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GREENHOUSE TESTING



COVER STORY



Scientific Devices Australia has been appointed as the primary distributor for the Teledyne LeCroy range of premium test equipment. The portfolio includes the LabMaster 10-100Zi Real-time Digital Oscilloscope having the world's highest bandwidth of 100 GHz at 240 GS/s sampling rate.

Teledyne LeCroy has a reputation of designing digital oscilloscope systems that closely integrate digitisers and long acquisition memory, which enables users to capture very fast phenomena present on lower frequency signals by utilising the long acquisition memory to zoom in on the fast signal of interest. The company has expanded on this reputation by introducing powerful trigger features such as serial interface trigger and decode analysis, mixed signal analysis, frequency domain analysis and power analysis. HD4096 high definition technology consisting of high sample rate 12-bit ADCs, high signal-to-noise ratio amplifiers and low-noise system architecture are some key additional benefits of its range of high definition digital oscilloscopes. It has also introduced MAUI, which is said to be the most advanced user interface, developed to put all the power and capabilities of the modern touch-screen digital oscilloscopes right at the user's fingertips.

Scientific Devices Australia is celebrating 45 years in the test and measurement industry. Combining this local experience with Teledyne Lecroy's premium product range provides users with the confidence and trust to invest in a digital oscilloscope solution to meet their basic or demanding measurement applications.

Scientific Devices Australia
www.scientific-devices.com.au



WHERE TO NOW FOR THE TEST AND MEASUREMENT INDUSTRY?



Test departments are constantly looking for ways to drive down their test costs by maximising efficiencies. One method is the continuous improvement process, which strives to improve processes, products or services by ensuring commonality across test platforms through a standardised universal tester. But far too often, a lack of consideration for market drivers, product complexity and long-term cost goals results in overdesigned, costly testers that are intended to meet needs but end up creating highly complex burdens.

Thankfully, recent changes in automatic test equipment (ATE) allow test managers to look beyond the limited build-versus-buy purchase model and focus on a more holistic, hybrid approach when it comes to defining overall test strategy. In this new approach, test managers can evaluate more trade-offs, match unique needs with considerations for product complexity and contemplate how market drivers may reduce product life cycles. For the many industries typically inclined to purchase commercial ATE solutions, such as automotive, aerospace/defence and semiconductor, this trend presents an exciting new opportunity.

This is especially true for those in the semiconductor industry, who are seeing market drivers such as the IoT, tablets, smartphones, digital TVs and smart grids. Because these trends all leverage radio-frequency integrated circuits (RFICs) and microelectromechanical systems (MEMSs) that are more integrated, complex and capable, they also have significantly shorter life cycles and are much more difficult to test. As a result, an ATE test strategy that is not cost-efficient, flexible and easy to support will risk capital-intensive acquisitions of entirely new equipment every few years. However, with the benefits of increased throughput and high volume production driving strong adoption of a universal test approach in the semiconductor industry, these challenges can be easily addressed.

Leveraging big data

The emergence of the big analog data problem, which includes collecting and analysing raw data from the physical world around us, is pushing test and measurement companies to evaluate the people, processes and technologies used to develop products and services.

Unlike the big data typically associated with traditional IT data sources such as social media and enterprise applications, big analog data solutions represent a vastly untapped well of information and insight that test and measurement companies can use to identify and create competitive advantages in data-centric engineering. This is no small feat considering the IDC estimates that only 5% of the data collected today is even being analysed.

In this push to better acquire, store and leverage big analog data solutions, specifically for test data, as it is known in automated test, engineers must start by recognising the role that IT plays in managing it. At present, the sheer amount of data being generated by engineering departments is causing a chasm between IT and engineering. Unless these groups work together to develop tools and methods to better use the data, this chasm will grow deeper.

The first step to cohesion is understanding how big data is classified: structured, unstructured or semi-structured. Historically, most big data solutions have focused on structured data. Defined by the user, structured data embodies a distinct relationship to the user, who inputs numerous values (name, birthday, address) as raw data. Unstructured data contains no metadata, schema or other preassigned, established organisation.

The third category, semi-structured, is influenced by the dramatic increase in the amount of test data being collected. As more test systems are deployed for 24/7 test data collection, the volume of test data will soon surpass that of human-generated data. Because test data yields so much information, assigning structured value to each byte is difficult. Creating hierarchies of data provides structure and



COMPANIES NEED TO KEEP THE BIG PICTURE IN MIND WHEN STARTING PILOT PROGRAMS IN TEST AUTOMATION. THEY NEED TO REMEMBER THAT SOLUTIONS ARCHITECTED FOR CERTAIN GROUPS WILL NOT SCALE WHEN ROLLING OUT TEST DATA ANALYTICS SOLUTIONS TO DIFFERENT DEPARTMENTS.

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makes mining the data after capture easier. This semi-structured test data is typically marked with a timestamp and then analysed across a set period or for a set stimulus/response event.

Form a cross-functional team

To effectively transform into a test data-centric organisation, a cross-functional team should jointly test solutions and ensure compatibility. This team should include a representative from IT, an engineer tasked with data collection, a data scientist and a manager with a high-level view of how new solutions will roll out to other departments. Additionally, an executive should have a vested interest in the outcome of the inclusion of test data analytics to ensure key members of the cross-functional team are held accountable for progress.

Do not expect results immediately

Many companies make the mistake of expecting a full data analytics solution in an unreasonable amount of time. Underestimating the effort required to align multiple teams while trying to overhaul existing workflow processes usually leads teams into proposing solutions without understanding their true data needs. This results in an unusable solution that end users don't adopt.

A full data analytics solution for test data involves smaller, incremental steps and builds momentum for end users, IT professionals, business leaders and so on. Best-in-class companies often run an internal pilot within a single department before documenting data analytics requirements. This allows key stakeholders to understand the flow of the collected data and identify data bottlenecks. Addressing bottlenecks also improves yield, quality and time to market as well as prevents sending inadequate products to market by catching more errors or tests out of specification. These benefits will increase the company's overall profit.

Design for expansion

Companies need to keep the big picture in mind when starting pilot programs in test automation. They need to remember that solutions architected for certain groups will not scale when rolling out test data analytics solutions to different departments.

In addition, companies can send their engineering and design teams' weekly reports to identify key trends for avoiding failures or tightening margins. This can jump-start a redesign process that addresses all possible scenarios.

By prioritising a long-term vision when designing a test data analytics solution architecture, companies can set tangible goals for expansion and IT can plan accordingly and add more servers as the solution is implemented across multiple departments.

Invest now for enormous payoffs

Implementing a test data solution can add tremendous value to an organisation by enabling a more productive workforce while lowering costs and increasing profit. The companies that choose to make the shift to data-centric organisations will be market leaders with access to up to 95% more data than competitors, which can make them 20% more cost-efficient.

Multi-core to many-core

In the test and measurement industry, faster processor clock rates have traditionally reduced test time and cost. Though many companies, especially those in semiconductor and consumer electronics, have benefited from upgrading the PCs that control test hardware, the days of depending on faster clock rates for computational performance gains are numbered.

Faster clock rates have an inverse correlation to processor thermal dissipation and power efficiency. Therefore, over the last decade, the computing industry has focused on integrating multiple parallel processing elements or cores instead of increasing clock rates for increasing the computing performance of CPUs. Moore's law states that transistor counts double every two years, and processor vendors use those additional transistors to fabricate more cores. Today, dual- and quad-core processors are common in desktop, mobile and ultra-mobile computing segments and servers typically have 10 or more cores.

Traditionally, the test and measurement industry has relied on computers with a desktop and/or server class of processor for higher performance. As recent sales

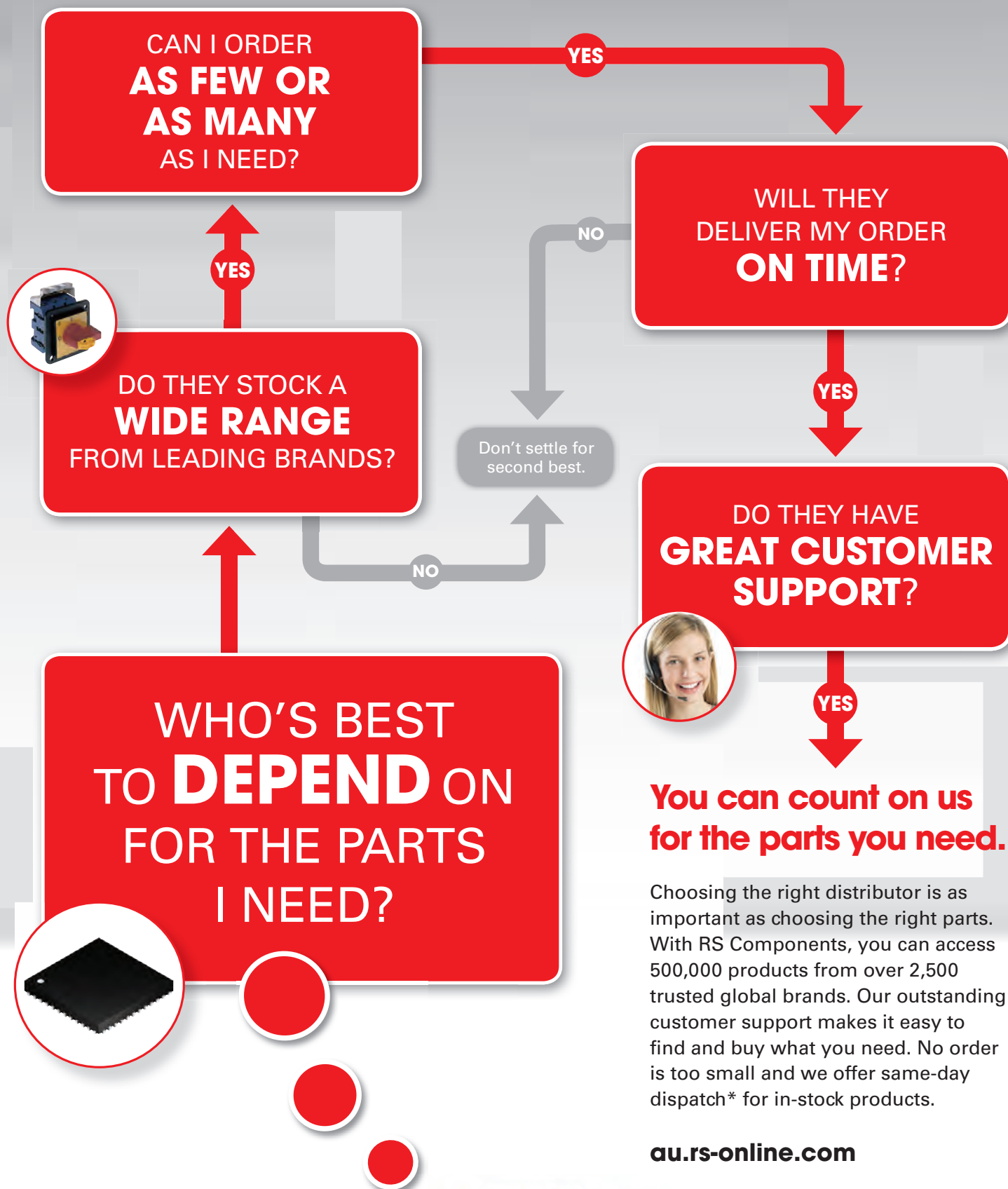
trends indicate, the desktop segment of the computing industry is shrinking. This trend reveals that casual consumers are moving towards more portable yet powerful platforms such as ultrabooks, tablets and all-in-ones. For better addressing the demands of the faster growing market segment, the computing industry is focusing on improving the graphics performance and power efficiency of the ultra-mobile, mobile and desktop classes of processors. Increasing computational performance for these processor categories is generally a tertiary consideration. High-end mobile and desktop processors will continue to offer adequate computational performance for test and measurement applications. However, limited improvements in their raw processing capabilities between newer generations of these processors should be expected.

