, the carbon nanotubes act as antennas to capture light from the sun or other sources. As the waves of light hit the nanotube antennas, they create an oscillating charge that moves through rectifier devices attached to them. The rectifiers switch on and off at record high petahertz speeds, creating a small direct current.

Billions of rectennas in an array can produce significant current, though the efficiency of the devices demonstrated so far remains below 1%.

The researchers hope to boost that output through optimisation techniques and believe that a rectenna with commercial potential may be available within a year.

Developed in the 1960s and 1970s, rectennas have operated at wavelengths as short as 10 microns, but for more than 40 years researchers have been attempting to make devices at optical wavelengths. There were many challenges: making the antennas small enough to couple optical wavelengths and fabricating a matching rectifier diode small enough and able to operate fast enough to capture the electromagnetic wave oscillations. But the potential of high efficiency and low cost kept scientists working on the technology.

"The physics and the scientific concepts have been out there," said Cola. "Now was the perfect time to try some new things and make a device work, thanks to advances in fabrication technology."

Using metallic multiwall carbon nanotubes and nanoscale fabrication techniques, Cola and collaborators Asha Sharma, Virendra Singh and Thomas Bougher constructed devices that utilise the wave nature of light rather than its particle nature. The devices operated at a range of temperatures from 5 to 77°C.

Fabricating the rectennas begins with growing forests of vertically aligned carbon nanotubes on a conductive substrate. Using atomic layer chemical vapour deposition, the nanotubes are coated with an aluminium oxide material to insulate them. Finally, physical vapour deposition is used to deposit optically transparent thin layers of calcium then aluminium metals atop the nanotube forest. The difference of work functions between the nanotubes and the calcium provides a potential of about two electron volts, enough to drive electrons out of the carbon nanotube antennas when they are excited by light.

In operation, oscillating waves of light pass through the transparent calcium-aluminium electrode and interact with the nanotubes. The metal-insulator-metal junctions at the nanotube tips serve as rectifiers switching on and off at femtosecond intervals, allowing electrons generated by the antenna to flow one way into the top electrode. Ultralow capacitance, on the order of a few attofarads, enables the 10-nanometre diameter diode to operate at these exceptional frequencies.

The rectennas fabricated by Cola's group are grown on rigid substrates, but the goal is to grow them on a foil or other material that would produce flexible solar cells or photodetectors.

Cola sees the rectennas built so far as simple proof of principle. He has ideas for how to improve the efficiency by changing the materials, opening the carbon nanotubes to allow multiple conduction channels and reducing resistance in the structures.

The research, supported by the Defense Advanced Research Projects Agency (DARPA), the Space and Naval Warfare (SPAWAR) Systems Center and the Army Research Office (ARO), was reported the journal *Nature Nanotechnology*.

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LIQUID-TIGHT PLUGS

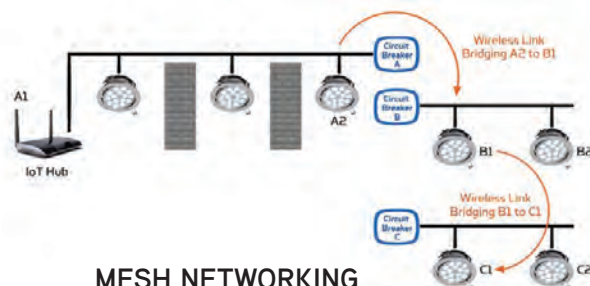
HEYCo-molded Liquid Tight Break-Thru Plugs are co-moulded and elastomer parts that function as liquid-tight plugs with an IP67/68 rating. They have an HB flammability rating and a temperature range of -40 to 100°C.

Round wire, cable or tubing will easily pierce the plug to convert it for use as a liquid-tight bushing due to the flexibility of the TPE material used in the plug. Once pierced, the bushing converts raw edged holes to smooth, neat, insulated holes. When used as a liquid-tight bushing, the plug insulates and mechanically protects electrical and telecommunications cable, tubing, hose, rope and utility lines.

The plugs have locking fingers that snap easily into holes with only fingertip pressure in fractional increments up to the maximum panel thickness. They withstand a pushback force of greater than 15 kg and are available in multiple sizes from 12.7 to 38.1 mm. They are suitable for use in panels as thin as 0.5 mm and as thick as 6.4 mm.

NPA Pty Ltd

www.npa.com.au



MESH NETWORKING TECHNOLOGY FOR IoT APPLICATIONS

Greenvity Communications announces Hybrid Mesh, a mesh networking technology that provides a communications link for commercial building and industrial applications. The technology utilises mixed-medium IEEE 802.15.4 wireless and wideband powerline communication (PLC).

Hybrid Mesh is the mixed-medium operation and algorithm between wireless and PLC that supports multiple hops for range extension, bridging and self-healing. It is suitable for commercial building automation, smart lighting, security, safety and industrial IoT applications that require always-connected links between the gateway and nodes, as well as long range and the ability to go through walls and obstacles.

Modules with Hybrid Mesh networking rely on an algorithm to make decisions on whether powerline or wireless is the better medium in the current environment. Each node repeats the same data to the next node — selecting PLC when wireless strength is weak and choosing wireless when the PLC signal is degraded due to circuit breakers or noise.

The first Greenvity modules with Hybrid Mesh operation are the GV7011-MOD for commercial and industrial applications, and the GV-LED-11 smart LED controller and general IoT controller. The GV7011-MOD can be used in air conditioners, heaters, appliances, solar inverters, energy management and home/building security. The GV-LED-11 enables on, off, dimming and colour tuning that can control all LED and non-LED lights in the market.

Greenvity Communications

www.greenvity.com

PRE-AMPLIFIERS

For applications where low-level electronic signals need to be analysed, Spectrum pre-amplifiers can be used to boost signal levels. Seven different versions are available, offering gain ranges from 20 to 60 dB, bandwidths from 10 MHz to 2 GHz, and 50 Ω and 1 M Ω terminations. Most of the pre-amplifiers have true DC coupling and an adjustable output offset control to extend their operational use.



The 16-bit M2i.46xx series digitisers come with eight programmable input settings offering from 50 mV to 10 V full-scale range (FSR). Using an SPA.1231 pre-amplifier can provide an additional gain of either 40 or 60 dB, effectively delivering an FSR that can go as low as 50 μ V. The low FSR, together with the 16-bit resolution of the digitiser, makes it possible to detect signal variations in the nanovolt range.

The pre-amplifier SPA.1841, with a bandwidth of 2 GHz, matches the Spectrum M4i.22xx series digitisers with a 5 GS/s sampling rate and a bandwidth up to 1.5 GHz. Using the combination of a M4i.2230-x8 and a SPA.1841 amplifier, one can sample signals in the GHz range with an FSR of 2 mV resulting in a resolution of 15 μ V per step at the given digitiser resolution of 8 bit.

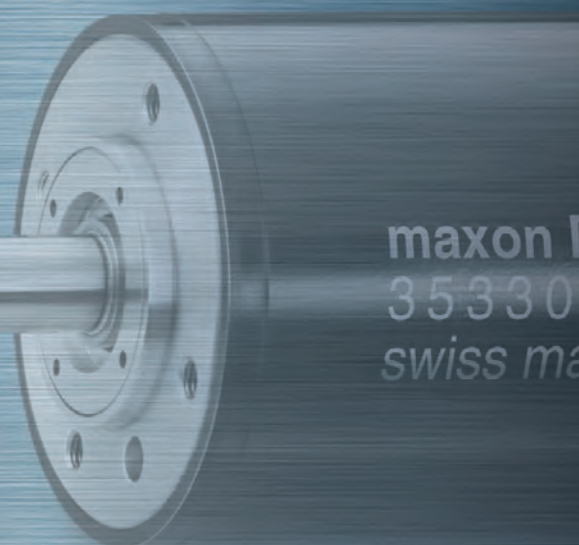
SPA series pre-amplifiers are optimised for minimum input noise with models available that reach values as low as 0.9 nV/ $\sqrt{\text{Hz}}$. For applications that need to push the technology further, signal processing functions, such as averaging and filtering, can be used on the digitised data.

TRIO Test & Measurement Pty Ltd

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If decentralised drive intelligence is called for, maxon motor control provides the answer: all speed and positioning controllers are designed to match with brushed and brushless DC motors up to 700 watts power. The EPOS2 positioning controller enables you to connect quickly through the network and, using the Interpolated Position Mode, to synchronously run a preset path specified by interpolating points in real time.

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REAL-TIME SPECTRUM ANALYSER

The ThinkRF WSA5000 Real-Time Spectrum Analyzer (RTSA) provides a combination of good performance and versatility. The product has a frequency range from 100 kHz to 8, 18 or 27 GHz; real-time bandwidth up to 100 MHz; probability of intercept as short as 1.02 μ s; and spurious-free dynamic range (SFDR) up to 100 dBc.

Other features include a flexible 10/100/1000 ethernet interface for direct connection to laptop or network access without any additional hardware; DSP filtering and decimation; real-time FPGA triggering for detection of elusive, time-varying signals; waveform recording and playback; open APIs for use with Python, MATLAB and C/C++; standard protocols SCPI and VRT to facilitate quick integration and interoperability; and interface with external digitisers for real-time bandwidth of up to 160 MHz.

Scientific Devices Australia

www.scientific-devices.com.au



48 V BUCK REGULATORS

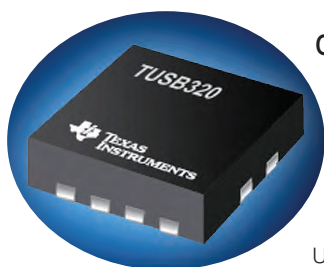
Vicor Corporation has expanded its Picor Cool-Power ZVS Point-of-Load Regulator portfolio with the introduction of high-efficiency PI3542, PI3543, PI3545 and PI3546 buck regulators. The buck regulators are designed for a range of applications leveraging higher voltage distribution, including telecom, network infrastructure, data centres, industrial, battery and lighting applications.

PI354x Cool-Power ZVS buck regulators utilise the integration of high-performance zero-voltage switching (ZVS) topology that enables 48 V direct to PoL without sacrificing performance, providing efficiency over 96%. With step-down regulation from a higher voltage source, engineers can deploy efficient power distribution architectures, reduce I²R losses and eliminate intermediate conversion stages.

The series operates from 36 to 60 V_{in} and regulates an output voltage ranging from 2.2 to 14 V, with output current delivery up to 10 A. Power delivery can be further increased by using single-wire current sharing. Other features include: a high-density 10 x 10 x 2.5 mm LGA SiP module for power delivery over 100 W; and constant current control for lighting and battery applications.

Vicor Corporation

www.vicor-asia.com



CC LOGIC AND PORT CONTROLLERS

Texas Instruments has released the TUSB320 family of USB Type-C configuration channel logic and port controllers. The device provides USB Type-C configuration channel (CC) logic and port control, making it possible for a system to detect the orientation of the plug and determine the appropriate USB specification and mode settings for the end equipment.

The product can be configured as a downstream-facing port (DFP), upstream-facing port (UFP) or dual-role port (DRP). It supports USB 2.0 and USB 3.1, giving designers the flexibility to use the device in multiple USB-enabled designs. The unit also contains features such as mode configuration and low standby current, making it applicable for source or sinks in USB 2.0 applications.

The device operates over a wide supply range (2.7–5.5 V_{bus}) and offers low power consumption. Its low shutdown power of 8 mW benefits a variety of battery-powered applications.

The product offers I²C or GPIO control, an industrial temperature range of -40 to 85°C and support for up to 3 A advertisement and detection. It can be used for host, device and dual-role port applications in mobile phones, tablets and USB peripherals.

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AUSTRALIAN RESEARCHERS DEVELOP

ULTRAFAST NANOSCALE PHOTONICS SWITCH

Australian and Russian researchers have created an ultrafast all-optical switch on silicon nanostructures. This device may become a platform for future computers and permit the transfer of data at an ultrahigh speed.

The work, by researchers from the Australian National University and the Lomonosov Moscow State University, belongs to the field of photonics — an optics discipline that appeared in the 1960s, simultaneously with the invention of lasers.

Photonics has the same goals as electronics does, but it uses photons — the quanta of light — instead of electrons. The biggest advantage of using photons is the absence of interactions between them. As a consequence, photons address the data transmission problem better than electrons. This property can primarily be used in computing where IPS (instructions per second) is the main attribute to be maximised.

The typical scale of electronic transistors — the basis of contemporary electronic devices — is less than 100 nanometres, where the typical scale of photonic transistors stays on the scale of several micrometres. Nanostructures that are able to compete with the electronic structures — for example, plasmonic nanoparticles — are characterised by low efficiency and significant losses. Therefore, coming up with a compact photonic switch was a very challenging task.