For the server class of processors, the main applications for the computing industry are IT systems, data centres, cloud computing and high-performance computing for commercial and academic research. These applications are significantly more computationally intensive and are pushing the computing industry to continue to invest in increasing the raw computational capabilities of this server class of processors.

Many-core

More cores are being pushed into smaller, lower-power footprints. Processors are becoming 'many-core' as core counts soar higher than the 10 cores common in server-class processors today. Supercomputers provide an idea of what the processors of tomorrow will look like. Some cores are being devoted to special functions instead of solely to general computing. Graphics processing engines are a good example, with video displays at high resolutions showing more realistic 3D rendering. Other special-purpose cores include security engines that perform root-of-trust and encryption/decryption operations and manageability engines that allow for out-of-band management if the processor is hung, in reset or otherwise unreachable. However, for these many-core processors, the majority of cores will be available for general computing.

Continued on page 28 »



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COMBINED TV ANALYSER

The Rover HD Compact is designed for the installation, maintenance and commissioning of terrestrial, satellite and cable TV systems. It is available to rent from TechRentals.

The TV analyser covers DVB T/C/S/S2 standards. It performs measurements for modulation error (MER) up to 36 dB for DVB-T and C, bit error ratio (BER), noise margin, signal to noise ratio (SNR), error vector magnitude (EVM) and power level. It also handles network and stream IDs as well as MPEG4 HD programs.

Other features include: memory functions and data logging; echoes, micro-echoes and pre-echoes in real time; and a USB interface for screen shots. The product is Foxtel approved.

TechRentals

www.techrentals.com.au

OPTOCOUPLERS

Vishay Intertechnology is expanding its VOW Widebody family of high-isolation optocouplers with a series of high-speed devices capable of 1 MBd and 10 MBd data rates. Designed to increase reliability in high-voltage alternative energy and industrial applications, the VOW135, VOW136, VOW137 and VOW2611 provide a VIOTM of 8000 V, a VIORM of 1414 V and a high creepage distance of more than 10 mm.

The optocouplers consist of a GaAlAs infrared emitting diode, optically coupled with an integrated photo detector. In addition to the robustness provided by their high safety isolation, the devices feature an internal Faraday shield to provide the high input-to-output noise isolation required by high-power switching applications. Eliminating the need for conformal-coated solutions, they allow designers to meet domestic and international safety agency requirements with a small form factor.

The VOW135 and VOW136 offer common mode transient immunity of 1000 V/ μ s and high- and low-level propagation delay of less than 2 μ s at a data rate of 1 MBd. VOW137 and VOW2611 devices provide a data rate of 10 MBd and boost common mode transient immunity up to 40,000 V/ μ s while keeping high- and low-level propagation delay at less than 100 ns and high pulse width distortion less than 40 ns.

Future Electronics

www.futureelectronics.com

HEAVY-DUTY CABLE ROLLER STAND

The simple but effective design of the Adept Direct A-Frame Cable Stand ensures the cable, wire or lead is dispensed easily without excessive tugging and prevents reels of cable rolling around when electricians or telecommunications personnel are installing lines. The company has now released an extra-heavy-duty version of the product.

The Extra Heavy Duty Cable Roller Stand will handle large cable rolls up to 1.5 m diameter and has a safe working load of 150 kg. At 1 m wide, the cable stand will hold and dispense most rolls of cable neatly and safely.

The stand incorporates features of the company's other cable-handling tools, including: high-visibility, yellow powdercoat finish on the A-frames; locking thumbscrews to secure the A-frames into position; galvanised tubular steel cable support axle; safe storage of reels of cable or wire on-site or in the workshop; use for reels or rolls of any product (power lead, rope, hose, etc); multiple cable drum reel capacity for plastic, timber or steel reels; easy collapse for transport and storage.

Adept Direct - Cable Rollers & Lead Stands

www.adeptdirect.com.au



FOUR-WAY 0° SPLITTER/COMBINER

Mini-Circuits' ZB4PD-282-50W+ is a high-power four-way 0° splitter/combiner covering frequencies from 500 to 2750 MHz, supporting many applications such as high-band PCS, WiMAX and more.

It can handle up to 100 W RF input power as a splitter and is capable of passing up to 0.5 A DC current from input to output. The product provides 1.5 dB insertion loss, 21 dB isolation between ports, 5° phase unbalance and 0.3 dB amplitude unbalance. It comes housed in a rugged aluminium alloy case measuring 6 x 4.5 x 1.5" with N-type connectors and heat sink included.

Clarke & Severn Electronics

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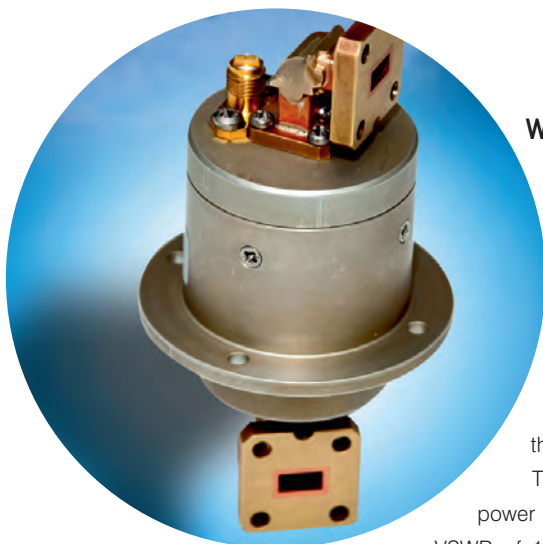
Signal Hound has announced a significant software upgrade, called Spike, that will integrate all of its SA series spectrum analysers and TG series tracking generators under the same open-source GUI platform as the Signal Hound BB60C spectrum analyser.

The software allows the SAs to function as real-time spectrum analysers for sweeps of 250 kHz and less, meaning every RF event will be captured when using spans that are equal to or less than 250 kHz. Sweep speeds are up to 8x faster for spans between 500 kHz and 2 MHz, and the product's graphics now include colour persistence and a 2D waterfall display.

The TG devices' long-standing stability issues are resolved, with the software making the high dynamic range user-friendly and efficient. The tracking generators can also now save 1000-point data files that are then loaded in the path loss table for normalising precision measurements using RF cables and/or antennas. Both ranges benefit from a zero span pre-triggering function and calibrated I/Q data streaming.

Developers will be able to customise the software and compile the modified spectrum analyser code for redistribution. The software is available free of charge and can be downloaded from the company's website.

Silvertone Electronics
www.silvertone.com.au



WAVEGUIDE DUAL-CHANNEL ROTARY JOINT

The AM28RJD dual-channel rotary joint from Link Microtek provides an effective means of reducing component count and saving space and weight in the compact antennas that are used for Ka-band high-data-rate SOTM (satellite-on-the-move) communication systems.

Particularly suitable for military or commercial airborne systems such as satcom uplinks in unmanned aerial vehicles, the rotary joint features a high-power/low-loss WR28 waveguide transmit channel, together with a coaxial receive channel offering a high current rating of 2 A at 24 VDC, which enables it to power the antenna's LNB and servo motors without the need for additional slip rings.

The central transmit channel has a frequency range of 29-31 GHz, with an average power rating in excess of 50 W, a typical insertion loss of just 0.5 dB and a maximum VSWR of 1.7:1. The receive channel can handle frequencies up to 3 GHz at an average microwave power of 1 W, and its typical VSWR and insertion loss are specified as 1.5:1 and 0.25 dB respectively.

The robust device is fabricated from lightweight aluminium with an Iridite finish. Right-angle waveguide bends are used on the transmit channel to save additional space, resulting in overall dimensions of 36 x 90.3 mm, with a 50 mm-diameter UBR320 bulkhead flange. Other rotary-joint configurations and sizes are available on request.

Allied Technologies Group Pty Ltd
www.alliedtech.com.au

CONVERTERS

Analog Devices has released a digital-to-analog converter, an analog-to-digital converter and a dual analog-to-digital converter. The devices are suitable for a range of applications, including 3G/4G cellular infrastructure, aerospace and defence, and instrumentation.

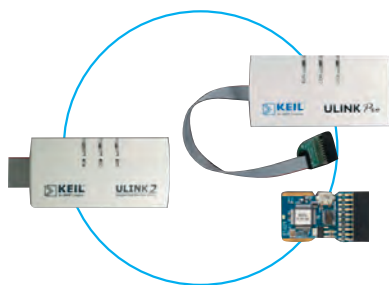
The AD9144 is a quad, 16-bit, high-dynamic-range DAC with a maximum sample rate of 2.8 GS/s that permits a multicarrier generation up to the Nyquist frequency. An optional serial port interface provides for programming or read-back of many internal parameters. Full-scale output current can be programmed over a typical range of 13.9 to 27 mA.

The AD9625 is a 12-bit monolithic sampling ADC that operates at conversion rates of up to 2.5 GS/s and is designed for sampling wide bandwidth analog signals up to the second Nyquist zone. The combination of wide input bandwidth, high sampling rate and good linearity makes the product suitable for spectrum analysers, data acquisition systems and a range of military electronics applications, such as radar and electronic countermeasures.

The AD9680 is a dual, 14-bit, 1 GSPS ADC with an on-chip buffer and sample-and-hold circuit designed for low power, small size and ease of use. It is designed for sampling wide bandwidth analog signals of up to 2 GHz. The product includes buffered inputs with programmable input termination for easier filter design and implementation, and a flexible SPI controls various product features to meet system requirements.

Arrow Electronics Australia
www.arrowaustralia.com





DEVELOPMENT KIT FOR ARM-BASED MICROCONTROLLERS

ARM has announced special editions of the Keil MDK Development Kit for ARM-based microcontrollers from Atmel, Freescale, Infineon, Spansion and Toshiba. The offerings are specifically focused on the respective vendors' devices and enable consumers to use a professional tool.

Keil MDK is the complete software development environment for ARM Cortex-M-based microcontrollers. MDK includes the uVision IDE/Debugger, ARM C/C++ Compiler and comprehensive support for more than 3000 microcontrollers. MDK Version 5 introduced software packs as a way to handle device support, board support and the management of software components. The MDK Professional Edition includes royalty-free middleware components for TCP/IP networking, USB connections, file system access and graphical user interfaces.

The MDK Atmel Edition supports all ARM-based SAM microcontrollers and ships with example applications for numerous Atmel evaluation kits. The MDK Freescale Edition supports all Kinetis microcontrollers and has been selected as a Kinetis-featured IDE by Freescale, making it suitable for developers transitioning from CodeWarrior. The MDK Infineon XMC1000 Edition supports the Infineon XMC1000 series, enabling the transition from 8- and 16-bit architectures to 32-bit ARM Cortex-M0 processors, and is available free of charge.

**Embedded Logic
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www.emlogic.com.au

REFERENCE DESIGN

Maxim's MAXREFDES32 reference design provides two high-speed, high-accuracy, 400 kSps, 16-bit analog input channels and output channels to meet the factory environments of today's advanced manufacturing.

The design utilises four dual fast-settling high-voltage op amps (MAX9633); two 16-bit 500 kSps ADCs (MAX11166); two low-noise, fast-settling precision 16-bit DACs (MAX5316); two ultrahigh-precision 4.096 V voltage references (MAX6126); seven high-speed digital isolators (MAX14850); a peak-current-mode converter for flyback/boost supplies (MAX17498B); and regulated +18, -18, +5 and -1.25 V power rails (MAX8719, MAX8881). By using high-accuracy and high-speed components, the subsystem performs well in both process control applications, such as sensor inputs, and control applications, such as servo drives, resolvers and encoders.

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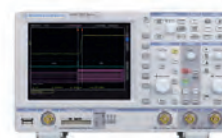
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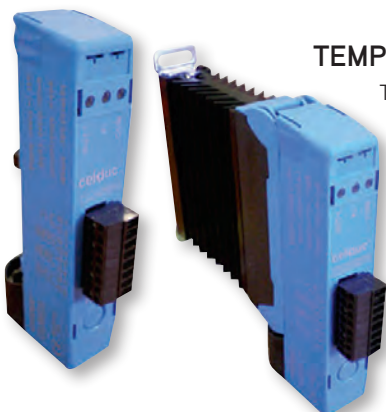


Power supplies



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TEMPERATURE CONTROLLER

The Ecom is a compact temperature controller claimed to incorporate the latest measuring and control technology. Pluggable on a celduc relais SSR type SU, it can enable cost reduction of electrical cabinets (making them smaller), PLCs (with fewer analog and digital I/Os) and wiring (due to bus communication).

The unit incorporates a temperature controller with thermocouple input, loop and heater break alarms, and heating and cooling PID autotuning. It also features current monitoring and alarms up to 50 A with current transformer (CT).

The device includes a pluggable module on a 22.5 mm pitch SSR, as well as J, K, T and E thermocouples. Auxiliary output is available for cooling, alarm or three-phase application control. The product features RS485 communication with Modbus RTU, with others available on request.

Semikron Pty Ltd

www.semikron.com

WIRELESS PRODUCTS FOR VIDEO-OVER-WIRELESS NETWORKS

Moxa has unveiled a complete series of high-bandwidth wireless solutions for enabling video-over-wireless networks in industrial automation applications. The products feature low latency, seamless mobility and a rugged design.

The high-bandwidth wireless product portfolio includes both 802.11n for WLANs and HSPA for WWANs, making it easy for bandwidth-hungry systems, such as are used for IP surveillance, to transmit video data over a wireless network. The AWK and OnCell series offer end users a comprehensive solution that fulfils all these demands. Features such as dual-radio redundancy technology and GuaranLink technology are designed to achieve zero packet loss transmission. Turbo Roaming delivers good wireless communication, even when connected to vehicles moving at high speed. A variety of industrial-grade design features and certifications ensure that the user's wireless network can provide reliable video-over-wireless transmission.

Madison Technologies

www.madisontech.com



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IEC 61000-4-8 / IEC 61000-4-9

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IEC 61000-4-16

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BEST PRACTICES TO

ENHANCE PRIVACY AND SECURITY FOR THE IoT

In a detailed report on the Internet of Things (IoT), the US Federal Trade Commission has recommended a series of concrete steps that businesses can take to enhance and protect consumers' privacy and security.

The IoT universe is expanding quickly, and there are now over 25 billion connected devices in use worldwide, with that number set to rise significantly as consumer goods companies, auto manufacturers, healthcare providers and other businesses continue to invest in connected devices, according to data cited in the report.

The report includes the following recommendations for companies developing IoT devices:

- Build security into devices at the outset, rather than as an afterthought in the design process.
- Train employees about the importance of security, and ensure that security is managed at an appropriate level in the organisation.
- Ensure that when outside service providers are hired, those providers are capable of maintaining reasonable security, and provide reasonable oversight of the providers.
- When a security risk is identified, consider a 'defence-in-depth' strategy whereby multiple layers of security may be used to defend against a particular risk.
- Consider measures to keep unauthorised users from accessing a consumer's device, data or personal information stored on the network.
- Monitor connected devices throughout their expected life cycle and, where feasible, provide security patches to cover known risks.

Commission staff also recommend that companies consider data minimisation - that is, limiting the collection of consumer data and retaining that information only for a set period of time, and not

indefinitely. The report notes that data minimisation addresses two key privacy risks: first, the risk that a company with a large store of consumer data will become a more enticing target for data thieves or hackers, and second, that consumer data will be used in ways contrary to consumers' expectations.

The report takes a flexible approach to data minimisation. Under the recommendations, companies can choose to collect no data, data limited to the categories required to provide the service offered by the device, less sensitive data; or choose to de-identify the data collected. FTC staff also recommend that companies notify consumers and give them choices about how their information will be used, particularly when the data collection is beyond consumers' reasonable expectations. It acknowledges that there is no one-size-fits-all approach to how that notice must be given to consumers, particularly since some Internet of Things devices may have no consumer interface. FTC staff identify several innovative ways that companies could provide notice and choice to consumers.

The report is partly based on input from leading technologists and academics, industry representatives, consumer advocates and others who participated in the FTC's Internet of Things workshop held in November 2013, as well as those who submitted public comments to the commission. Staff defined the IoT as devices or sensors - other than computers, smartphones or tablets - that connect, store or transmit information with or between each other via the internet. The scope of the report is limited to IoT devices that are sold to or used by consumers.



'CAREFUL CONNECTIONS: BUILDING SECURITY IN THE INTERNET OF THINGS' ENCOURAGES COMPANIES TO IMPLEMENT A RISK-BASED APPROACH AND TAKE ADVANTAGE OF BEST PRACTICES DEVELOPED BY SECURITY EXPERTS, SUCH AS USING STRONG ENCRYPTION AND PROPER AUTHENTICATION.

Regarding legislation, staff concur with many stakeholders that any IoT-specific legislation would be premature at this point in time given the rapidly evolving nature of the technology. The report, however, reiterates the commission's repeated call for strong data security and breach notification legislation. Staff also reiterate the commission's call from its 2012 Privacy Report for broad-based privacy legislation that is both flexible and technology-neutral, though Commissioner Ohlhausen did not concur in this portion of the report.

In addition to the report, the FTC also released a new publication for businesses containing advice about how to build security into products connected to the Internet of Things. 'Careful Connections:



Building Security in the Internet of Things' encourages companies to implement a risk-based approach and take advantage of best practices developed by security experts, such as using strong encryption and proper authentication.

The commission vote to issue the staff report was 4-1, with Commissioner Wright voting no. Commissioner Ohlhausen issued a concurring statement and Commissioner Wright issued a dissenting statement.

"We believe that by adopting the best practices we've laid out, businesses will be better able to provide consumers the protections they want and allow the benefits of the Internet of Things to be fully realised," said FTC Chairwoman Edith Ramirez.

new PRODUCTS



BAREBOARD COMPUTER ENCLOSURES

Hammond Electronics has announced its 1593HAMEGG enclosures - board-specific designs for the Arduino and Raspberry Pi bareboard computers. Available in translucent blue, translucent purple or translucent black, they have been designed in response to user feedback, providing

an alternative to traditional base and lid designs where the bareboard is mounted inside an enclosure.

In the HAMEGG design, the board is screwed into moulded studs located on the top of an egg-shaped base, giving stability and all-round unrestricted access to I/O connectors, often-used controls, indicators and expansion boards. It also allows easy installation of EMC shields if required.

The platform provides space for a battery holder for either three or four AAA batteries. For added expandability and mobility, mountings are provided for a range of interlocking plastic bricks and wheels.

The platforms have been configured for the Raspberry Pi A, A+, B and B+ and the Arduino Uno, Due, Ethernet, Leonardo, Mega ADK, Mega 2560 and Yún. Board-specific versions for designs from other manufacturers are in development and will be available in the near future.

Hammond Electronics Pty Ltd
www.hammondmfg.com

USB 2.0 DATA ACQUISITION MODULE

ADLINK Technology has announced its USB 2.0 data acquisition module, the USB-1210. The product supports four 16-bit channels of simultaneous sampling at up to 2 MSps per channel. It is suitable for portable measurement applications such as ultrasound and optical sensors.



The product features high dynamic performance, delivering -100 dB THD and 14.3-Bit ENOB at up to 2 MSps. With 256 MS deep onboard FIFO, a data buffer enables long-term data acquisition and recording at full speed, preventing data loss from slow CPU response under heavy system loading. The unit's built-in precision reference voltage makes auto-calibration simple, reducing the impact of environmental temperature variations to maximise accuracy.

To maintain performance in varied conditions, the product supports external digital/analog trigger source and flexible trigger modes. In addition, 500 VDC isolation protects the connected computer from hazardous voltage caused by improper signal connection and an anti-noise capability prevents improper ground loop interference.

The product supports Windows 8 and Windows 7 operating systems and is fully compatible with third-party software such as LabVIEW, MATLAB and Visual Studio. NET. With the company's U-Test software, users can quickly and easily process instrument set-up and quality data acquisition with no programming required.

ADLINK Technology Inc
www.adlinktech.com

NFC BUILT-IN SDHC MEMORY CARD

Toshiba's Semiconductor & Storage Products Company has launched an SDHC memory card with built-in NFC (near field communication) functions in sizes of 8, 16 and 32 GB.