Three years ago several groups of researchers simultaneously discovered an important effect: they found out that silicon nanoparticles exhibit strong resonances in the visible spectrum — the so-called magnetic dipole resonances. This type of resonance is characterised by strong localisation of light waves on subwavelength scales, inside the nanoparticles. This effect turned out to be interesting to researchers but, according to Maxim Shcherbakov, the first author of the article published in *Nano Letters*, nobody thought that this discovery could create a basis for development of a compact and very rapid photonic switch.

Nanoparticles were fabricated in the Australian National University by e-beam lithography followed by plasma-phase etching.

It was done by Alexander Shorokhov, who served an internship in the university as a part of a presidential scholarship for studying abroad. The samples were brought to Moscow, and all the experimental work was carried out at the Faculty of Physics of Lomonosov Moscow State University, in the Laboratory of Nanophotonics and Metamaterials.

"In our experimental research, me and my colleague Polina Vabishchevich from the faculty used a set of nonlinear optics methods that address femtosecond light-matter," said Maxim Shcherbakov. "We used our femtosecond laser complex acquired as part of the MSU development program."

Eventually, researchers developed a 'device': a disc 250 nm in diameter that is capable of switching optical pulses at femtosecond rates (femtosecond is a one millionth of one billionth of a second). Switching speeds that fast will facilitate creation of data transmission and processing devices that will work at tens and hundreds terabits per second.

The operation of the all-optical switch created by MSU researchers is based on the interaction between two femtosecond pulses. The interaction becomes possible due to the magnetic resonance of the silicon nanostructures. If the pulses arrive at the nanostructure simultaneously, one of them interacts with the other and dampers it due to the effect of two-photon absorption. If there is a 100 fs delay between the two pulses, the interaction does not occur, and the second pulse goes through the nanostructure without changing.

Our work represents an important step towards novel and efficient active photonic devices — transistors, logic units and others, said Maxim Shcherbakov. Features of the technology implemented in our work will allow its use in silicon photonics. In the nearest future, we are going to test such nanoparticles in integrated circuits, said Shcherbakov.



3G ROUTERS

The MultiConnect rCell 100 Series MTR-H6 and MTR-H5 are intelligent wireless routers for M2M communications. They combine with HSPA/Wi-Fi/ethernet/Bluetooth/serial/ GPS, as well as routing functions, in a compact box.

The routers offer a stable lifecycle; 10/100BaseT ethernet LAN connectivity; single-point routing; serial-to-ethernet/Wi-Fi/HSPA+ solutions; the option to have GPS, Bluetooth and Wi-Fi built in; supported secured connection with SSL, 3DES and AES encryption; support for IPSec VPN tunnels for secure LAN-to-LAN access; and configuration by web manager and AT command.

The routers have a Keep Alive Ping feature and will reboot RF automatically if Ping fails. Remote AT command via SMS for reboot and configuration helps to secure the internet connection in any circumstance. The product can be used as a serial modem or router to fulfil different applications.

The devices include free access to MultiTech Device Manager, a cloud-based device management solution that simplifies and scales the management of the networking devices. It allows users to remotely monitor, upgrade and configure an entire device population from a single location.

The routers have been MIL-STD-810 and SAE J1455 tested; optional Class1, Div2 Hazardous Location (US, CA) approved; and Telstra and AT&T approved. A CDMA/EVDO version is available for Verizon, which is AERIS approved.

Elecom Electronics Supply
www.elecomes.com



ETHERNET SWITCHES

Antaira Technologies has expanded in the industrial networking infrastructure family with the LMP-1002G-SFP and LMP-1002G-SFP-24 series. The 10-port industrial gigabit PoE+ managed ethernet switches feature 48–55 VDC high-power input (LMP-1002C-SFP) support and 12–36 VDC low-voltage power input with a built-in voltage booster (LMP-1002C-SFP-24). The product provides 48 VDC PoE power for any low-voltage power source or mobile PoE application environment.

Each unit is designed with eight 10/100/1000Tx fast ethernet ports that are IEEE 802.3at/af compliant (PoE+/PoE) with a PoE power output up to 30 W per port and two dual-rate 100/1000Tx SFP slots for fibre connections. The series supports jumbo frames up to 9.6 KB and provides high EFT, surge (2000 VDC) and ESD (6000 VDC) protection.

All units have a dual-power input design with reverse polarity protection and a relay warning function to alert maintainers when any ports break or power failures occur. This makes it suitable for industrial automation applications in harsh environments, such as high-density traffic control equipment within ITS applications; remote PoE wireless radios; security surveillance systems; GigE vision systems; and quality inspection systems within factory automation.

The units are IP30 rated, compact, fanless and DIN rail/wall mountable. They are built to withstand industrial networking hazards like shock, drop, vibration, EMI and extreme temperatures.

Antaira Technologies
www.antaira.com.tw



AC POWER SOURCE WITH POWER/ENERGY ANALYSER

Prodigit Electronics has launched the 5302A AC Power Source with Power/Energy Analyzer. The device is suitable for power quality testing of any product.

Electrical and electronic equipment may be affected by voltage dips, short interruptions or voltage variations of power supply. Voltage dips and short interruptions are caused by faults in the network, in installations or by sudden large changes of load. In certain cases, two or more consecutive dips or interruptions may occur. Voltage variations are caused by continuously varying loads connected to the network.

Based on a 270 VAC source integrated with a multimeasurement function power meter, the power source can integrate DC load to measure AC and DC power parameters to calculate UUT efficiency. The all-in-one LCD can display all electronic characteristics for convenient user analysis.

Triplepoint Calibrations Pty Ltd
www.triplepoint.com.au

SYSTEM DESIGN SOFTWARE

NI LabVIEW is a development environment optimised for engineers and scientists creating test, measurement and control applications. The product enables users to quickly and easily acquire real-world signals; perform analysis to ascertain meaningful data; and communicate or store results in a variety of ways.

LabVIEW 2015 will include hardware integration, add-on tools and a more efficient programming ADE than the previous version.

National Instruments Australia

www.ni.com/oceania

SIGNAL ANALYSER TRACKING GENERATOR OPTIONS

Keysight Technologies has announced the release of four M9290A CXA-m PXIe signal analyser tracking generator options. The signal analyser, with a built-in tracking generator, now has 3, 7.5, 13.6 and 26.5 GHz options. Vector signal analysis capabilities are also now available via the N9064A VXA X-Series measurement application or 89600 VSA software.

Adding a tracking generator to the signal analyser makes it suitable for characterising the behaviour of components or subsystems, including frequency response, conversion loss and insertion loss/gain, as well as analysing and identifying unknown signals. The modular stimulus response measurement solution allows system developers to fulfil the tasks for component characterisation while shrinking the test footprint and budget.

The VXA measurement application provides the device with a vector signal analysis mode that supports a wide range of measurements, demodulation types and filters that enable engineers to perform comprehensive signal analysis, test designs, ensure product quality and optimise performance. The N9064A is one of over 25 measurement applications in the Keysight X-Series signal analysers.

The 89600 VSA software is a set of tools for measuring signals; verifying signal performance with multiple simultaneous views in time, frequency and modulation domains; and troubleshooting via trace-to-trace coupling, triggering, record and playback. These tools accelerate device development with consistent vector signal analyser measurements at any stage of design.

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THE ROAD TO LONGER LASTING BATTERIES



Ahmet Oguz Tezel, Ann Mari Svensson and Svein Sunde are hard at work on the technology behind new batteries. Image credit: Steinar Brandslet, NTNU

Researchers from the Norwegian University of Science and Technology are working on improving battery life by changing the electrolyte composition.

When the battery is first charged up, a thin film called an SEI (solid electrolyte interphase) forms on the surface of the carbon anode. This film has a complex chemical structure containing both organic and inorganic lithium compounds.

"This film is an essential part of the battery," said Professor Ann Mari Svensson, from the Norwegian University of Science and Engineering's (NTNU) Department of Materials Science and Engineering.

The SEI film forms the first time the battery is charged, from the reaction between the electrolyte and the anode. This protective coating is key in determining a battery's lifetime, thermal stability and capacity, especially at high rates. Lithium that is bound in the film doesn't participate in charging the electrodes, which results in reduced capacity.

"Once the battery is assembled, we cannot add more lithium to the cell, and therefore limiting the loss of available lithium in the cell is of prime importance for long-lasting batteries," said Ahmet Oguz Tezel, a PhD candidate at the Department of Materials Science and Engineering.

If you can't add more lithium to the solution, you have to do a better job of preserving the lithium that is already there. Tezel has recently handed in his PhD on the formation of SEI films, and how this is influenced by the composition of the electrolyte that is used.

Tezel's work has focused on modifying the electrolyte to achieve higher battery capacity and life span, especially at low temperatures.

He has also had promising results with his work with developing a preparatory treatment that prevents too much lithium loss in the formation of the SEI film. This allows more of the lithium in the electrolyte solution to participate in charging the electrodes.

State-of-the-art electrolytes that consist of ethylene carbonate (EC), in principle, cannot operate when the temperature is at about -10°C , due to the high melting temperature of the EC. On the other hand, batteries containing the organic compound propylene carbonate (PC) can work at temperatures as low as -50°C .

"We think that we found a way to substitute EC for PC; however, we haven't confirmed this yet," Tezel said of the use of PC in batteries. "But our research suggests how it might be realised."

Tezel's supervisors are Professor Ann Mari Svensson and Professor Svein Sunde, also at the Department of Materials Science and Engineering. Tezel also works for Graphene Batteries AS in Oslo.

ADELAIDE'S NEW ELECTRONICS INDUSTRY ASSOCIATION

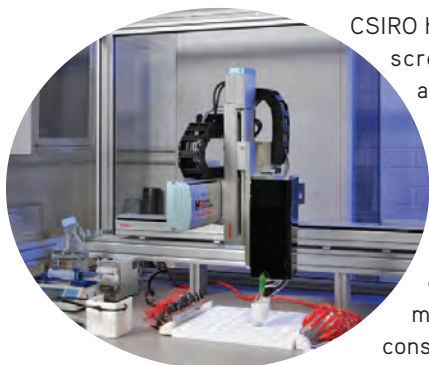
A new organisation, Electronics Industry Development Adelaide (EIDA), has been established to focus specifically on the development, promotion and representation of the Adelaide electronics industry. The purpose of EIDA, as described in its constitution, is "To develop and promote the electronics industry and profession in the region of Adelaide, South Australia."

The association will work towards this goal through a combination of a website and online forum with live events of specific value to industry people. Contributors to the forum will be encouraged to ask questions and make comments and suggestions on all matters relating to electronics design and manufacture, as well as the development and promotion of the industry. Live events will meanwhile provide opportunities to meet, discuss and network with others across the spectrum of design, manufacturing, marketing, education and research sectors. Events planned for this year include a launch event and a visit to an Adelaide high-technology electronics design and manufacturing facility. The association will also be attending and presenting to the World Electronics Forum in Taiwan in October. EIDA will regularly provide government and community with current and relevant data and information on the scope, scale, significance and sustainability of the Adelaide electronics industry. This promotion will seek to raise community awareness of entrepreneurial and investment opportunities and of career opportunities, as well as raise government awareness of the importance of the Adelaide electronics industry in the transition of the economy from its past dependence on 'industrial-age' manufacturing to its future as a 'knowledge-age' centre.

The association will also be conducting industry research, measuring and analysing the strengths, weaknesses, opportunities and threats in the Adelaide electronics industry. This research will provide the data upon which both industry and government can make decisions about future directions for maximum benefit to all stakeholders. Contributors to the website and all firms and organisations known to be engaged in the industry will be invited to contribute to the research. For more information on EIDA, visit <http://eida.asn.au/>.



CSIRO ROBOT SPEEDS UP NEXT-GEN TESTING



CSIRO has launched a new robot that can automatically screen and evaluate next-generation materials around the clock.

The robot, called FASTER, provides Australian companies with an advanced electrochemical testing system that is said to carry out repetitive experiments 10 times faster than humans.

According to research director Dr Ivan Cole, electrochemical testing and validation of new materials can be extremely repetitive and time-consuming for businesses.

“Having to do these tests manually takes up a lot of time for scientists and technical staff, and significantly slows down the research and development phase for new materials,” Dr Cole said.

“By using FASTER, the robot can do a whole lot of the leg work. This frees up employees to focus on the important high-level tasks that require lateral thinking.”

The FASTER robot uses a robotic sensing platform and a computer-controlled liquid delivery system. This allows it to automate testing tasks, carrying out up to 80 discrete experiments without human intervention.

“The robot also has the advantage of overcoming human error in testing and materials validation — meaning the data it collects is extremely accurate,” Dr Cole said. FASTER was designed by CSIRO at its Clayton laboratory in Melbourne and can benefit a range of industries, including manufacturing, infrastructure and aerospace.