In order to find out what is stored inside SD memory cards, users usually need to put them into PCs or digital cameras. This memory card utilises the features of NFC technology to exchange data simply with a touch. By holding an NFC-enabled Android smartphone with the app 'Memory Card Preview' installed over the memory cards, the user can preview the available storage space, as well as up to 16 thumbnails of the photos stored in the card.

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

MELT TANK SERIES

For users looking to protect electronics from environmental factors, low-pressure moulding is a suitable solution that should also be flexible in Australian manufacturing conditions. The LPMS 500A melt tank series offers a high level of adaptability, allowing a number of different configurations suitable for low- to high-volume applications.

The tanks can be configured to both manual and automated solutions. The 100J is suitable for low-volume/high-mix situations where multiple products can be encapsulated concurrently. The 5 L tank size equates to continuous workflow, uninterrupted by constant tank filling associated with smaller manual systems.

For high-volume work, 10 and 20 L tanks are available. They can also be coupled with custom clamping systems such as the 100W vertical injection system or the 100WR vertical injection with rotating table system.

The series enables users to adapt their equipment to their product and processes.

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ENCLOSURES FOR WALL-MOUNT AND DESKTOP ELECTRONICS

OKW's DIATEC range of plastic enclosures is suitable for wall-mounted applications as well as desktop-mounted electronics - especially the XS and L models. Typical desktop applications include communications equipment, audiovisual electronics, point-of-sale terminals, machine controllers and test and measurement devices.

The enclosures have a modern contoured design with a central control panel for mounting a membrane keypad, display module or push-button switches. The range is available in four sizes with external dimensions from 155 x 150 x 37 mm to 200 x 330 x 48 mm.

The central control panel is recessed by 2.5 mm to suit different types of membrane keypad or product label. The enclosures are moulded in ABS (UL 94 HB) in two standard colours: lava grey and off-white. Other colours can be moulded or painted on request.

The XS models consist of a top and base part assembled by two fixing screws hidden on the underside. The S, M and L models consist of four moulded parts: the top, base and two contoured side panels that are snapped into place. The side panels hide all of the assembly and mounting screws, giving a clean and secure appearance.

The interior of the three larger enclosures can be subdivided using the accessory slot-in panels. Screw pillars are moulded in the top and base parts of all models for mounting the PCBs and electronic assemblies. For desktop applications, the power cables can be positioned in the ends. Alternatively, when used in remote locations or as portable units, the enclosures can be fitted with batteries. Two 1.5 V AA cells, or a single 9 V cell (S, M and L), can be accommodated under the side panels.

Customising options include CNC milling and drilling of holes and cut-outs; silk-screen, digital and tamper printing of legends and logos; EMC shielding and assembly.

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

TOOLSET FOR MICROCONTROLLER

Altium supports the ARM Cortex-M development community through its TASKING VX-toolset for ARM, consisting of an Eclipse-based IDE, C and C++ compiler, multicore ready linker, simulator, in-circuit debugger and Software Platform, which enables the developer to complete the application with RTOS and a wide range of middleware components. Release v5.1 of the toolset adds support for many microcontroller variants, while support for existing vendors' devices has been extended. It enables developers to easily change semiconductor manufacturer and switch controller type.

TASKING's Pin Mapper functionality removes the developer's challenge of configuring the chip's hardware registers that are used for assigning the peripheral module signals to the physical pins. The Pin Mapper provides a visual representation of the pin layout within the toolset IDE, through which the developer can configure and review properties of the pins. It also reports errors or warnings for possible connection conflicts.

The toolset has incorporated support for the latest MISRA C:2012 guidelines for C programming, as well as the CERT C secure coding standard. Code analysis support integrated into the compiler enables developers to select and configure the coding guidelines in accordance with the company's prescribed rules. Developers can benefit from the latest guidelines improvements that can reduce the complexity of compliance, while aiding consistent, safe use of C in embedded systems.

Altium Limited
www.altium.com

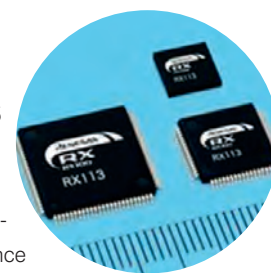
32-BIT MICROCONTROLLERS

Renesas Electronics is expanding the use of touch key in healthcare, building-automation and home-appliance applications with the RX113 Group of microcontrollers (MCUs).

Part of the RX100 Series, the MCUs offer a single-chip solution with touch-sensor IP and low-power technologies. This is said to enable significantly reduced power, size and development costs for entry-level devices in these markets, as well as for other cost-sensitive, capacitive touch-based applications for the growing Internet of Things (IoT) market.

The company's innovative touch-sensor intellectual property (IP) core achieves both high noise immunity and high sensitivity, offering touch key operation on wet and curved touch panels.

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EXTREME-TEMPERATURE ELECTRONICS

Zhengzheng Zhang

Many industries are calling for electronics that can operate reliably in a harsh environment, including extreme temperatures above 200°C. Examples of the high-temperature applications include turbine engine control in aerospace and electronics or sensors used for drilling operation in oil and gas industry.

Although traditional cooling systems can help electronics function at high temperatures, in some applications, cooling may not be possible - or it may be more appealing for the electronics to operate hot to improve system reliability or reduce cost. However, the availability of transistors and circuits for high-temperature operation is very limited.

Now, researchers from the University of California, Riverside and Rensselaer Polytechnic Institute have discovered that molybdenum disulfide (MoS_2), a semiconductor material, may be a promising candidate to make thin-film transistors for extreme temperature applications. "Our study shows that molybdenum disulfide thin-film transistors remain functional to high temperatures of at least 500 K [220°C]," said Alexander Balandin, the team leader and a professor at the Department of Electrical and Computer Engineering at the UC-Riverside. The findings have been published in the *Journal of Applied Physics*, from AIP Publishing.

"The transistors also demonstrate stable operation after two months of ageing, which suggests new applications for molybdenum disulfide thin-film transistors in extreme-temperature electronics and sensors."

Molybdenite, a mineral of molybdenum disulfide, is an abundant, naturally occurring material, which is commonly used as an additive in lubricants. Molybdenum disulfide synthesised by chemical vapour deposition has been found to be a promising material for manufacturing flexible, thin-film transistors - devices that control the movement of electrons and electric current, like a water faucet. According to Balandin, molybdenum disulfide belongs to a family called van der Waals materials, which have characteristic layered crystal structure with atomic layers weakly bonded to each other. The weak connection between atomic sheets enables exfoliation of such materials layer by layer, similar to the process used for obtaining graphene by peeling thin sheets off chunks of graphite. The layered structure also suggests that extremely thin and high-quality layers can also be produced by chemical vapour deposition on an industrial scale.

"Although devices made of conventional large-band-gap semiconductors, such as silicon carbide or gallium nitride, hold promise for extended high-temperature operation, they are still not cost

effective for high-volume applications," Balandin said. "A single-layer molybdenum disulfide shows a band gap of 1.9 eV, which is larger than that of silicon and gallium arsenide. This is beneficial for the proposed application." The presence of a larger band gap means that a device can be easily switched on and off, a crucial property for a transistor's operation.

Using standard lithography techniques in a cleanroom environment, Balandin's team built molybdenum disulfide transistors on silicon substrates for high-temperature experiments. Some had just a few layers (1-3) and others had more, multiple layers (15-18). The relatively thick films were more thermally stable and demonstrated a higher mobility at elevated temperatures, according to Balandin.

By conducting direct current measurement, a technique applying constant voltage or current through the device for a relatively long time, researchers studied the current-voltage characteristics or functional performance of the fabricated transistor at temperatures from 300 to 500 K. They found that the device performed differently but remained functional as the temperature increased.

"Both mobility and threshold voltage decrease with temperature," Balandin said. "Decreasing mobility results in current decrease through the device channel, while decreasing threshold voltage leads to current increase. Therefore, the exact behaviour of current with increasing temperature would depend on the interplay of decreasing mobility and threshold voltage."

Another intriguing feature researchers observed is a characteristic 'kink' on the current-voltage graph at the zero voltage for temperatures higher than 450 K. This 'memory effect' is similar to one observed in graphene transistors and electron glasses and suggests the material's potential for use in high-temperature sensors.

According to Balandin, practical application of molybdenum disulfide transistors in control circuits or sensors at high temperatures requires operation longer than one month. After two months, the team found the aged devices demonstrated a stable operation and were characterised by a higher threshold voltage, lower mobility and weaker temperature dependence of the mobility. The researchers' next step is to study the high-temperature function of molybdenum disulfide transistors and circuits, fabricated by industrial methods such as chemical vapour deposition.



PORTABLE MULTIFUNCTION CALIBRATOR

The Transmile Model 1000 Series Calibrator is said to feature the latest in cutting-edge digital and analog electronics, combined with the latest manufacturing techniques. The ultraportable, full-function calibrator is suitable for DMMs, clamp meters, insulation testers, pressure meters, and temperature and process control meters. It also features a high drive capability for calibrating older analog instruments.

Other features include: 80 ppm accuracy; AC/DC voltage to 1000 V; AC/DC current to 10 A (500 A with coil; resistance to 100 M Ω ; good capacitance and frequency; thermocouple simulation (11 types); PRT simulation; pressure measurement (using a wide range of add-on transducers); process control measurement (mV/mA); insulation tester calibration (option). Procal Calibration Software can be implemented to automate calibration, with easy-to-generate calibration procedures enabling quick set-up, allowing work to begin quickly.

The product's small footprint, weight of less than 10 kg and durable, rugged enclosure make it suitable for sites including oil rigs, ships, aviation, power and process plants and railways, as well as traditional calibration laboratory applications.

**Scientific Devices
Australia**

www.scientific-devices.com.au

POSITION SENSOR ICS

Allegro MicroSystems has developed a line of fully integrated Hall-effect digital position sensor ICs that detect changes in magnetic flux density, allowing them to distinguish movement and position. The contactless sensing solutions require few external components and can withstand the hostile operating conditions of automotive applications.

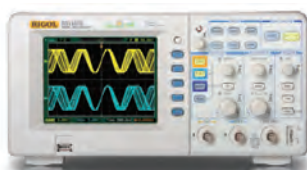
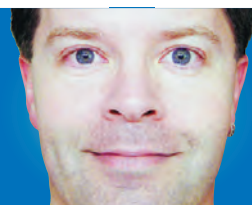
The product's 4x chopper-stabilisation for offset cancellation provides enhanced switch point stability that increases accuracy in measuring motor speed or duty cycle, as well as good jitter performance. The device also features low-voltage (3 V) operation and low ICC for more power-efficient devices.

The products are designed to survive harsh automotive transient conditions, including double battery and 40 V load dump, without a limiting series resistor, which eliminates the need for external components and prevents transient voltage field failures.