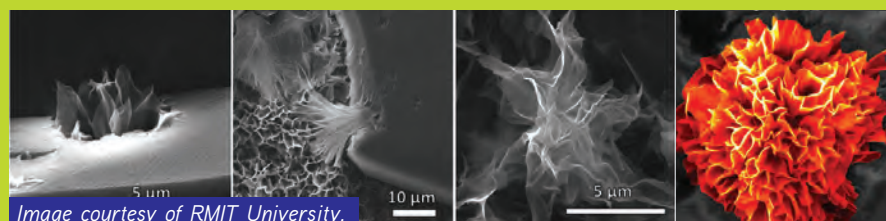
\$340K FUNDING FOR ADELAIDE UNI'S WEARABLE TEXTILE ANTENNAS

Developing wearable textile antennas to monitor activity of our elderly, exploring the cane toad to understand rapid evolution of invasive species and developing ‘metal-organic framework superstructures’ are some of the 635 new research projects to receive Australian Government funding. Education Minister Simon Birmingham announced almost \$245 million in new Discovery Projects scheme funding as part of the Australian Research Council's (ARC) 2016 Major Grants Announcement in Adelaide. The funding includes \$340,000 for researchers at The University of Adelaide for developing wearable textile antennas that can form robust connections with miniature battery-less motion sensors to monitor activity of our ageing community.

The wearable antennas have potential application in biomedical monitoring, sports analysis, military and emergency communications. They can be incorporated into clothing using computerised embroidery into conductive fabric. A range of different shaped and sized antennas can be produced using altered patterns in the embroidery. Wearable electronic systems have grown exponentially over the last few years but these devices need very efficient antennas to communicate with the data receiver and to power the sensors being used, according to Dr Thomas Kaufmann, postdoctoral researcher in the School of Electrical and Electronic Engineering.

The solution being developed is a t-shirt made of conductive metallised fabric which is low cost, flexible and lightweight. The difficulty of incorporating the electronics has been overcome with using snap-on buttons which form a connection between the textile antenna and the sensor device. These can easily be removed for washing.

The group is investigating various configurations of antennas to optimise their performance for different frequencies and purposes, and are also looking at the replacement of rigid data cables with flexible ones incorporated as transmission lines into t-shirts.



SELF-ASSEMBLING MICROFLOWERS OPEN NEW ELECTRONIC FRONTIERS

RMIT University researchers have developed artificial microflowers that self-assemble in water and mimic the natural blooming process, an important step for advances in frontier-edge electronics. Flower-shaped structures have been the focus of research because their distinctive surfaces offer exciting potential for applications in a range of fields — from optoelectronics and chemosensors to nanotechnology, biotechnology, biomedicine and organic electronics. The team from the RMIT-Indian Institute of Chemical Technology Research Centre has for the first time developed microstructures shaped like flowers that build through self-repeating arrangement in water.

Lead investigator Dr Sheshanath Boshanale said the field of organic flower-shaped morphology was still in its infancy. “This is the first time flower-shaped microforms have been developed in a water solution, opening an exciting new pathway for further research,” he said.

“The artificial blooms developed by our team are just 10 microns wide — about 10 could fit along the width of a strand of human hair.

“While tiny, they have potential to make a big impact by enabling researchers to easily and reliably build microflowers and use them to break frontiers in a range of scientific fields.”

To create the microflowers, researchers mixed two organic components (NDI-bearing phosphonic acid and melamine) in water, which is then evaporated. The artificial microflowers take about three hours to fully develop, mimicking the way natural flowers bloom. The research has been published in *Scientific Reports*, a high-impact open-access journal from the publishers of *Nature*.

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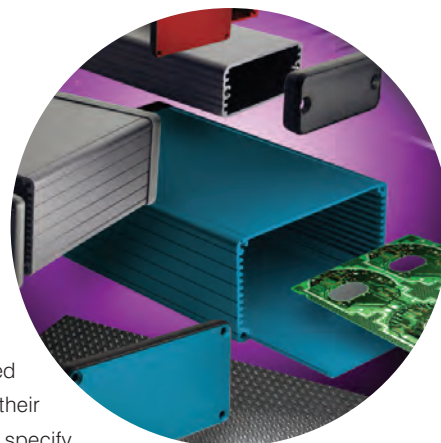


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EXTRUDED ENCLOSURE COLOUR OPTIONS

The 1455 family of extruded aluminium instrument cases, from Hammond Electronics, consists of 22 sizes from 60 x 45 x 25 to 220 x 165 x 52 mm. All sizes are now available in a durable red or blue anodised finish in addition to the original clear and black anodised options, enabling designers to make their products stand out without needing to specify custom finishes.



The product is designed to house PCBs mounted horizontally into internal slots in the body of the case or as an enclosure for any small electronic, electrical or pneumatic instrument. All sizes apart from the smallest ones have a removable slide cover on the case body to allow access to the PCB when it is in situ.

The 14 largest sizes are designed to accept a 100 x 160 or 100 x 220 mm Eurocard. All sizes are supplied complete with fixings and self-adhesive rubber feet. Flange brackets that enable the unit to be mounted directly to a shelf or wall are available as an optional accessory.

Two types of end panels are available: a flat aluminium panel retained to the case body by a separate plastic bezel and an easy-to-machine one-piece moulded black ABS plastic end panel complete with integral bezel.

Hammond Electronics Pty Ltd
www.hammondmfg.com

FANLESS EMBEDDED BOX PC

Extreme Engineering Solutions (X-ES) has announced the XPand6903, a rugged, sealed, compact, fanless, embedded box PC utilising the Intel Atom E3800 family processor. The product provides a maintenance-free computing platform that is suitable for environmentally challenging and space-constrained situations.



The device is designed specifically for industrial PC (IPC), human machine interface (HMI), industrial automation, military and transportation applications. The sealed, IP67-capable design makes it suitable for medical, industrial and food-safe environments where exposure to high humidity, moisture or harsh chemicals is a concern. The PC includes DIN rail-mounting hardware to simplify installation.

The Intel Atom E3800 family processor offers up to four cores at 1.91 GHz. Internal solid-state storage is included for the operating system and application. Each of the two VGA video connectors has a USB link that supports the connection of a touch screen with a single cable. The product provides additional connectors for Gigabit Ethernet, USB and RS232/422 serial ports. Other I/O options are also available, such as WLAN, cellular, GPS, DVI-D and CAN bus.

The PC's power input supports a wide range of input voltages, from 12 to 28 V. Additional power input voltages also may be supported by request.

Metromatics Pty Ltd
www.metromatics.com.au

IoT WIRELESS I/O MODULES



Advantech has combined the core functions of data acquisition, processing and publishing into a single I/O module to meet the needs of a wide range of industries, such as environmental monitoring, machine monitoring and smart cities. The company claims its module will improve the way that data is gathered from remote or difficult-to-wire locations.

The Advantech WISE-4000 series wireless ethernet I/O modules can be used without needing to go through a gateway to provide the information. Deployment is easy as a limitless number of I/O modules can be used to gather the information from any third-party sensors and connect to an existing network.

With an integrated HTML5 interface, the module can be configured and accessed from any mobile device using a standard web browser and without needing to go through an access point. The series uses RESTful API, meaning system integrators can adjust the configurator to meet their specific needs.

The module's data logger can send time-stamped information to a Dropbox account or a private cloud. It can also buffer the device's data so that in the event of network failure, no data is lost. Other features include: three levels of security, interchangeable antennas for flexibility and external DIP switches so the factory settings can be easily reapplied.

The series includes the WISE-4050 4-channel digital input, 4-channel digital output module; the WISE-4060 4-channel digital input, 4-channel relay output module; and the WISE-4012E 6-channel input/output module for developers with WebAccess (optional).

Advantech Australia Pty Ltd
www.advantech.net.au

AC/DC POWER SUPPLY

The PBI6C Series, by Powerbox, is a compact AC/DC power supply that has been engineered for applications where real estate and accessibility are limited. It has a small and lightweight closed-frame design that enables the power supply to be installed in locations where other systems may not be suitable.

Limited access isn't a problem with the series, as one of its key features is the remote control. This enables operation to be controlled away from the housing and in positions not normally possible. Output power ranges from 50 to 150 W, which includes an adjustable voltage range.

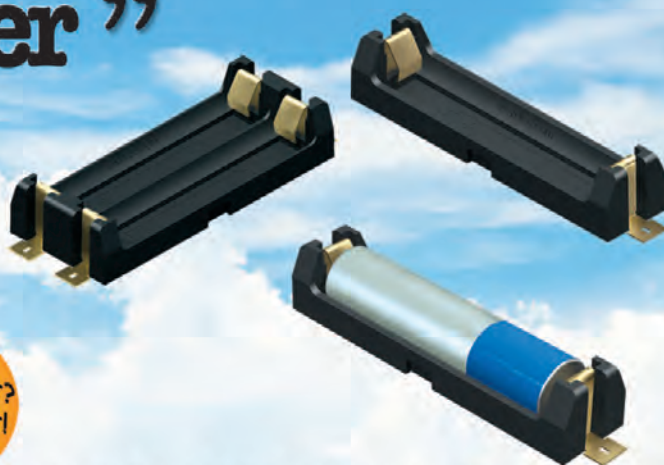
The power supply incorporates an adjustable current limiter from 20 to 100%, allowing precision constant current to the equipment load. It can operate at temperatures up to 71°C. Other features include overcurrent and overvoltage protection to prevent damage that might be initiated by input power.

The power supply can meet the needs of a broad range of applications and is compliant with multiple safety standards from a variety of industries. Such applications include LED displays and battery charging.

Powerbox Australia Pty Ltd
www.powerbox.com.au

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RUGGED EMBEDDED COMPUTER

MPL's CEC10 is a high-performance, low-power and highly integrated rugged embedded computer. It is available in a compact aluminium housing with DIN rail or flange mount, a rugged MIL IP67 case or an open-frame solution with a cooling plate.

The housings offer sufficient space for a 2.5" HDD/SSD or other expansion requirements. With the integrated PCI-Express Mini Card slot, the computer can be expanded with any mPCIe module. The design integrates standard connectors for easy connection or lockable headers, depending on housing choice.

The product can be operated in harsh environments and extreme temperature conditions, from -40 to 85°C, without the need of a fan or ventilation holes. The rugged design, combined with industrial-grade components, offers long-term performance.

The unit comes with a board interface that offers 2x PCIe, 2x HSIC, 2x UART, SATA, SDIO, LPC and I²C. This enables customisation for any I/O boards and allows system expansion with additional interfaces, eg, GPIOs, additional serial ports, gigabit fibre ports, CAN, additional miniPCIe slots or even a PCI/104-Express port. The industrial PC meets rugged standards including EN50155, IEC 60945 and MIL-STD-810.

The device is a suitable embedded computer for industrial environments, railway applications, MIL/COTS applications and more. It can be used in any x86 application where a complete but still expandable solution is needed.

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

SPECIAL MATERIALS FOR ENCLOSURES

In addition to its diverse range of standard plastic enclosures and tuning knobs, OKW also offers production in other special materials. The enclosures can be produced in special colours, flame-resistant material or environmentally friendly bioplastic.

Enclosures and tuning knobs can be created in the user's company colours. Individual components can be accentuated or the product can be designed in one single colour. To achieve this, the natural material in question is dyed using high-quality substances.

It is possible to produce the enclosures according to the UL 94 V-0 fire safety standard. To meet flame-resistance requirements, the company uses coloured, halogen-free ABS+PC-FR or ABS-FR. The standard colours of the materials are off-white, black, light grey or lava.

An enclosure made of BIOGRADE, a bioplastic produced on the basis of renewable raw materials (cotton, wood), has a number of ecological advantages. It only releases the amount of CO₂ that it removed from the atmosphere during the growth phase and protects petroleum resources. The enclosure, produced in off-white and complying with the UL 94 HB fire safety standard, has similar properties to high-quality plastic and a good surface finish.

Enclosures made of special materials can also be further modified using various processing and finishing techniques, such as mechanical processing, printing or EMC coating.

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HOW TO USE A

DIGITAL MULTIMETER

— PART 2

Digital multimeters (DMMs) can be useful for a variety of measurements. This article, Part 2 of a two-part series, discusses cover resistance measurements, continuity and diode testing.

Resistance measurements

Resistance measurements are commonly used to measure resistors or other components such as sensors or speakers.

Resistance measuring works by applying a known DC voltage over an unknown resistance in series with a small internal resistance. It measures the test voltage, then it calculates the unknown resistance. Because of this, test the device only when it isn't powered, otherwise there is already voltage in the circuit and you can get incorrect readings. Also, keep in mind that a component should be measured before it is inserted into the circuit, otherwise you are measuring the resistance of everything connected to the component instead of just the component by itself.

One of the nice things about resistance is that it is non-directional, meaning if you switch the probes the reading is still the same. The symbol for a resistance measurement is Ω , which represents the resistance unit of measure. Be sure to select the correct range and mode for your application. If the display reads OL, this means the reading is over the limit or greater than the meter can measure in that range. As discussed earlier, using the null offset can improve your measurement readings.

Additional measurements

Many DMMs offer two additional measurement functions: continuity testing and diode testing.

Continuity testing

Continuity testing helps you identify when two points are electrically connected. This can be helpful when troubleshooting wire breaks, printed circuit board (PCB) traces or solder joints. When testing for continuity, it is essential to monitor exactly where the

probes are touching. As such, most DMMs emit a sound when they detect a closed circuit, so you don't have to look up from your probes. As such, the symbol for continuity looks like a sound wave. Continuity testing works just like a resistance measurement; as such, it is essential that your device not be powered when you are testing. It can also be helpful to make sure everything is connected first by brushing the test tips together to verify the beep. If you don't hear a sound, then check that the probes are firmly connected, your DMM has sufficient battery life and that you are in the correct mode. You should also look in your user manual to determine the level of resistance required to trigger the sound as it varies from model to model.

If you are testing a circuit that has a large capacitor, you may hear a quick beep and then silence. This is because the voltage the DMM is applying to the circuit is charging up the capacitor and, during that time, the DMM thinks it is a closed circuit when it isn't really.

Diode testing

Diode testing displays the forward voltage drop of the diode in volts. The symbol, not surprisingly, is the diode symbol.

The DMM forces a small current through the diode and measures the voltage drop between the two test leads. When measuring a diode, you want the positive probe on the anode side and the negative on the cathode side. The voltage reading typically is about 0.7 V for silicon but can range from 0.5 to 0.9 V and still be a working diode. Germanium diodes are typically around 0.3 V.

Next, switch probes so the negative is on the anode side and the positive is on the cathode side. If the diode is working properly, the multimeter should show that there is an open circuit indicated by OL. If a diode is defective, it can defect to be either a short or an open diode. If the diode has failed to open, the DMM shows OL in both the forward and reverse bias because the current flowing through is zero and is an equivalent to an open circuit. If the diode is shorted, the DMM indicates 0 V as there is no voltage drop across the diode.



Noise rejection parameters

It is always important to consider noise when taking a measurement. There are two additional parameters you should be familiar with to better understand your instrument and the associated noise of the measurement.

The normal-mode rejection ratio (NMRR) describes the DMM's ability to reject noise that appears between the two input terminals or, in other words, the noise mixed in with the measured signal. Most of this noise is a line frequency and its harmonics. NMRR, which is often used to indicate the capability of the instrument to reject a power line noise of 50 or 60 Hz, is valid only at the specified frequency and is useful when making DC measurements. Normal-mode noise can also be reduced through the use of shielding or filtering.

The common-mode rejection ratio (CMRR) describes the DMM's ability to reject noise that is common to both input terminals, such as from a noisy environment. Common-mode noise is usually less severe than normal-mode noise.

NMRR and CMRR are typically specified at 50 Hz and 60 Hz, and CMRR is often specified at a DC value as well. Typical values are greater than 80 dB and 120 dB, respectively.

Summary

- The number of display digits on a DMM is not related to the resolution but can help determine the number of significant values that can be displayed and read.
- For most applications, it can be said the higher the impedance, the more accurate the voltage measurement.
- Higher crest factors indicate sharper peaks and make it more difficult to get an accurate AC measurement.
- Null offset can be used to eliminate errors caused by connections and wires when making a DC voltage or resistance measurement.
- Auto zero is used to compensate for internal instrument offsets.
- Current measurements require you to break the circuit in order to insert the DMM into the circuit loop.
- Accidentally measuring voltage while in the current mode can cause a fuse to blow.
- Resistance measurements and continuity testing should be taken when the circuit does not have power.
- The normal-mode rejection ratio (NMRR) describes the DMM's ability to reject noise that appears between the two input terminals.
- The common-mode rejection ratio (CMRR) describes the DMM's ability to reject noise that is common to both input terminals, such as from a noisy environment.

National Instruments Australia
www.ni.com/oceania

new
PRODUCTS

AUTOMOTIVE-GRADE DUAL INDUCTOR

Vishay Intertechnology has expanded its IHLD series of low-profile, high-current dual inductors with a device in the 3232 case size. Offering a high operating temperature range to 155°C, the automotive-grade IHLD-3232HB-5A saves board space by combining two inductors in one

9.75 x 9.14 mm package. The inductor is optimised for automotive and commercial class D amplifier circuits, where the device reduces board space requirements and offers improved performance over multiple individual inductors. It is designed for good inductance stability over temperature and DC current, providing high-quality sound and low harmonic distortion due to linear saturation performance. The inductor pair is designed with low coupling for minimal crosstalk between inductors.

The AEC-Q200-qualified inductor pair offers maximum DCR from 29.2 to 159.43 mΩ, inductance from 5 to 33 μH and rated current to 6 A. Manufactured using a 100% Pb-free, shielded, composite construction package, the product features high resistance to thermal shock, moisture, mechanical shock and vibration.

Future Electronics

www.futureelectronics.com



LTE-ENABLED WIRELESS COMPUTER

The fact that extreme temperatures can cause computing systems to crash or become unstable has led to the development of wide-temperature industrial computers. The thermal design of Moxa's LTE-enabled V2201 wireless computers ensures system operation in temperatures ranging from -40 to 70°C.

The wireless computer is small enough to fit in the palm of the hand. The fanless, ultralow-power (18 W) device supports both DIN-rail and wall-mounting capability, making installation and maintenance easy.

The computer uses the Intel Atom E3800 series processor to provide high computing performance for local data analysis and processes. With an SD socket and mSTA connector, users don't need to worry about storage limitations restricting their software designs.

To ensure that the product is suitable for a wide range of data communication infrastructures, the computer has two built-in serial ports, two ethernet ports and one set of DI/DO ports. It also supports a full range of wireless connectivity protocols, including Bluetooth, Wi-Fi, 3G and LTE modules that fit into the unit's two mini PCIe sockets.

MOXA Inc

www.moxa.com

DISCONNECT SPLITTER WITH ENHANCED VISIBILITY

TURCK has announced an expansion to the YB2 line of compact disconnect splitters with LEDs. The LEDs provide a visual indication of when power is applied and when one or both discrete signals are present.

The addition to the line features a translucent, black over-moulded design. This encapsulates the LEDs and protects them from physical damage while also complementing visibility. The LEDs are visible from both sides of the splitter, which allows for more flexible mounting options.

The splitter is used to consolidate two separate PNP device signals into a single cable or into a multiport junction box. It is available with an M12 (eurofast) trunk connector and either M12 (eurofast) or M8 (picofast) branch connectors. It has a rating of 10–30 VDC at up to 4 A and provides users with an ingress rating of IP67.

The consolidation splitter is suitable for applications in the material handling, food and beverage, and automotive industries. It is recommended by the company for those using TURCK's Z-style junction boxes.

Turck Australia Pty Ltd
www.turck.com.au



NOR FLASH MEMORY

Micron Technology has announced XTRMFlash memory, a NOR flash solution designed to meet the demand for 'instant-on' performance and fast system responsiveness in automotive, industrial and consumer applications.

Utilising its low pin-count interface, the memory is said to out-perform other industry NOR flash while also reducing pin counts by as much as 75% compared to those found in parallel NOR flash. The memory provides system designers with what is claimed to be the fastest direct code execution NOR flash memory solution available to enable high-performance, small form factor designs.

With random access times as fast as 83 ns and sequential byte reads as fast as 2.5 ns, the memory is said to offer better performance compared to traditional SPI (Serial Peripheral Interface) and Quad-SPI NOR flash. Sustained read throughputs of 400 MBps enable an entire 1 Gb XTRMFlash device to be read in 0.3 s. With the memory's direct execute-in-place (XIP) operation and low pin count interface, board space can be saved and the need for code shadowing can be eliminated.

The product family offers a number of voltage, package and density options in both industrial and automotive temperature grades. Memory densities range from 128 Mb to 2 Gb.

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BIAS CONTROLLER/ SEQUENCER MODULE

The MACOM MABC-001000-DP000L is a gallium nitride bias controller/sequencer module that provides proper gate voltage and pulsed drain voltage biasing for a device under test (DUT).

The module offers protection and dynamic control of all MACOM high-power transistors, including its GaN portfolio. It also provides bias sequencing so that pulsed drain voltage cannot be applied to a DUT unless the negative gate bias voltage is present.

The module can be implemented for fixed negative gate biasing with pulsed drain biasing, and for pulsed negative gate biasing with pulsed drain biasing. Both applications will recommend the external circuitry and P-channel power MOSFET.

The module consists of two functional elements arranged vertically to conserve size and cost. The first functional element (drain switching) is patterned and populated directly onto the board, while the second element (gate switching) connects vertically through the first functional element.

Additional features include: robust GaN protection at any power-up/power-down sequence; open drain output current of ≤ 200 mA for external MOSFET switch drive; internal thermistor or external temperature sensor voltage for gate bias sum; 30 dB typical EMI/RFI rejection at all I/O ports; 6.60×22.48 mm² package with 1 mm pitch SMT leads; target ≤ 500 ns total switch transition time; and gate bias output current ≤ 50 mA for heavy RF compression.

Wireless Components

www.wirelesscomponents.com.au

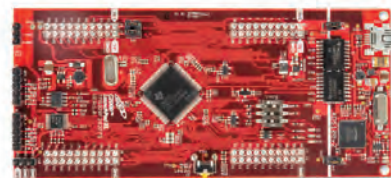
DEVELOPMENT BOARD

The C2000 Delfino F28377S LaunchPad development kit is claimed to be the most powerful C2000 LaunchPad in Texas Instruments' LaunchPad Ecosystem. The development board delivers high-performance digital control for use in power conversion and motor control applications. It is based on the Delfino TMS320F28377S MCU, contains 1 MB of onboard flash and includes highly differentiated peripherals such as 12-bit ADCs, comparators, DACs, delta-sigma sinc filters, HRPWMs, eCAPs, eQEPs, CANs and more.

The board also features an integrated isolated XDS100v2 JTAG emulator for easy programming and debugging, is compatible with controlSUITE and booster packs such as BOOSTXL-BUCKCONV and BOOSTXL-DRV8301, and includes a complimentary full licence of the latest version of Code Composer Studio IDE.

element14

au.element14.com



COMPACT MODULES

The conga-TC170 COM Express compact modules, from congatec, are said to offer users improvements in graphics and processing performance, enhanced energy efficiency and high-speed I/Os.

Users will benefit from the high level of standardisation and scalability of the COM Express modules — combined with congatec's documentation, industry-grade driver implementations and customer support — which enable OEMs to integrate the latest processor technology quickly and efficiently into their

individual applications. All modules are offered with long-term availability and software support of at least seven years.

The modules, with COM Express Type 6 pinout, are equipped with the ULV-SoC editions of the sixth-generation Intel Core i3/i5/i7 processors. They offer a configurable TDP (thermal design power) of 8.5 to 15 W, which simplifies matching the application to the system's thermal design. The optimised power supply, in addition to the microarchitecture, contributes to the energy efficiency and enables a longer turbo-boost.

The modules are designed for challenging applications that demand high performance in sealed, fanless system designs, such as in medical and industrial imaging, central control room technology, shop floor terminals, HMIs, robotics, professional gaming, infotainment, professional AV, smart video surveillance, autonomous vehicle control, computer-aided situational awareness and high-end digital signage applications.

congatec Australia Pty Ltd

www.congatec.com

SEALED MOMENTARY CABLE SWITCH

Switchcraft has extended its EP900 series of momentary cord switches by introducing a sealed switch.

The switch is waterproof and dustproof to IP67. It is rated for 0.25 A, 30 W max AC, non-inductive load and has been tested for a minimum of 20,000 cycles at 48 VDC, 0.25 A and 125 VAC, 0.25 A.

It is available with two switch options that allow for three possible circuit configurations for each switch. There are four handle configurations to accommodate cable diameters from 3.6 to 6.4 mm. The product is suitable for outdoor instrument applications, traffic control override and nurse call switches or infusion pumps.

Clarke & Severn Electronics

www.clarke.com.au





RUGGED 5U SERVERS

The RS549 and RS5718L24 rugged 5U servers, from Crystal Group, are developed for applications in industries such as oil and gas, public transport, utilities, mining, military and security.

The servers provide high compute performance in tough environmental conditions. They are designed to collect, store and process large amounts of data while providing the space necessary to customise platforms for various purposes.

The dimensions of the RS549 are 17.5" x 8.72" x 20". The CPU is an Intel Quad E5-4600 Class processor. It has multiple expansion slots: four PCIe x16 (double-width) slots and 32–1024 GB registered DDR3 with ECC memory. The unit has four options on external bays configurations: nine removable SATA or SAS 2.5" or 3.5" HDD; 18 2.5" SATA or SAS HDDs; three drive packs and eight removable SATA or SAS 2.5"; or one CD/DVD/BD (R/W).