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GATEWAYS FOR 4G LTE NETWORKS

The AirLink GX450 mobile gateway and ES450 enterprise gateway, from Sierra Wireless, support a broad array of LTE bands for worldwide compatibility and optimal performance as LTE networks evolve. With the launch of the gateways, users can purchase a single solution for deployment across many different regions, simplifying procurement and management.

The next-generation AirLink GX450 4G is a purpose-built, rugged mobile gateway that provides broadband connectivity for all devices and applications deployed in vehicles, allowing them to be remotely monitored and managed. The series is relied on by professionals in law enforcement, emergency services, utilities and field services for in-vehicle connectivity and access to critical information.

The AirLink ES450 4G enterprise gateway provides a simple, secure way to wirelessly manage business transactions and deploy PCI-compliant systems. The gateway can support an automatic switchover of transaction processing from a landline connection to the wireless one, notify IT personnel when failures occur and enable remote troubleshooting of network equipment to restore normal operations.

M2M Connectivity

www.m2mconnectivity.com.au

10.1" SLIM TABLET PC

Designed for field applications, RuggON's PM-521 tablet PC meets the MIL-STD-810G rating for shock and vibration and can be dropped from 1.5 m onto plywood on a concrete surface. The slim, rugged tablet PC is fully sealed against the ingress of liquid and dust damage (IP65) and has an operating temperature rating of -20 to +50°C.

The 10.1" LED backlit screen with integrated 10-point capacitive multitouch screen supports glove touch, water rejection, palm rejection and 2 mm hard tip stylus. The Gorilla Glass3 screen features a display brightness of 1000 nits, offering sunlight-readable functionality for outdoor applications.

The tablet PC is based on Intel's Atom E3827 1.75 GHz Dual Core CPU and includes 4 GB of DDR3 SODIMM (8 GB by request) and 120 GB of upgradeable mSATA Solid State Disk. The hot-swappable dual batteries offer up to 12 h of battery life in the extended version and 6 h in the standard version.

A 5 MP webcam with an LED flash and auto-focus is embedded in the rear bezel and a 2 MP camera with audio input is in the front panel. Communication is available via the onboard WiFi 802.11 ac/a/b/g/n, Bluetooth 4.0 and GPS plus optional 3.5G or 4G LTE modules. GNSS (GPS/Glonass/BelDou) is a standard feature.

Connectivity interfaces include 1x USB 3.0, 1x USB 2.0, 1x audio jack, 1x micro SIM slot, 1x micro SD slot, 1x micro HDMI port and 1x Gigabit Ethernet port. For user flexibility, three programmable function buttons are located on the front panel along with power and volume controls.

Backplane Systems Technology Pty Ltd

www.backplane.com.au



CONSTANT-VOLTAGE LED DRIVERS

The ELED-80 is a series of AC-DC triac-dimmable, constant-voltage LED drivers. The LED power supply is IP66 rated, comes in a metal case and works with both leading and trailing-edge triac dimmers.

The LED drivers feature 180 to 264 VAC input and provide 12 and 24 V output constant voltage options. Cooled by free air convection, the product has up to 83% efficiency and comes with short-circuit and overvoltage protection. The LED driver features a built-in PFC function and complies with CE marking.

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AUSTRALIAN DISCOVERY COULD LEAD TO

IMPROVED PRINTED ELECTRONICS

University of Melbourne researchers have discovered highly sought-after 'nematic liquid crystals' that could lead to improved solar panels and printed electronics.

Published in *Nature Communications*, University of Melbourne researchers say their discovery could result in vastly improved organic solar cell performance. Lead author Dr David Jones of the university's School of Chemistry and Bio 21 Institute, said these cells will be easier to manufacture, with the new crystals now able to work in cells that are double in thickness on the previous limit of 200 nanometres.

"We have improved the performance of this type of solar cell from around 8% efficient to 9.3%, finally approaching the international benchmark of 10%."

It means that consumers can look forward to more competitive pricing in the solar energy sector, and according to Dr Jones, the discovery is a shot-in-the-arm for the organic materials sector. "The discovery is a step forward for the wider commercialisation of printed organic solar cells. But more than this, could aid in the development of new materials with improved performance such as LCD screens."

Uptake of the current generation of organic solar cells has lagged behind more widespread silicon-based models, due to

their comparative lack of performance even with a simplified construction via large printers. This is despite the organic models providing an unparalleled degree of versatility in how they are used; they can be shaped to fit nearly any surface area, as opposed to the traditional 'grid' formation of silicon-based cells.

"It had been theorised that a certain group of nematic liquid crystals would provide excellent electronic properties - as well as being printable - and therefore they had been sought for a long time," said Dr Jones.

"With this research, we have shown for the first time these high-performing materials.

"We've seen recently at the annual Consumer Electronics Show (CES) in Las Vegas that printable electronics have an exciting future, as parts of phones and even cars. This discovery could help improve the performance of these solar cells, and lead to even more innovation in the coming years," concluded Dr Jones.

The research was conducted with international researchers in Singapore, China and Germany, and received funding from the Victorian Organic Solar Cell Consortium and the Australian Centre for Advanced Photovoltaics.



DIGITAL OSCILLOSCOPE

The R&S RTE oscilloscope is said to enable accurate measurements and fast results. From embedded design development to power electronics analysis to general debugging, the product offers quick solutions for everyday test and measurement tasks, while featuring several tools and being fun to use.

The oscilloscopes offer a sampling rate of 5 GS/s and a memory depth of 10 MS/ch. As a result, they can display signals accurately, right down to the details, as well as provide high time resolution, even for long sequences.

An acquisition rate of more than one million waveforms/s ensures that signal faults are found quickly. An accurate digital trigger system and the high dynamic range of the A/D converter, with more than seven bits, deliver good results across the entire frequency range.

The high-definition (HD) mode increases the vertical resolution of the oscilloscope to up to 16 bits - a 256-fold improvement over 8-bit resolution. Waveforms are sharper and show signal details that would otherwise be masked by noise. Users benefit from more precise analysis results.

Rohde & Schwarz
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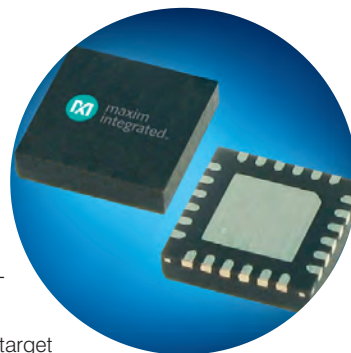
DUAL-OUTPUT SENSOR TRANSCIVER

The MAX14836 24V Dual-Output Sensor Transceiver is a sensor driver capable of driving two sensors from dual 24 V outputs. The device features two outputs, each of which is configurable for push-pull, high-side or low-side outputs. The sensor transceiver targets industrial applications requiring sensor monitoring.

The product allows two sensors to communicate with a target microcontroller. Communication is through an SPI interface which allows configuration and monitoring of the device and its target sensors. The DIO driver can handle a 3 μ F load, while the DO driver can handle a 2 μ F load. Electromagnetic interference can be controlled by programmable slew control.

The unit includes two linear regulators that generate 5 and 3.3 V. The 5 V regulator can drive up to 30 mA external load current, while the 3.3 V regulator can drive up to 20 mA. If the 5 V regulator is not used, it can be used to supply current for the internal analog and digital functions. The output drivers are automatically disabled if either the regulator or the chip supply voltage falls below its preset thresholds. The device features extensive on-chip fault detection including detecting DIO driver short circuits longer than 650 μ s, DO driver short circuits longer than 440 μ s, reverse polarity protection, undervoltage detection and thermal protection, including overtemperature warning and thermal shutdown.

Mouser Electronics
www.mouser.com



DC SERVOMOTORS

Faulhaber has extended its linear DC servomotor product range with versions aimed at facilitating product integration inside the user's application. The linear servomotors integrate analog Hall sensors or sin/cos type sensors to match the user's positioning needs without requiring an external encoder.

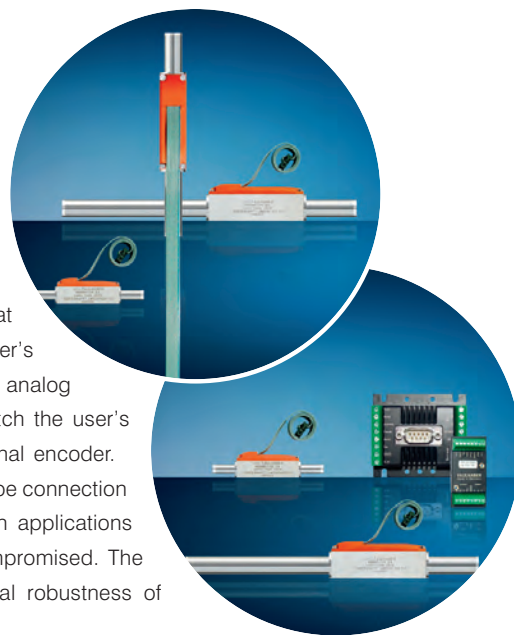
The linear servomotors integrate an axial type connection to satisfy constrained space requirements in applications where performance and size cannot be compromised. The axial coupling also improves the mechanical robustness of the connection to electronic controllers.

The LM 1247 and LM 2070 provide a peak force of up to 27.6 and 10.7 N, respectively. They are available with different stroke lengths ranging from 20 to 120 mm for LM 1247 and up to 220 mm for the LM 2070.

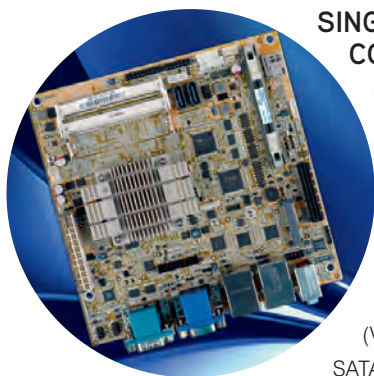
The LM 2070 can be coupled to MCLM 3003 or MCLM 3006 drive electronics, while the miniature MCLM 3002 controller is a suitable companion for the LM 1247. Motion controllers are available with serial or CAN interface.

The linear DC servomotor product family also includes the small LM 0830, measuring 8 x 12 x 30 mm and weighing 17 g. The easy-to-use Motion Manager Software, for use with the analog Hall sensor version, is included.

ERNTEC Pty Ltd
www.erntec.net



SINGLE-BOARD COMPUTER



IEI Technology's KINO-ABT-i2 Mini ITX industrial single-board computer, based on the Intel Bay Trail platform, supports dual independent displays (VGA, HDMI and iDP), SATA, dual gigabit ethernet, USB 3.0 and audio. It is powered

by the system-on-chip (SoC) codenamed 'Bay Trail' and designed for intelligent systems and applications requiring low power consumption and high performance. The industrial motherboard supports two 204-pin 1066/1333 MHz dual-channel DDR3L SDRAM SO-DIMM up to 4 or 8 GB. The I/O rich functionally includes 2x USB 3.0 (rear I/O), 6x USB 2.0 (2x rear I/O and 4x pin header), 5x RS232 and 1x RS422/485, 2x SATA with 5 V output and 8-bit digital I/O.