The RS5718L24 dimensions are 17.5" x 8.75" x 23.75". The unit has three CPU options: Sandy Bridge or Ivy Bridge LGA2011, X9DRL-IF; Sandy Bridge or Ivy Bridge LGA1155, X9SAE-V; or Haswell LGA2011, X10SRL-F or X10DRL-I. The unit has seven full-height slots and two options for external bays: up to 18 removable SATA or SAS 3.5" HDD; or a rugged drive pack (RDp) offer up to 30 hot-swappable 2.5" HDDs or eight four-drive packs.

Metromatics Pty Ltd

www.metromatics.com.au

LEAD-FREE SOLDERING STATION

The QUICK3202 soldering station features microcomputer control, rapid heating and thermal recovery. It is equipped with digital temperature calibration and is easy to maintain. Another feature is the insert-plug design of the heating element and soldering tip.

The temperature is locked by a password, and three different temperatures can be set and saved. Two cleaning methods are available: a sponge and a metallic sponge.

The 90 W station has a temperature range of 100–500°C and temperature stability of $\pm 2^\circ\text{C}$. The ambient temperature (max) is 40°C; the tip-to-ground resistance is $< 2\ \Omega$; and the tip-to-ground potential is $< 2\ \text{mV}$.

The product has dimensions of 96 x 160 x 135 mm. It weighs about 1.4 kg.

Onboard Solutions

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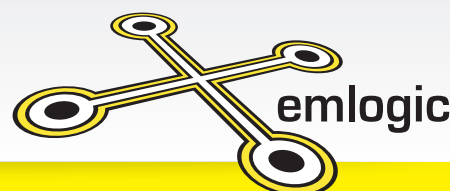
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The NV08C-RTK-A is the latest L1 RTK+Heading GNSS receiver from NVS Technologies.

A fully integrated multiconstellation satellite navigation receiver with embedded RTK functionality, the product is compatible with GPS, GLONASS and future global navigation satellite systems (GNSS) GALILEO and BeiDou. Specifically designed for use in high-accuracy applications, the product offers low power consumption in a small form factor with high performance.

The easy-to-integrate device features a data rate up to 20 Hz; base and rover mode; RTK positioning; heading + pitch/roll; centimetre-level positioning in RTK mode; individual GLONASS group delay calibration; three-stage filtration for high out-of-band interference immunity; enhanced RAIM for 3D and RTK modes; NMEA 0183, RTCM 3.1 communication protocols; an industrial operating temperature range -40 to +85°C; and integrated MEMS sensors (INS).

Applications include: construction, mining and industrial; environmental and structural monitoring; machine control and automation; parallel driving systems; precision agriculture; unmanned aerial vehicles (UAV); robotics and intelligent machines; and land surveying, 3D cartography and air photography.

M2M Connectivity

www.m2mconnectivity.com.au

μQSEVEN COMPUTER MODULES

congatec is extending its product portfolio by offering computer-on-modules in the 40 x 70 mm sub-credit-card μQseven format. The first flagship module of the next-generation mini form factor is the conga-UMX6 with ARM Cortex A9-based Freescale i.MX 6 processors.



The product caters to applications in harsh environments which require not only compact low-power designs, but also appealing multimedia and computing performance. Applications benefit from the computer module's ARM-consistent, long-term availability of 10+ years; high performance per watt, with a typical power consumption of 3.5 W; and the extended temperature support of -40 to +85°C.

The module is tailored to traffic systems, in-vehicle systems, small-size PLCs, parking ticket machines and any other embedded or IoT application that requires a space-saving design and low power consumption. Users benefit from the high level of standardisation and scalability of the form factor, which enables small and flat designs. The company's extensive documentation, industry-grade driver implementations and experienced personal integration support help OEMs to integrate the processor technology quickly and efficiently into their individual applications.

congatec Australia Pty Ltd

www.congatec.com

POWER AMPLIFIER

The MAAP-011140-DIE is a four-stage, 6 W power amplifier in bare die form that is fabricated using a GaAs pHEMT device process featuring full passivation. The power amplifier operates from 27.5 to 30 GHz and provides 24 dB of linear gain, 6 W saturated output power and 23% power-added efficiency.

Additional features include: P1dB of 37.5 dBm; Psat of 38.5 dBm; return loss of 12 dB; and die dimensions of 3.6 x 3.8 x 0.05 mm. The amplifier is designed for VSAT terminals and other military and civilian Ka-band SatCom datalink applications.

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NEXT-GEN MEMORY CHIPS

Ramin Skibba



The memory chips in phones, laptops and other electronic devices need to be small and fast, and to draw as little power as possible. For years, silicon chips have delivered on that promise.

To dramatically extend the battery life of mobile gadgets, and to create data centres that use far less energy, engineers are now developing memory chips based on new nanomaterials with capabilities that silicon can't match.

Stanford engineers have developed post-silicon materials and technologies that store more data per square inch and use a fraction of the energy of today's memory chips. The unifying thread in the engineers' three recent experiments is graphene — an extraordinary material isolated a decade ago but which had, until now, relatively few practical applications in electronics.

"Graphene is the star of this research," said Eric Pop, associate professor of electrical engineering and a contributor to two of the three memory projects. "With these new storage technologies, it would be conceivable to design a smartphone that could store 10 times as much data, using less battery power, than the memory we use today."

Professor H-S Philip Wong and Pop led an international group of collaborators who describe three graphene-centric memory technologies in separate articles in *Nature Communications*, *Nano Letters* and *Applied Physics Letters*.

Engineers think post-silicon memory chips may transform server farms that must store and deliver quick access to the vast quantities of data stored in the cloud.

"Data storage has become a significant, large-scale consumer of electricity, and new solid-state memory technologies such as these could also transform cloud computing," Wong said.

Memory makeover

Memory chips store data as a string of ones and zeroes. Today most memory chips are based on silicon, and come in two basic

types — volatile and non-volatile. Volatile memory, such as random-access memory (RAM), offers fast but temporary storage. When the power shuts off, the zeros and ones vanish. Non-volatile memory, such as the flash memory in mobile phones, is slow but stable. Even if the battery expires, the data remains.

The Stanford engineers show how to create memory with the speed of RAM and the persistence of flash by using new materials and technologies that require less energy than silicon to store the zeroes and ones.

In *Nature Communications*, Wong worked with postdoctoral fellow Seunghyun Lee and PhD candidate Joon Sohn on a technique known as resistive random-access memory, or RRAM for short.

In RRAM chips, tiny jolts of electricity switch certain metal oxides between resistive and conductive states. When the metal oxides resist the flow of electrons, that creates a zero. When the materials conduct electrons, that is a one. RRAM is fast, like volatile silicon memory; but like flash memory, it retains stored data when the power is turned off.

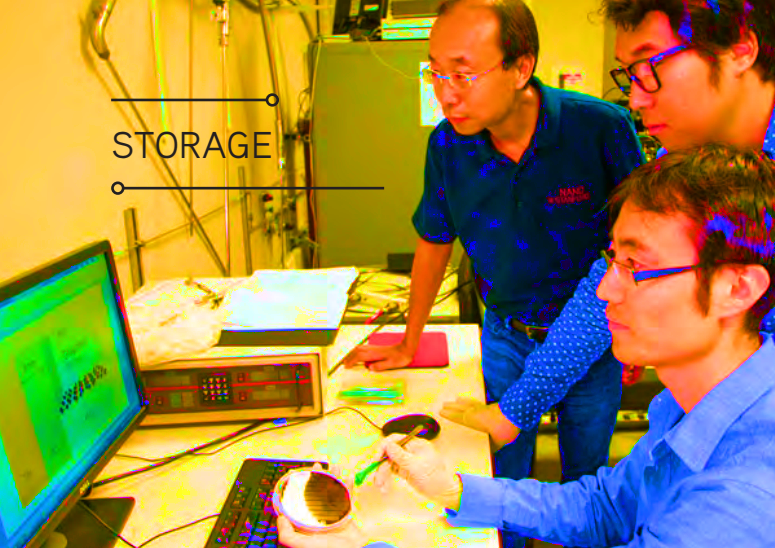
This work demonstrates the possibility of constructing non-volatile RRAM while densely storing data without consuming more energy.

New phases of memory

In two other papers, published in *Applied Physics Letters* and *Nano Letters*, Pop and Wong led research teams that used graphene to make advances with a different but conceptually similar storage approach called phase-change memory.

In phase-change memory, a tiny jolt of electricity causes an alloy of germanium, antimony and tellurium to change its atomic structure. One jolt tweaks the atoms into a regular, crystalline structure that allows electrons to flow, notated as a digital one.

STORAGE



Professor H-S Philip Wong, postdoctoral fellow Seunghyun Lee and graduate student Joon Sohn are developing high-capacity, energy-efficient memory chips that are not based on silicon. Image credit: Norbert von der Groeben.

A second jolt makes the structure irregular, or amorphous, creating a zero. Each jolt quickly toggles the phase-change material from one to zero. Like RRAM, it retains its stored data when the power is turned off.

In the *Applied Physics Letters* paper, Pop led a team that included former students at the University of Illinois Urbana-Champaign and collaborators at the Universities of Modena and Bologna in Italy. They used ribbons of graphene as ultrathin electrodes to intersect phase-change memory cells, like skewers spearing marshmallows.

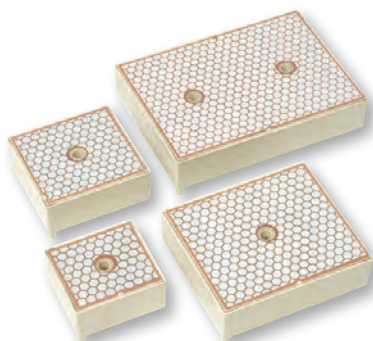


IN RRAM CHIPS, TINY JOLTS OF ELECTRICITY SWITCH CERTAIN METAL OXIDES BETWEEN RESISTIVE AND CONDUCTIVE STATES. WHEN THE METAL OXIDES RESIST THE FLOW OF ELECTRONS, THAT CREATES A ZERO. WHEN THE MATERIALS CONDUCT ELECTRONS, THAT IS A ONE.

This set-up also exploited the atomically thin edge of graphene to push current into the material and change its phase, again in an extremely energy-efficient manner.

In the *Nano Letters* paper, Pop and Wong used both the electrical and thermal properties of graphene in a phase-change memory chip. However, in a twist, here they used the surface of the graphene sheet to contact the phase-change memory alloy. In essence, the graphene prevented the heat from leaking out of the phase-change material, creating a more energy-efficient memory cell.

new
PRODUCTS



SILICONE-FREE, PRE-APPLIED THERMAL INTERFACE MATERIAL FOR POWER MODULES

Vincotech has announced the approval of silicone-free Müller-Ahlhorn Thermigrease TG 20032 for the company's power modules.

Many applications, eg, automotive production lines, have severe requirements regarding silicone-free products. Responding to rising demand for silicone-free thermal paste, Vincotech approved Müller-Ahlhorn Thermigrease TG 20032 for the company's power modules. MiniSKiP modules are the first to ship with this pre-applied silicone-free thermal paste, with other product families following soon.

Features of pre-applied thermal interface material include: thermal conducting material with optimised thickness; optimised thermal resistance; a streamlined production process (no need for screen-printing facilities); and automated screen printing for precision and reliability.

Vincotech

www.vincotech.com

EMBEDDED EVALUATION KIT

The MAX 10 Nios II Embedded Evaluation Kit (NEEK), from Terasic Technologies, supports test and development of the Altera MAX 10 non-volatile FPGAs, offering a comprehensive design environment with everything embedded developers need to create a processing-based system. The kit allows developers to customise their processor and IP to suit their specific needs.



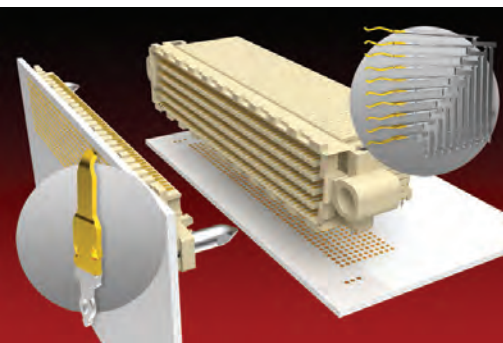
The product provides developers with an integrated platform to develop a wide range of applications on the Altera MAX 10 FPGAs. The MAX 10 NEEK board includes an Altera MAX10 10M50DAF484C6G FPGA, which features integrated dual analog-to-digital converters (ADCs), 1638 kb of embedded memory, 5888 kb of flash memory and 50,000 programmable logic elements. The embedded 32-bit Nios II RISC processor supports a variety of operating systems and includes free development tools.

The board offers 256 MB of DDR3 SDRAM, 512 MB of quad-SPI Flash and a Micro SD socket for additional storage. It includes a five-point 800 x 480 LCD five-point capacitive touch panel and digital image module to allow for the development of multimedia applications. Designers can use the onboard USB-Blaster II or optional JTAG (via a 10-pin header) for easy test and debugging.

The board features Gigabit Ethernet, PS/2 connection and a 2 x 6 Terasic Mini Digital (TMD) expansion header. It supports 24-bit audio, HDMI RX (including support for 3D video) and an 8 MP MIPI CS-2 colour camera input.

Mouser Electronics

www.mouser.com



PRESS-FIT RIGHT-ANGLE SOCKET ARRAY

Samtec's range of SEARAY open pin field arrays has expanded to include a right-angle socket with press-fit terminations for increased design flexibility and high retention. The socket is a high-density

solution for micro backplane applications, featuring Samtec's Edge Rate contact system optimised for signal integrity.

Available in 8- and 10-row designs with up to 500 total I/Os on a 1.27 mm pitch grid, the SEAFP-RA Series press-fit right-angle socket array delivers maximum grounding and routing flexibility, low insertion/extraction forces and high cycle life. Optional guide post holes aid in proper alignment when mating with SEARAY terminal arrays, which are also available in right-angle and press-fit terminations.

The featured Edge Rate contact system increases cycle life and minimises the effects of broadside coupling, which decreases crosstalk for good signal integrity performance and impedance control. The rugged contact system is also less prone to damage when 'zippered' during unmating.

SEARAY high-speed, high-density open pin field arrays support 28+ Gbps applications and are Final Inch certified for Break Out Region trace routing recommendations. The open pin field arrays feature a 1.27 x 1.27 mm pitch grid and stack heights from 7 to 40 mm.

Samtec ANZ

www.samtec.com



60 V, 50 A DC SUPPLY

The Sorensen DCS60-50 60 V 50 A DC supply provides 3 kW of DC power for test and measurement applications. Available to rent from TechRentals, it is suitable for research, product development, production test, automated test equipment (ATE), electroplating, burn-in and other bulk power applications.

The product allows the user the option to operate multiple units in series or parallel and is subject to regulatory approvals CE, CSA. It also has protection features such as overvoltage protection, current limit and overtemperature protection.

Other features include: constant voltage with automatic crossover and mode indication; constant current; remote sense, 1 V line loss compensation; and isolated analog programming.

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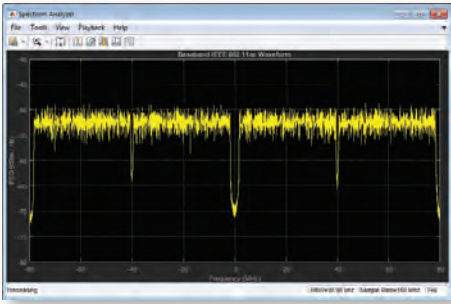
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WLAN SYSTEM TOOLBOX

MathWorks has introduced WLAN System Toolbox, providing standards-compliant functions for the design, simulation, analysis and testing of wireless LAN communications systems.

The product expands capabilities of MATLAB for wireless development by providing configurable physical layer waveforms for IEEE 802.11ac and 802.11b/a/g/n standards. It provides reference designs to enable exploration of baseband specifications and demodulate and recover signals. Users can also study the effects of RF designs and interference sources on system performance.

The system toolbox provides MATLAB source code, allowing engineers to customise algorithms and analyses. The toolbox also generates unencrypted, hardware-independent waveforms for simulation and over-the-air testing.

Other features include: end-to-end system simulation and algorithm development; a golden reference for design verification; measurement and analysis of system performance; over-the-air waveform transmission and reception with software-defined radios and RF instruments; C-code generation support.

MathWorks Australia

www.mathworks.com.au



WLAN ACCESS POINT AND GATEWAY INTO THE IoT

The NM50, from MEN Mikro Elektronik, is a maintenance-free WLAN access point for connecting networks in demanding railway and automotive applications. Its robust design and secure data transmission make the product a suitable gateway solution for vehicle-to-vehicle or vehicle-to-land communication in safety-critical environments of the IoT.

The device is compliant to EN 50155 and ISO 7637-2 (E-mark for automotive), fulfilling the requirements for use in public transportation. As a member of MEN's robust and flexible box PC family, it enables a fast time to market for IoT applications.

Two WLAN modules provide high-speed internet and local data connection to multiple WLAN-compatible devices. A configurable firewall protects WLAN clients and supports secure and uninterrupted network connectivity. Two Gigabit Ethernet ports available on M12 connectors secure a redundant upstream connection to a local server, or downstream to other access points in a network, to extend coverage and increase availability of service. Up to six possible antenna interfaces via RP-TNC connectors enable redundant and continuous signal reception.

The product's electronics are based on a low-power Freescale QorIQ Power PC CPU and are protected by a conduction-cooled IP30 aluminium housing. It is designed for operation at temperatures from -40 to +85°C.

OEM Technology Solutions

www.oem.net.au



POWER SUPPLY

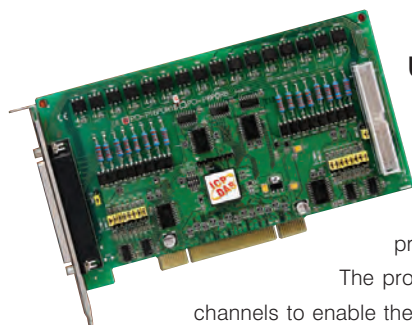
The Sorensen XFR 600-4 is designed to provide power for product R&D and other production test applications, including electroplating and burn-in, magnet control and automated test equipment (ATE). It is available to rent from TechRentals.

The 600 V, 4 A DC power supply is suitable for high-power applications where a range of output voltages and currents is required. It provides 2.4 kW of power, features remote analog programming and has an operating range of 0 to 50°C.

The product can be stacked in rack mounts without ventilation space between units due to its good thermal management. Constant voltage/current operation with automatic crossover and mode indication provides stable power for testing. Additionally, zero-voltage 'soft switching' virtually eliminates switching transients, reduces heat generation and decreases stress on the switching transistors.

TechRentals

www.techrentals.com.au



UNIVERSAL PCI CARD

ICP DAS's PCI-P16POR16U universal PCI card supports 3.3 V/5 V PCI bus and provides 16 photo coupler digital inputs with 5000 Vrms isolation protection and allows input signals to be completely floated to prevent ground loop noise.

The product is also equipped with 16 PhotoMOS relay output channels to enable the control of the ON/OFF state of external devices, drive external relays, small power switches or activate alarms. The card has a selectable DC signal input filter and a DIO response time of 250 μ s (4 kHz max). The card also supports DIO status readback and has LED indication on the relay outputs.

The unit also has a card ID switch onboard. Users can set the card ID and then recognise the board by the ID via software when using two or more cards in one computer.

The card supports various OS versions, such as Linux, DOS, Windows 98/NT/2000 and 32/64-bit Windows 8/7/Vista/XP. Various language sample programs based on Turbo C++, Borland C++, Microsoft C++, Visual C++, Borland Delphi, Borland C++ Builder, Visual Basic, C#.NET, Visual Basic.NET and LabVIEW are provided in order to help users quickly and easily develop their own applications. An 8/8-channel version is also available.

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

CABLE PLUGS AND JACKS FOR HARSH CONDITIONS

Amphenol RF's TNC and Type N cable plugs and jacks have been engineered for harsh conditions without compromising their performance. The 50 Ω ARC rugged connectors come in standard and reverse-polarity versions and are sealed at IP67 levels in unmated and mated conditions.

The products have a temperature range of -65 to 165°C and are made of beryllium copper, brass, copper alloy and PTFE. The mating durability for both the TNC and Type N products is 500 cycles minimum.

Applications include transportation, military, mining and construction, public safety, wireless, smart energy and industrial control.

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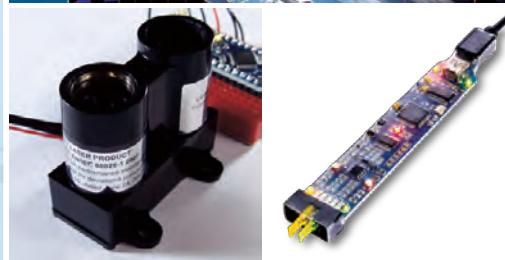
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www.silvertone.com.au



ENTERPRISE PERFORMANCE HDD

Toshiba Corporation's Semiconductor & Storage Products Company has announced its enterprise performance hard disk drive (HDD) line, the AL14SE series, designed for mission-critical servers and high-performance, high-availability storage systems. The 10,500 rpm HDD supports 12 Gbps SAS and 512n sector length for compatibility with the latest generation host controllers and host bus adapters.

The product features a four-platter design, increasing storage capacity by 33% over previous models. The range is also updated with a 128 MB data buffer for improved performance. It provides 12 Gbps dual-ported SAS support and 512n sector models in capacities of 300, 450, 600, 900 and 1200 GB.

The HDD is designed to support OEM customisations of value-add features such as optional RAID rebuild assist and optional self-encryption feature sets. The 12 Gbps SAS feature provides auto-negotiation to 6 Gbps SAS for legacy host controllers, enabling compatibility within legacy hardware platforms and host controllers.

The product is suitable for server and storage systems and applications requiring a balance between storage capacity and performance in virtualised storage environments.

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

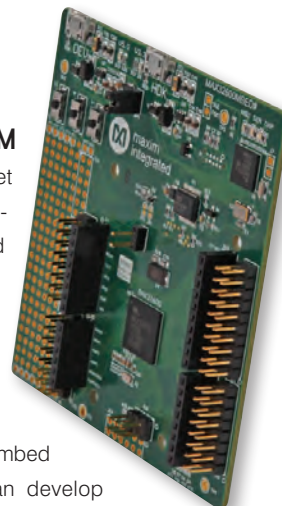
DEVELOPMENT PLATFORM

To make it faster to design Internet of Things (IoT) applications with differentiated silicon, Maxim Integrated Products has developed software libraries and development hardware for its MCUs to be prototyped through mbed. With the addition of MAX32600MBED to the ARM mbed IoT Device Platform program, mbed engineers and IoT developers can develop embedded systems based on the MAX32600 MCU.

The platform includes a MAX32600 ARM Cortex-M3 based microcontroller, prototyping area with adjacent access to precision analog front-end (AFE) connections, I/O access through Arduino-compatible connectors, additional I/O access through 100 x 100 mm headers, USB interface and other general-purpose I/O devices. The platform's secure, low-power, mixed-signal microcontrollers are said to ease the development path to IoT products.

Features include: ease of design with access to software, tools, infrastructure and a support community; an onboard trust protection unit; and low power of 175 μ A/MHz with full SRAM retention in 1.5 μ A standby mode.


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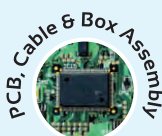
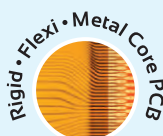
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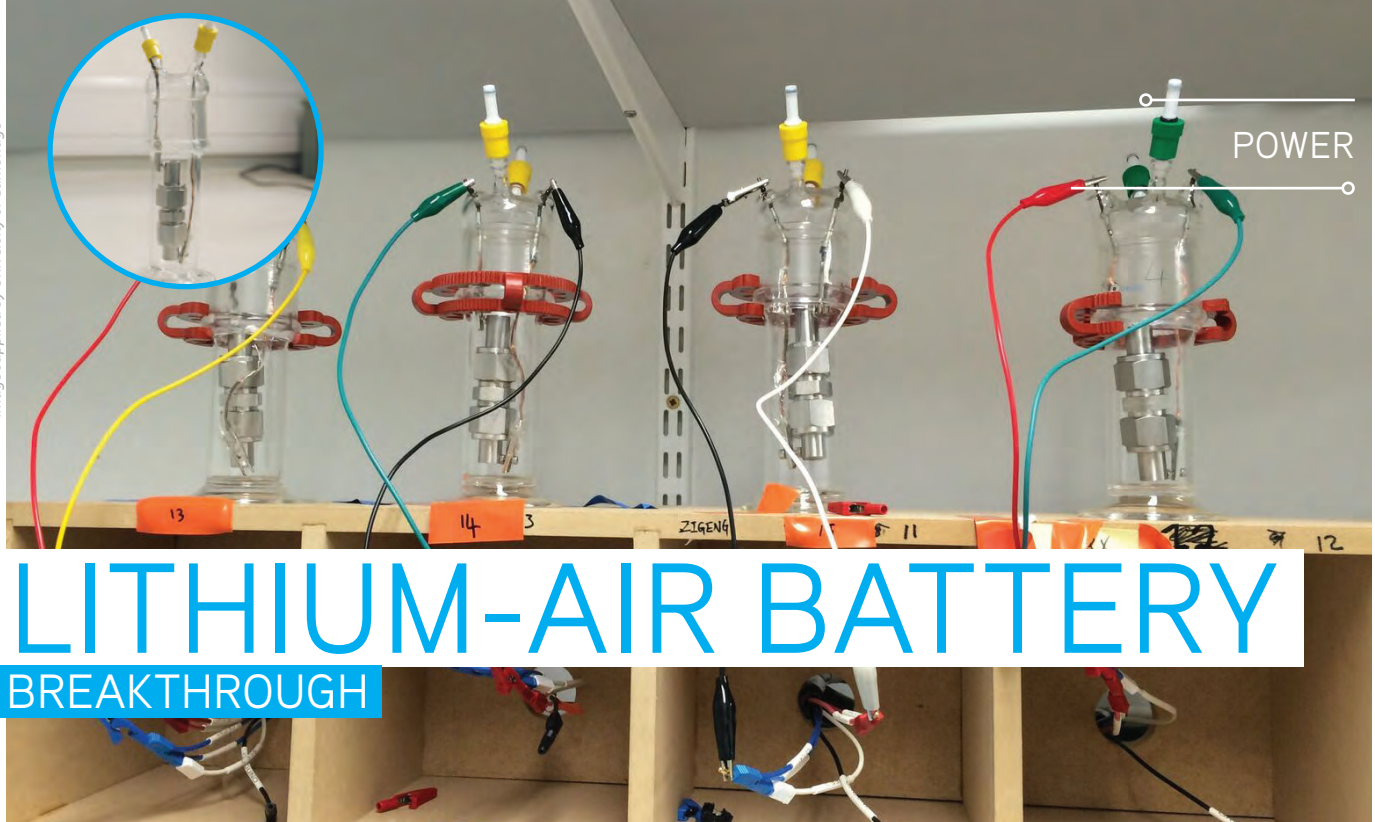
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LITHIUM-AIR BATTERY

BREAKTHROUGH

Cambridge University scientists have developed a working laboratory demonstrator of a high-density lithium-oxygen battery that is more than 90% efficient, and, to date, can be reportedly recharged more than 2000 times.