The product is suitable for many intelligent systems, such as kiosks, vending machines, entry POS and ATMs, automotive, retail, medical, security, surveillance and in-vehicle infotainment.

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

RECTIFIERS

Vishay Intertechnology has introduced its latest rectifiers in the surface-mount SMF eSMP package. Suitable for automated placement, the devices are compliant to RoHS Directive 2011/65/EU and halogen-free according to JEDEC JS709A standards.

The devices include one standard, three Schottky barrier and two Hyperfast FRED Pt rectifiers for high-frequency DC/DC converter, freewheeling diode and power line polarity protection applications in automotive systems, including engine control units, antilock braking systems and LED lighting. With a compact footprint and low profile, the devices' SMF package saves board space while increasing power density.

The SS1F4HM3, SS1FH6HM3 and SS2FH6HM3 Schottky rectifiers offer 40 and 60 V reverse voltages and low forward voltage drops down to 0.37 V at 1 A, 125°C. The SE10FJHM3 standard rectifier is built on an oxide planar chip technology that provides for class H3B ESD protection (>8 kV) based on the AEC-Q101-001 human body model (contact mode).

The Hyperfast VS-1EFH02HM3 and VS-2EFH02HM3 FRED Pt rectifiers feature fast and soft recovery characteristics, with recovery times down to 28 ns. The devices offer breakdown voltages of 200 V and low forward voltage drops down to 0.93 V at 1 A. The rectifiers feature a planar structure and platinum doped lifetime control for high overall performance and ruggedness.

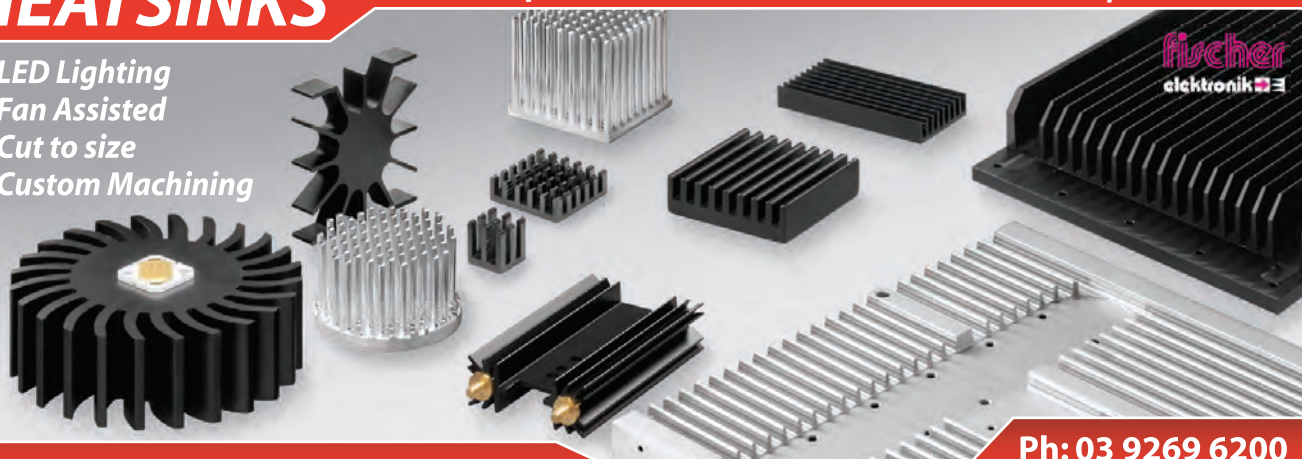
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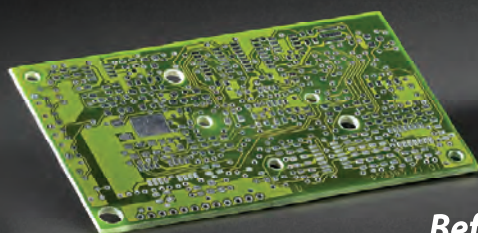
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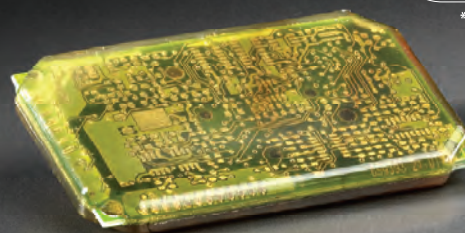
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After



www.lowpressuremoulding.com.au

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Tarapath



TUNING CONTROL SWITCHES

The PE613010 and PE613050 are the first two devices in a family of tuning control switches based on Peregrine Semiconductor's UltraCMOS technology, a variation of silicon-on-insulator (SOI) technology on a sapphire substrate, offering good RF performance. The switches are versatile and support a variety of tuning circuit topologies, with emphasis on impedance-matching and aperture-tuning applications.

Both switches feature low on-resistance and insertion loss across key cellular frequency bands from 100 to 3000 MHz. They offer high RF power handling and ruggedness, and Peregrine's HaRP technology enables them to meet challenging harmonic and linearity requirements. All decoding and biasing is integrated on-chip and no external bypassing or filtering components are required.

UltraCMOS tuning devices feature ease of use while delivering good RF performance. With built-in bias voltage generation and ESD protection, tuning control switches provide a monolithically integrated tuning solution for demanding RF applications.

Wireless Components

www.wirelesscomponents.com.au

0.5-8 GHZ WIDEBAND SPIRAL ANTENNA

Steatite Q-par Antennas has launched the 0.5-8 GHz right- or left-hand circularly polarised spiral antenna fitted with an SMA-type connector. The spiral antenna provides broad beamwidth with low squint, smooth radiation patterns and purity of circular polarisation.

A derivative of the 0.5-22 GHz spiral antenna, the product is suitable for 360° direction finding, spectrum management, RWR and ESM. The company provides custom-designed spiral antennas and, if required, integrates lensed radomes to improve performance.

Test & Measurement Australia

www.tandm.com.au



SHIELD CAN RANGE

Harwin has added three additional sizes to the EZ-Shield Can range. They are 0.2 mm thick and designed to be used with smaller

shield clips, minimising both the can size and weight. The range is suitable for radio systems, wireless equipment and consumer electronic devices which require good shielding performance and effective can retention.

The low-profile shield cans provide protection for sensitive PCB circuitry against radiofrequency interference (RFI) and electromagnetic interference (EMI) at board level. Attenuation performance up to 24 dB can be achieved, depending on frequency and configuration. Protection is provided against vibration due to good retention.

The nickel silver cans provide good screening, particularly at high frequencies, and can be placed automatically to reduce manufacturing costs. They are also easy to remove and replace when adjustment, repairs and maintenance are required. Clips eliminate post-assembly soldering and de-soldering, reducing PCB damage caused by local overheating on the board.

Clarke & Severn Electronics

www.clarke.com.au

LOW LEAKAGE CURRENT THREE-PHASE FILTERS

Schurter has expanded its range of FMBC NEO three-phase filters with a low leakage current series for applications where no high leakage currents are allowed. The FMBC LL series of filters is designed for rated currents between 7 and 180 A. It is suitable for leakage current-critical industrial applications such as drive technology and medical technology.

The filters help reduce leakage currents and permit compliance with common EMC standards as efficient input filters. They have been designed for currents from 7 to 180 A at an ambient temperature of 50°C and have UL approvals for ambient temperatures of 50°C as well as 40°C at a higher rated current. The filters are approved for rated voltages of 520 VAC. This means they can be used in high-power systems, such as machines used in an industrial environment. Despite their high output performance, they are compact and lightweight in design.

The product is fitted with a screw connection. Other types of connections including wires or copper bars are possible on request, as well as customised modifications to the circuit or housing. Schurter offers its own EMC measuring service for an optimum adjustment to the inverter.

SCHURTER (S) PTE LTD

www.schurter.com





MINIATURE, WATERPROOF DATA LOGGER

The MSR145 is a miniature, waterproof, high-performance data logger. The product can be factory configured to user specifications with up to five internal sensors, including temperature, humidity, air-pressure, 3-axis accelerometer and light sensors.

Reducing the number of internal sensors allows a range of external sensors to be connected. External sensors include temperature, Type K thermocouples, fluid pressure and analog inputs, allowing third-party sensors to be connected.

All sensors are scanned and logged at up to once/s. The accelerometer sensor allows up to 1600 acceleration measurements/s/axis to be logged and peak values to be recorded once/s.

The thumb-sized data logger can record over 2 million measured values or over 1 billion measured values with an optional microSD card. Its high-capacity, rechargeable 800 mAh battery enables the product to continuously record data for up to two years, making it suitable for long-term data acquisition applications. Once collected, all the data can be quickly transferred to a PC or laptop via a USB interface.

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

LED ARRAY HOLDERS

LED technology is an efficient and user-friendly way of accommodating general illumination requirements. Using interconnect technology, Molex provides a solderless solution to mounting LED arrays into OEM fixtures.

The company's LED array holders feature good electrical performance in a low-profile, one-piece design. They simplify the installation process for next-generation Nichia COB-L arrays by eliminating the need for hand or SMT soldering and SMT equipment.

The holders allow users to install LED arrays quickly into fixtures, enable field replacements and facilitate upgrades to current applications.

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

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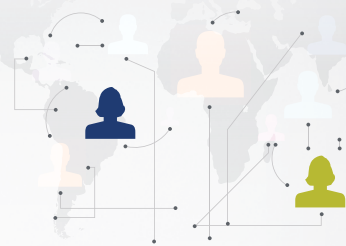
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Follow us and keep updated with all the latest trends around this burgeoning new movement. Whether you're looking for products, advice, or ideas for your own designs, you'll find them all here on the element14 Community.

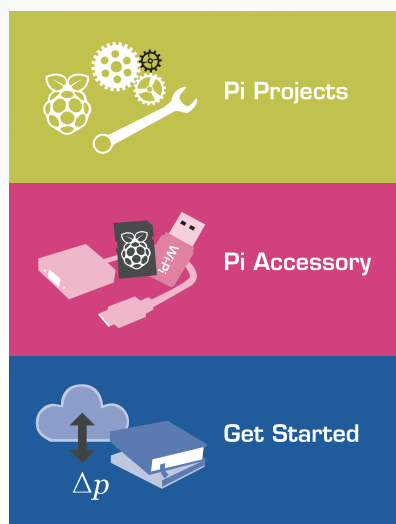
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The element14 Design Centre

A complete Development Tool resource for students and engineers that offers the most comprehensive range of development tool information alongside product details and supporting material.

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Take your Pi further and accessorise it with our complete range of add-ons.

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The community isn't just about the Raspberry Pi.



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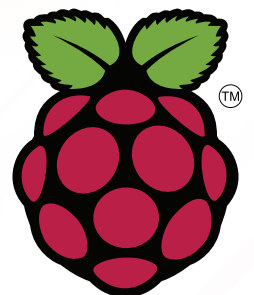
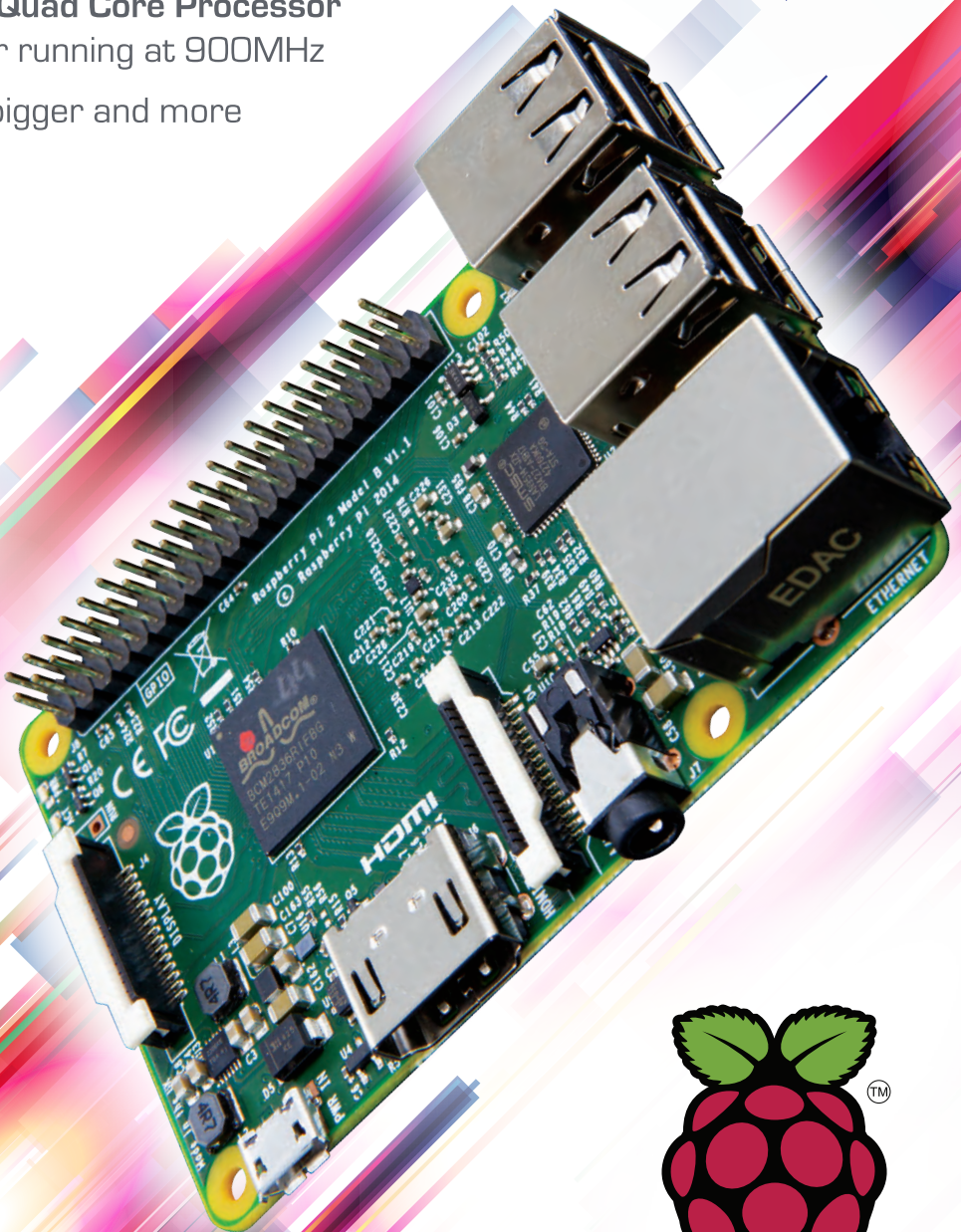
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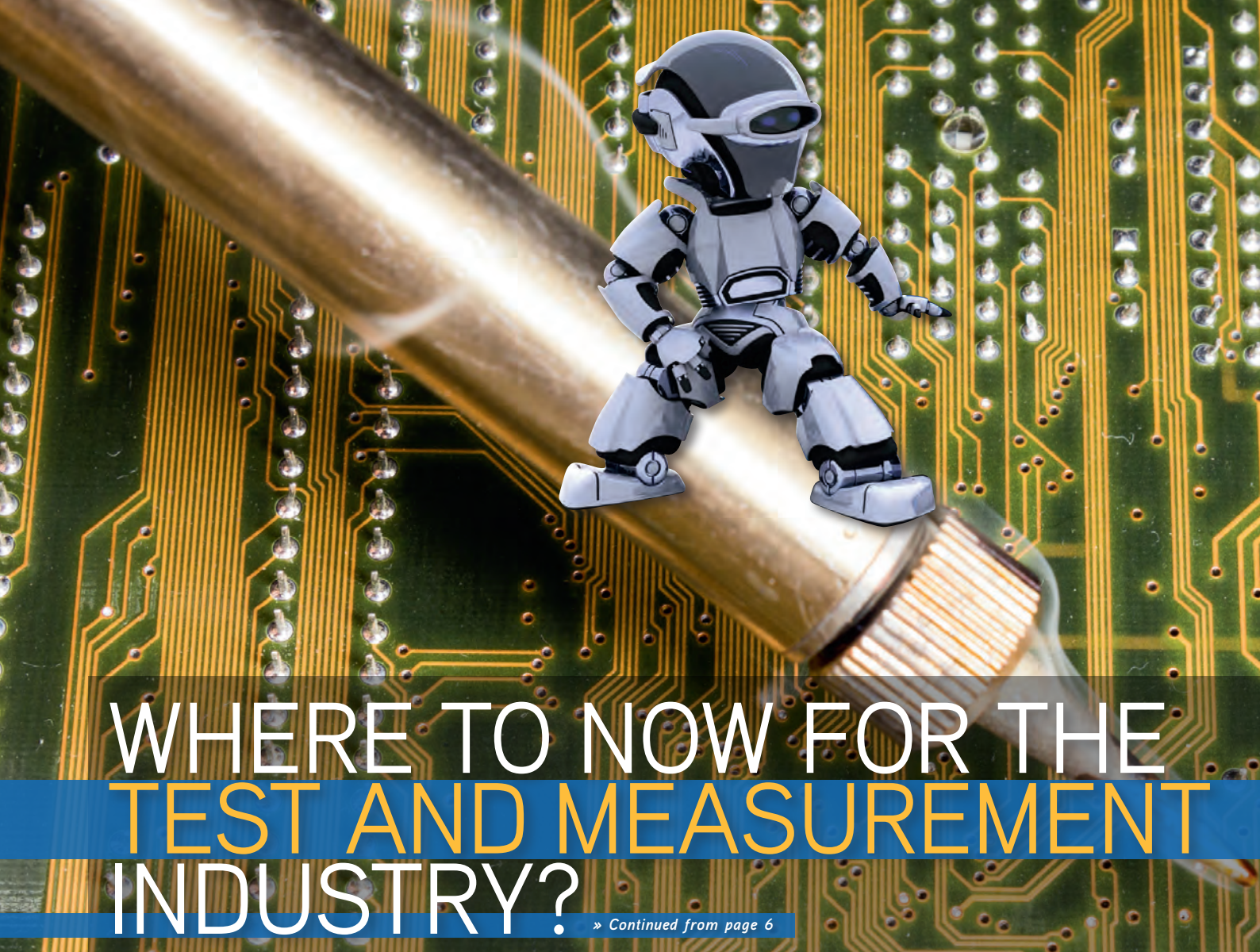
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WHERE TO NOW FOR THE TEST AND MEASUREMENT INDUSTRY?

» Continued from page 6

With the relative plateauing of the general-purpose computing capabilities of high-end mobile and desktop processors, engineers who want their test applications to maximise performance, lower test times and hence reduce the overall cost of ownership will need to start adopting server-class processors with many-core architectures.

Software architectures that divide computing work and can scale to leverage more than 10 processor cores will be required. Consider which tasks can be implemented in parallel from the beginning when designing new applications. When considering implementation, choose tools that allow a user to maximise the parallelism in an application. Selecting an optimising compiler, multithreaded analysis routines and thread-safe drivers is a good starting point. Also, make sure that implementation languages offer strong support for threading and an appropriate level of abstraction so that the increased software complexity does not negatively affect developer efficiency.

Ignoring parallelism, at best, will result in tepid performance gains as processors evolve. The market is pushing for graphics improvements and higher core counts. However, test and measurement applications most likely will not use the graphics features, newer processors with higher core counts offer valuable performance gains to test applications designed to benefit from the upward trend in core count.

Testing in the software-driven world

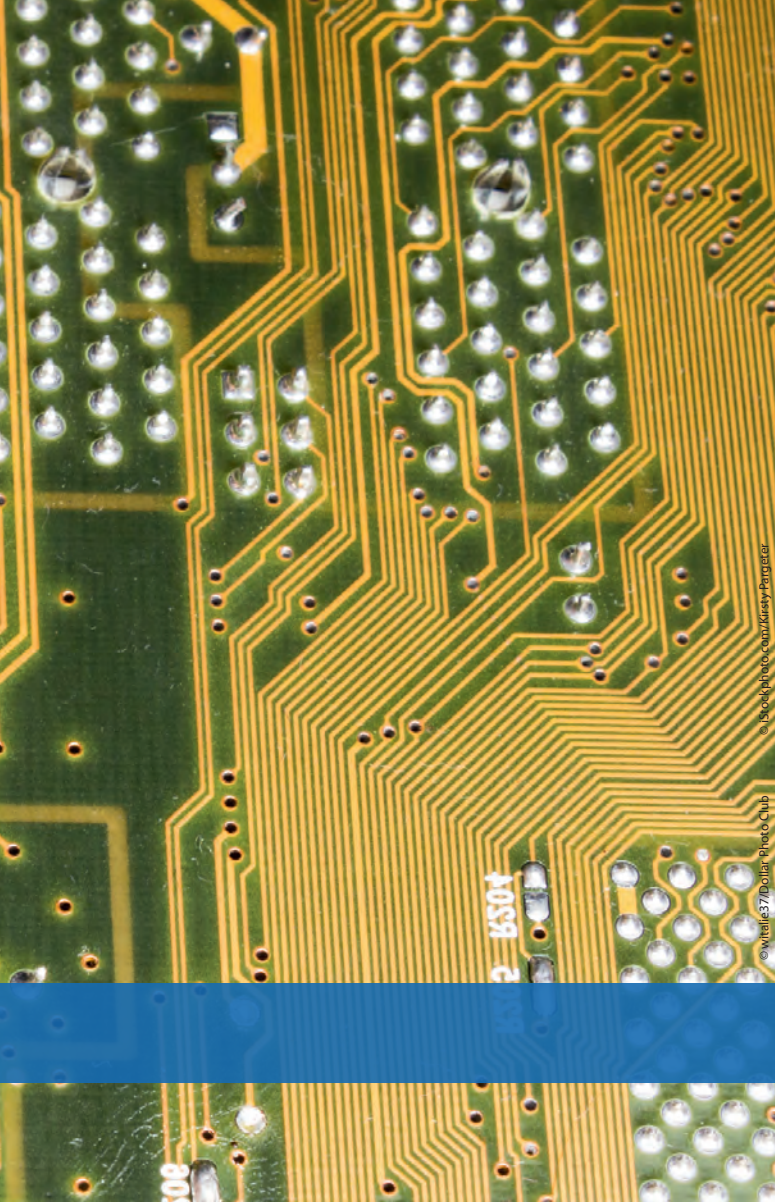
We live in an increasingly software-driven world, but the growth of embedded software in modern automobiles and airplanes presents significant challenges for manufacturers trying to eliminate software

bugs and make products as safe as possible. In the aerospace and defence industry, reducing release cycles and preventing program delays have become increasingly difficult. In automotive, consumer demands are driving up test complexity and introducing new costs in areas like infotainment. In response, test managers must find affordable ways to incorporate RF testing for wireless signals and machine vision testing for assisted parking to meet the widening I/O spread of test coverage.