Lithium-oxygen, or lithium-air, batteries have been touted as the 'ultimate' battery due to their theoretical energy density, which is 10 times that of a lithium-ion battery. Such a high energy density would be comparable to that of gasoline — and is said to enable an electric car with a battery that is a fifth the cost and a fifth the weight of those currently on the market to drive from London to Edinburgh on a single charge.

However, as is the case with other next-generation batteries, there are several practical challenges that need to be addressed before lithium-air batteries become a viable alternative to gasoline.

Now, researchers from the University of Cambridge have demonstrated how some of these obstacles may be overcome. Their demonstrator relies on a highly porous, 'fluffy' carbon electrode made from graphene (comprising one-atom-thick sheets of carbon atoms), and additives that alter the chemical reactions at work in the battery, making it more stable and more efficient. While the results, reported in the journal *Science*, are promising, the researchers caution that a practical lithium-air battery still remains at least a decade away.

Many of the technologies we use every day have been getting smaller, faster and cheaper each year — with the notable exception of batteries. Apart from the possibility of a smartphone that lasts for days without needing to be charged, the challenges associated with making a better battery are holding back the widespread adoption of two major clean technologies: electric cars and grid-scale storage for solar power. Li-ion batteries are light, but their capacity deteriorates with age, and their relatively low energy densities mean that they need to be recharged frequently.

Over the past decade, researchers have been developing various alternatives to Li-ion batteries, and lithium-air batteries are considered the ultimate in next-generation energy storage, because of their extremely high energy density. However, previous attempts at working demonstrators have had low efficiency, poor rate performance and unwanted chemical reactions, and can only be cycled in pure oxygen.

The demonstrator developed by Professor Clare Grey and Dr Tao Liu from the Department of Chemistry and their colleagues uses a very different chemistry than earlier attempts at a non-aqueous

lithium-air battery, relying on lithium hydroxide instead of lithium peroxide. With the addition of water and the use of lithium iodide as a 'mediator', their battery showed far less of the chemical reactions which can cause cells to die, making it far more stable after multiple charge and discharge cycles.

By precisely engineering the structure of the electrode, changing it to a highly porous form of graphene, adding lithium iodide and changing the chemical make-up of the electrolyte, the researchers were able to reduce the 'voltage gap' between charge and discharge to 0.2 V. A small voltage gap equals a more efficient battery — previous versions of a lithium-air battery have only managed to get the gap down to 0.5 to 1.0 V, whereas 0.2 V is closer to that of a Li-ion battery, and equates to an energy efficiency of 93%.

The highly porous graphene electrode is also said to increase the capacity of the demonstrator, although only at certain rates of charge and discharge. Other issues that still have to be addressed include finding a way to protect the metal electrode so that it doesn't form spindly lithium metal fibres known as dendrites, which can cause batteries to explode if they grow too much and short-circuit the battery.

Additionally, the demonstrator can only be cycled in pure oxygen, while the air around us also contains carbon dioxide, nitrogen and moisture, all of which are generally harmful to the metal electrode.

"There's still a lot of work to do," said Liu. "But what we've seen here suggests that there are ways to solve these problems — maybe we've just got to look at things a little differently."

"While there are still plenty of fundamental studies that remain to be done, to iron out some of the mechanistic details, the current results are extremely exciting — we are still very much at the development stage, but we've shown that there are solutions to some of the tough problems associated with this technology," said Grey.

The technology has been patented and is being commercialised through Cambridge Enterprise, the university's commercialisation arm.

Changes have been made to the text, originally licensed by Cambridge University under a Creative Commons Attribution 4.0 International License. Original source: <http://www.cam.ac.uk/research/news/new-design-points-a-path-to-the-ultimate-battery>.

SMART FOLIO

Bamboo Spark offers a convenient way to capture ideas in both physical and digital ink to save them for further editing. The product allows users to write and sketch with Bamboo Spark's traditional ink pen on most A5 paper. The smart folio's EMR (electromagnetic resonance) board, which communicates with the Bamboo Spark pen, offers digital input. With the push of a button, the product synchronises whatever has been written or sketched to the Wacom Cloud.

To get started, simply download the Bamboo Spark app on an iOS or Android device with Bluetooth Smart technology. Next, pair the device with the app and start writing. Every stroke is saved within the app by simply pushing the button in the centre of the device. Refine and edit notes in the Bamboo Spark app or export them to Bamboo Paper, Evernote or Dropbox.

The product comes in three models. Bamboo Spark with gadget pocket features a carrier for smartphone, pen, business cards and paper; Bamboo Spark with tablet sleeve, made with neoprene, provides room for a tablet and/or smartphone, pen and paper; and Bamboo Spark with snap-fit for iPad Air 2 is specifically designed for the iPad Air 2.

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EDIBLE ELECTRONICS



An artistic representation of edible electronics. Image by: Christopher J. Bettinger.

Imagine a 'smart pill' that can sense problems in your intestines and actively release the appropriate drugs. We have the biological understanding to create such a device, but we're still searching for electronic materials, like batteries and circuits, that pose no risk if they get stuck in our bodies.

In the journal *Trends in Biotechnology*, Christopher Bettinger of Carnegie Mellon University presents a vision for creating safe, consumable electronics, such as those powered by the charged ions within our digestive tracts.

Edible electronic medical devices are not a new idea. Since the 1970s, researchers have been asking people to swallow prototypes that measure temperature and biomarkers. Currently, there are ingestible cameras for gastrointestinal surgeries as well as sensors attached to medications used to study how drugs are broken down in the body.

"The primary risk is the intrinsic toxicity of these materials; for example, if the battery gets mechanically lodged in the gastrointestinal tract — but that's a known risk. In fact, there is very little unknown risk in these kinds of devices," said Bettinger, a professor in materials science and engineering.

"The breakfast you ate this morning is only in your GI tract for about 20 hours — all you need is a battery that can do its job for 20 hours and then, if anything happens, it can just degrade away."

Bettinger and other researchers are exploring how minerals in a healthy diet, or even pigments from the skin or eye, could be used in bioelectronics. Ingestible devices that are used now are powered by off-the-shelf batteries, just like what you'd find in a watch. Bettinger challenges whether a segmented battery is

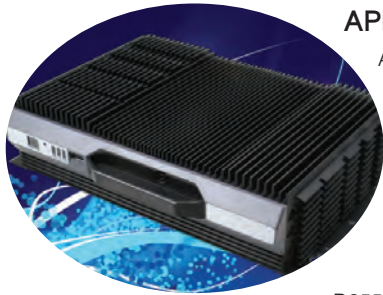
necessary, as the natural liquids within the body can be the electrolytes that move current through the device. Labs have already proven that electronics built using this method can disintegrate in water after 2–3 months.

There's also evidence that manufacturing biologically inspired 'smart pills' can be cost effective and pass regulatory approval. Ingestible medical devices and even 3D-printed pills have been given the green light for patient use in recent years despite their atypical properties. Regarding cost, one of the reasons medications cost so much is that only a small percentage of a pill actually makes it to where it needs to be used in the body. Bettinger argues that if an electronic pill can make better use of expensive medications, the amount needed for each patient can be reduced.

"There are many rapid advances in materials, inventions and discoveries that can be brought to bear on medical problems," Bettinger said. "If we can engineer devices that get the most mileage out of existing drugs, then that is a very attractive value proposition. I believe these devices can be tested in patients within the next 5–10 years."

Funding was provided by the American Chemical Society Petroleum Research Fund, the Defense Advanced Research Projects Agency and the Pittsburgh Innovation Works.

EMBEDDED SYSTEM FOR MARITIME APPLICATIONS



Avalanche Technology's EMS-CDV-Marine is an embedded system for maritime applications such as control rooms, integrated bridge systems, propulsion control and safety systems. The powerful and versatile system features a range of graphics, I/O extension flexibility and robust designs.

The product is equipped with an onboard Intel Atom D2550 1.86 GHz CPU to provide low power consumption.

It also features 6x COM and 2x PCIe slots, while 5x USB ports provide flexibility of expansion. The 12-bit GPIO connector allows users to define and connect various devices to fit applications. The front-access swappable hard drive and SIM card slot provide ease of operation.

The unit follows marine standards and is IEC EN609445 certified. It is designed to operate continuously under critical conditions, including shock, vibration, wide temperatures (-10 to +60°C) and wide power input (10 to 27.5 V). The slim and compact device can be installed into space-limited ships and boats, with its aluminium extrusion and heavy-duty steel chassis providing strong and solid construction to protect the internal electronic system.

The rugged PC comes with mounting brackets for easy installation. It requires little maintenance as its fanless and cable-less design includes minimal moving parts.

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

DESIGN SOFTWARE

With MATLAB Release 2015a, enhancements to signal processing and wireless communications products make it easy to analyse signals. Users can perform antenna-to-bits simulation, over-the-air testing and smart RF design, as well as develop real-time DSP algorithms for streaming audio devices and smart sensors.

The product includes MATLAB and Simulink Hardware Support Packages; optimised algorithm libraries for ARM Cortex A; and support for IP cameras in MATLAB. It also includes enhanced code generation capabilities for MATLAB and Simulink products.

In addition to a range of extra capabilities in MATLAB and Simulink, Release 2015a includes: Antenna Toolbox for designing, analysing and visualising antenna elements and antenna arrays; Robotics System Toolbox for designing and testing algorithms for robotics applications; Simulink Test for creating test harnesses, authoring complex test sequences and managing simulation-based tests; and Vision HDL Toolbox for designing image processing, video and computer vision systems for FPGAs and ASICs.

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DEVELOPMENT KITS

Dialog Semiconductor's SmartBond Basic and Pro development kits offer engineers a fast and easy route to developing intelligent connected devices, particularly where small size and low power consumption are critical, such as in battery-powered wearables and other IoT applications.

The kits are based on Dialog's DA14580 and DA14581 system-on-chip (SoC) ICs. The highly integrated devices combine a Bluetooth low-energy radio with an ARM Cortex-M0 application processor and intelligent power management. Processor resources are accessible via 32 GPIOs to enable development of fully hosted applications. The SoCs measure 2.5 x 2.5 mm and need just five external components to create complete solutions said to consume less than half the power of alternatives.

SmartBond Basic is a single-board kit with integral flash memory for software development. The Pro version includes mother- and daughterboards and a power profiler to enable power-optimised coding. Both kits are supported by Dialog's SmartSnippets software development environment, which includes Bluetooth Smart SIG-qualified profiles ranging from proximity to health and fitness, medical, smart home and security. Software upgrade over the air (SUOTA) is supported.

Digi-Key Corporation

www.digikey.com



THREE-PHASE SOLAR INVERTERS

The SEMIKUBE SlimLine three-phase solar inverter features easy cabinet assembly, full system monitoring and environmental and electrical robustness. It is available in four different frames, covering a power range of 75-1000 kVA with a power density up to 7.8 kVA/L. Complying with solar standards IEC 62109-1 and UL1741,

the product is designed for UL approval at 1000 V.

The air-cooled stacks close the gap for inverter set-ups up to 1 MW, while the latest IGBTs ensure a long service life. The integrated system monitoring collects all data of heatsink temperature, DC link and current, and provides them, galvanically isolated, to the controller.

Due to the high accuracy of DC link and current signals, the life cycle service management can be optimised. The integrated driver electronics contains all the protection, measurement and control functions needed to operate an inverter at up to 1000 VDC link voltage. A CAN interface provides for parameter setting of error and signal management, as well as failure diagnostics. Error conditions can easily be analysed in the field by the CAN readout, which reduces the service effort.

The flat frame provides two IP54 separated areas for power component cooling on the back side and user electrical interface on the front side, which enables use in tough environments. The specification for 95% humidity and 60°C ambient temperature covers even the harsh conditions of central solar inverters in rural areas. Cooling is ensured by electronic long-life axial fans, with speed control for maximum efficiency. The air-cooled film capacitors ensure long-life performance.

Semikron Pty Ltd

www.semikron.com

COMPUTER-ON-MODULES

ADLINK's COM Express computer-on-module (COM) offerings include the cExpress-SL and Express-SL in PICMG COM.0 Type 6 Compact and Basic Size form factors, respectively. Both modules are available with 6th generation Intel Core i7, i5 or i3 processors and accompanying Intel QM170 and HM170 Chipset.

ECC memory is supported by models utilising the Intel Xeon processor E3-15XX v5 family and Intel CM236 chipset. DDR4 memory is supported up to a total of 32 GB with a lower voltage compared to DDR3, resulting in a reduction in overall power consumption and heat dissipation.


The COMs also provide support for three independent UHD/4K displays and are suitable for automation, medical and infotainment applications, with an extended operating temperature range optionally available for transportation and defence applications.

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HOW TO CHOOSE A PCB MANUFACTURER

As the competition in the PCB manufacturing industry intensifies, engineers and purchasing officers are spoilt for choice, but selecting the right supplier is not easy. Below are some points to consider when choosing a PCB manufacturer.

Standards and accreditations

UL certification

It is important to choose a manufacturer that has a UL-certified facility. UL is a global independent company that certifies, validates, tests, inspects, audits, advises and educates. The company helps businesses navigate growing complexities across the supply chain from compliance and regulatory issues to trade challenges and market access. The key UL standard for rigid and flexible PCBs (printed wiring boards) is UL796. For Flexible Materials Interconnect Constructions (FMICs), the correct UL standard is UL796F.

UL796 requires the use of UL94, the standard for flammability of all plastic material. The most common flammability ratings for PCBs are UL94 V-0 and UL94 V-1. UL94 V-0 indicates a sample stops burning within 10 seconds (30 seconds for UL94 V-1) after the source of ignition was removed. While burning, dripping of particles is allowed as long as they are not inflamed.

To provide a proof to your end customer that PCBs have been manufactured in UL-approved facilities, you may ask your PCB supplier to either provide a certificate or print a UL logo/number on PCBs.

IPC standards

Founded in 1957, the IPC is known as the "Association Connecting Electronics Industries". The IPC's aim is to standardise the assembly and production requirements of electronic equipment.

IPC is an ANSI-accredited standards developing organisation. The following IPC standards apply to rigid and flexible PCBs:

- IPC-A-600 — Acceptability of Printed Circuit Boards
- IPC-6010 — Family of Board Performance Documents ie, series of standards
- IPC-6011 — Generic performance specification for PCBs
- IPC-6012C — Qualification and Performance Specification for Rigid PCBs
- IPC-6013C — Qualification and Performance Specification for Flexible PCBs
- IPC-6015 to IPC-6018 — Qualification and Performance Specification for specialised PCBs (ie, HDI, high frequency etc)

If you want to manufacture rigid and flexible PCBs, please ensure that your manufacturer follows IPC-6012 and IPC-6013 standards respectively. Following IPC-A-600 is not enough as it offers only visual interpretation of various inspection requirements.

Under IPC-6012, PCBs (both rigid and flexible) are manufactured in three different classes according to the usage:

- Class 1 PCB — General Electronic Products
- Class 2 PCB — Dedicated Service Electronic Products
- Class 3 PCB — High Reliability Electronic Products (Class 3/A for space and military avionics)

The major difference in these classes is in the degree of inspection

and the level of acceptance — from class 1 being strict to class 3 the strictest level of acceptance.

ISO certification

It is advisable to choose a PCB manufacturer with ISO 9001 certification and preferably ISO 14001 certification. ISO certification ensures that the holder follows a quality management system and standard documentation, which helps to track and control process variations and maintain consistent quality.

Technical skill

The electronics industry in Australia and New Zealand is focused more on research and development as against high-volume production. This is primarily because these markets have highly skilled engineers but labour is expensive. Due to the high volume of research and development activities, local electronics engineers always work on new designs and technologies. Therefore, it is also important for local PCB manufacturers to keep up to date with the latest technologies and processes. If your PCB manufacturer is not technically sound, your design requirements may be misinterpreted and you may end up wasting more time explaining the designs or correcting errors.

Communication

Poor communication can cost your business time and money. It's important to choose a manufacturer that: replies to your emails and return phone calls fairly quickly; studies your data and technical specifications in detail; clarifies technical issues before the design gets released to the production department; prepares their own technical document and lists your design requirements either in writing or using pictures to avoid misinterpretation; shares bad news as quickly as they share good news.

Economical

As they say, you get what you pay for. It is unlikely that your manufacturer offers best quality products, technical expertise and flawless communication and is also the cheapest. As long as the pricing is reasonably competitive and the transaction offers good value for money, you've got a good deal.

Reliable

The real test of reliability is not when products are delivered on time, every time. What's more important is your manufacturer's approach and attitude when something goes wrong. It is unlikely that everything will run smoothly every time in the real world. If your manufacturer has the willingness and dedication to correct things at any cost without wasting time, then look no further.

QualiEco Circuits Pty Ltd
www.qualiecocircuits.com.au



MODULAR PLATFORM OF OPEN HARDWARE AND SOFTWARE

The HARTING IIC MICA is a modular platform of open hardware and software that can be swiftly adapted to many industrial application areas. The platform consists of a compact, robust computer, suitable for scenarios in industry and rail systems, that has been tested in accordance with EN 50155 and other industry and railway standards.

Built on this is the Virtual Industrial Computing software platform, which is based on a combination of established Linux technologies. The platform enables the virtualisation of applications on field devices without the overhead typically seen with virtualisation. All applications run in sandboxes in virtual containers that hold all required libraries and drivers for the particular application. As a result, package dependencies and incompatibilities are things of the past.

This combination is said to make the product more than just an enhanced industrial equivalent of a Raspberry Pi or BeagleBone. It provides a complete infrastructure for the rapid integration of intelligence into existing manufacturing systems, data collection and the rapid implementation of futureproof small and medium-sized Industry 4.0 projects and proofs of concept. It also seamlessly fits into the Industry 4.0 reference architecture model from VDE/VDI/ZVEI.

HARTING Pty Ltd
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'FIT AND FORGET' DIN RAIL POWER SUPPLY

RECOM's DIN rail power supply, the REDIN series with 45 and 60 W power, is available with standard output voltages of 12 and 24 VDC, adjustable by a front cover potentiometer. The operating temperature range is -20 to +70°C.

The high efficiency reaches 87% and low stand-by losses (<0.5 W) reduce energy consumption and heat generation to a minimum. A long hold-up time of 50 ms at full load ensures a stable output even with unreliable mains inputs.

The power supplies are equipped with numerous safety protection measures; besides short-circuit and overcurrent protection with automatic restart, they are also overtemperature and overvoltage protected with a latching function. The series is fully certified by UL to IEC/EN/UL60950, CE and UL508. A universal input voltage range of 85 to 264 VAC and altitude up to 5000 m means that they are suitable for worldwide use. The compact power supply saves DIN rail space because the modules can be installed next to each other without the need for any spaces between. As an alternative to end mounting, the power supplies can also be side mounted for use in in low-profile cabinets.

RECOM Asia Pte Ltd
www.recomasia.com

MINIATURISED THIN-FILM COMMON- MODE FILTER

TDK Corporation has expanded its line-up of common-mode filters. The TCM0403R thin-film common-mode filter offers a common-mode attenuation of 27.5 dB at 850 MHz in a 0403 package (0.45 x 0.30 mm).

The footprint of the device is nearly 60% smaller than the existing TCM0605R with the same common-mode attenuation. In addition, the filter features a low insertion height of only 0.23 mm.

With a cut-off frequency of 5 GHz and good common-mode attenuation characteristics in the 500 MHz to 2.4 GHz range, the filter suppresses common-mode noise without distorting high-speed differential signals. It is thus compatible with high-speed interfaces such as MIPI, USB 2.0 and USB 3.0.

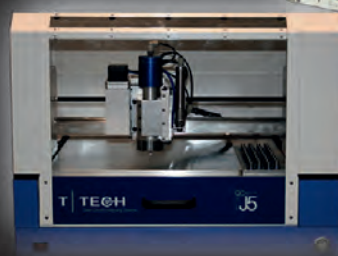
The typical DC resistance is 3.5 Ω. As a result, the filter improves the WLAN reception sensitivity in smartphones, conventional mobile phones and other compact portable devices.

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AUSTRALIAN SCIENTISTS

DESIGN ARCHITECTURE FOR A QUANTUM COMPUTER IN SILICON

Australian scientists have designed a 3D silicon chip architecture based on single atom quantum bits, providing a blueprint to build a large-scale quantum computer.

One of the final hurdles to scaling up to an operational quantum computer is the architecture. Here it is necessary to figure out how to precisely control multiple qubits in parallel, across an array of many thousands of qubits, and constantly correct for 'quantum' errors in calculations.

Now, the Quantum Computation and Communication Technology (CQC2T) collaboration, involving theoretical and experimental researchers from the University of Melbourne and UNSW, has designed such a device.

"We have demonstrated we can build devices in silicon at the atomic scale and have been working towards a full-scale architecture where we can perform error correction protocols — providing a practical system that can be scaled up to larger numbers of qubits," said UNSW Scientia Professor Michelle Simmons, director of the CQC2T.

"The great thing about this work, and architecture, is that it gives us an endpoint. We now know exactly what we need to do in the international race to get there."

In the team's conceptual design, they have moved from a one-dimensional array of qubits, positioned along a single line, to a two-dimensional array, positioned on a plane that is far more tolerant to errors. This qubit layer is 'sandwiched' in a three-dimensional architecture, between two layers of wires arranged in a grid.

By applying voltages to a subset of these wires, multiple qubits can be controlled in parallel, performing a series of operations using far fewer controls. Importantly, with their design, they can perform the 2D surface code error correction protocols in which any computational errors that creep into the calculation can be corrected faster than they occur.

"Our Australian team has developed the world's best qubits in silicon," said University of Melbourne Professor Lloyd Hollenberg, deputy director of the CQC2T, who led the work with colleague Dr Charles Hill. "However, to scale up to a full operational quantum computer we need more than just many of these qubits — we need to be able to control and arrange them in such a way that we can correct errors quantum mechanically."

"In our work, we've developed a blueprint that is unique to our system of qubits in silicon, for building a full-scale quantum computer."

In their paper published in *Science Advances*, the team proposes a strategy to build the device, which leverages the CQC2T's internationally unique capability of atomic-scale device fabrication. They have also modelled the required voltages applied to the grid wires, needed to address individual qubits and make the processor work.

"This architecture gives us the dense packing and parallel operation essential for scaling up the size of the quantum processor," said Scientia Professor Sven Rogge, head of the UNSW School of Physics. "Ultimately, the structure is scalable to millions of qubits, required for a full-scale quantum processor."

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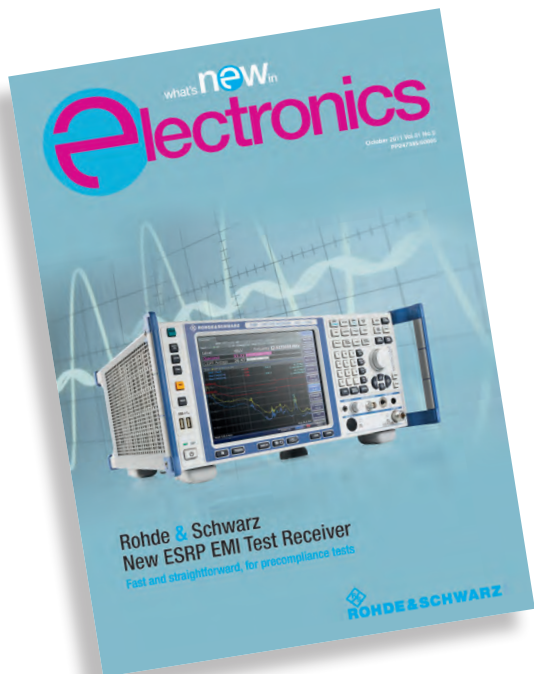
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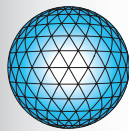
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