Though industry regulations provide a guide to ensure safety in embedded electronics, compliance with these regulations requires the thorough testing of embedded software across an exhaustive range of real-world scenarios. Developing and testing embedded software with an emphasis on quality can strain the balance of business needs such as short time to market, low test cost and the ability to meet the technical requirements driven by customer demand for new features and product differentiation. All embedded system manufacturers face similar demands, but they cannot sacrifice quality when it comes to safety-critical applications. Organisations that can evolve their development strategies to incorporate advanced hardware-in-the-loop (HIL) testing can reduce spending on quality-related problems, improve their market perception and, most importantly, ensure customer safety.

Meeting safety and business needs

Complying with safety standards requires an understanding of all potential health risks and hazards as well as the capability to rigorously test those scenarios. HIL testing meets many of these growing test needs at a lower cost and in a shorter time frame than physical tests and field tests. With this method, companies dynamically simulate real-world environments using mathematical



models to provide closed-loop feedback to the controller being tested. HIL test becomes even more valuable as the need to offload test time in the field or the test cell intensifies with the addition of functionalities to controllers and the increase in test cases.

Scalable test platforms

Embedded software design and test teams must continue to find new ways to use this practice to ensure quality and make consumer safety a priority without sacrificing release schedules. HIL testing is mostly entrusted to only a specific test team, but developers have also been performing manual stimulus testing known as knob-box testing for quick functionality checks. This restricted form of testing allows them to spoof the controller by manually changing a limited number of channels. However, many functionality defects are still found in the later stages of HIL testing, or even in the field, which cost developers more resolution time. With higher levels of automation and easily repeatable test scenarios, developers can discover more of these functionality defects so that test engineers can focus on identifying performance and integration-based defects. Full-rack HIL test systems are not necessary for this application. Instead, organisations must build scalable test platforms to provide an affordable solution across varying capabilities.

As increasing embedded controller capability drives further innovation, safety regulations will be honed to ensure even greater user safety. To keep up with feature demand while preserving the quality of the overall system, test capabilities will need to grow accordingly. Simply adding more test bandwidth will not scale with overhead; test managers need to adopt advanced HIL test technology and new techniques. This ensures that as industry regulations help guide system engineering teams towards higher levels of safety

for more advanced products, test platforms can still meet critical cost and time requirements.

The 5G era

From the late 1980s to the early 2000s, the rule of microwave instrumentation was simple: those who make the best microwave transistors win. Throughout this era, test vendors released instrumentation that pushed the envelope on characteristics like frequency range, noise floor and linearity performance. Advances in hybrid microcircuit technology, synthesiser tuning time and phase noise were some of the most critical innovations during this period.

Today, the continued evolution of wider instantaneous bandwidth represents a significant area of improvement for RF signal generator and analyser technology.

This trend of signal analysers supporting wider instantaneous bandwidth is primarily being driven by the evolution of off-the-shelf analog-to-digital converter (ADC) technology and wireless standards, but the benefits of faster ADCs reach far beyond the wireless industry. Improvements in off-the-shelf ADC technology now allow test equipment manufacturers to address the needs of customers across a broad spectrum of industries, especially aerospace and defence.

From 1G to 5G

To understand how the wireless communications industry has helped drive improvements in signal analyser technology, it is important to recognise the rapid increase of channel bandwidth across today's modern wireless standards.

An even more telling evolution in wireless technology was the widespread development of 802.11ac devices that began several years ago. At the time, the wireless industry had created a widely adopted standard that was ahead of the capabilities of RF signal generators and analysers. As a result, many test and measurement vendors accelerated their development of wider bandwidth instruments just to support the bandwidth requirements of 802.11ac in a timely manner.

Looking ahead, the next major milestone for RF test equipment is the ability to test the fifth generation of cellular devices. And as researchers use advanced software-defined radio tools to actively prototype 5G candidate technologies such as massive MIMO, GFDM and millimetre wave communications, the potential use of wideband millimetre wave signals most likely will require RF test equipment to offer 2 GHz of bandwidth by 2017 or 2018 to support a 2020 deployment.

By any standard, achieving 2 GHz of instantaneous bandwidth in an RF signal analyser would be a major landmark in the test and measurement industry. If such an instrument existed, it would be an incredibly useful tool for bandwidth-hungry applications such as radar pulse measurements and spectrum monitoring.



Making it all possible

If you're wondering how the industry is going to get to 2 GHz of bandwidth, a good place to start is Moore's law, which theorises that transistor density on an integrated circuit doubles every two years. And for those in the computing industry, Moore's law remains a strong indicator of the ever-increasing capability of computing technology today.

CPUs and FPGAs are not the only technologies that have benefited from exponential improvements in transistor density on an IC. ADC sample rates are following a similar trend. Consider the maximum available sample rate of 12-bit ADC technology versus time. Because 12-bit ADCs provide increasing dynamic range to analyse frequency domain signals, they are an effective proxy for the bandwidth capabilities of RF signal analysers. Based on the current rate of development, 12-bit converter technology will soon

be able to drive RF instruments to multi-gigahertz of instantaneous bandwidth and boost today's gigahertz-bandwidth oscilloscopes to even higher resolutions.

Next-gen RF instruments

For engineers in the wireless industry, the next generation of extremely wideband instruments is poised to help drive 5G products to market. However, with a broader view of the benefits to come, engineers will soon be using exciting new measurement approaches and techniques ushered in by next-generation RF signal analysers (and even oscilloscopes).

In radar design and development, for instance, the growing bandwidth and signal-processing capabilities of instrumentation should soon yield more advanced radar prototypes. In high-volume manufacturing test, the ability to acquire ultrawideband signals in a single shot will help test engineers easily capture data from multiple wireless devices in parallel for faster multisite test configurations.

In many respects, the bandwidth limitations of yesterday's RF signal analysers now drive some of the test techniques we use today. Now that we're in the middle of a bandwidth revolution, we need to consider how wider bandwidth is going to empower the test techniques of tomorrow.

National Instruments Australia
www.ni.com/oceania

new PRODUCTS

STEPPER MOTOR DRIVER

The DRV8846 provides a highly integrated stepper motor driver for cameras, printers, projectors and other automated equipment applications. The device has two H-bridges and a microstepping indexer and is intended to drive a bipolar stepper motor. The output block of each H-bridge driver consists of N-channel and P-channel power MOSFETs configured as full H-bridges to drive the motor windings. The device is capable of driving up to 1 A full scale output current (with proper heatsinking and $T_A = 25^\circ\text{C}$).

Texas Instruments Australia Ltd
www.ti.com

SNAP-IN ALUMINIUM ELECTROLYTIC CAPACITORS

TDK Corporation presents the latest series of Epcos snap-in aluminium electrolytic capacitors. They are characterised by a ripple current capability said to be up to 25% higher than that of the preceding Epcos series.

The capacitors of the B43642 series are manufactured in highly compact sizes with diameters ranging from 22 to 35 mm and heights of 25 to 55 mm.

TDK Australia
www.tdk.com.au

POE PANEL PC

iBase Technology's ARM-based PoE panel PC, the MRS-801-RE, is an all-in-one panel PC with an 8" LCD display. The product uses the single-core 1 GHz Freescale i.MX6 solo in a fanless enclosure and is equipped with 1 GB DDR3 memory.

The front bezel has an IP65 rating, making it resistant to dust and liquid. It features a programmable LED light bar at the top front side, which the user can control to show a green or red light with applications under an Android or Linux operating system. Moreover, the device supports the Android 4.3 operating system and Linux system with Kernel 3.0 or above.

The product uses a 5-wire resistive touch-screen technology, a 4-wire RS232 and an RS485 interface at the edge I/O. It is quite simple to adjust to RS232 or RS485 mode via an external DIP switch. In addition, a USB 2.0, Gigabit Ethernet and an OTG USB port are available.

The PC supports a wide-range operating temperature from 0 to +50°C and can be stored under -20 to +60°C. The power input is flexible and supports both 12 VDC and PoE+ (Power over Ethernet). It has been designed for manufacturing control, building and home automation, door signage and other industrial applications.

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





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RASPBERRY PI 2

LAUNCHES WITH ARMV7 QUAD CORE CPU



element14 and Raspberry Pi Trading have launched Raspberry Pi 2 Model B, which is six times faster than the previous model and now boasts 1 GB of RAM to run bigger and more powerful projects.

The Raspberry Pi 2 marks a major modification for the credit card-sized computer, with a new Broadcom BCM2836 ARMv7 quad core processor powered single board computer running at 900 MHz with 1 GB of RAM. The new Raspberry Pi 2 boots up in less than half the time of its predecessor.

All previous Raspberry Pi projects are compatible with the new Raspberry Pi 2 Model B, and the expanded GPIO pins, advanced power management and connectivity make it possible to connect up to four USB devices, including some powered devices such as hard drives. The 40-pin GPIO enables multiple sensors, connectors and expansion boards to be added, with the first 26 pins identical to the Model A and B boards, for full backward compatibility.

Since its launch in February 2012, over four million Raspberry Pi boards have been sold and element14 has launched over 30 exclusive accessories, specifically designed and manufactured to expand the usability of the device for millions of customers worldwide. The element14 Community has become one of the leading websites for discussion and collaboration around Raspberry Pi projects and developments.

Upgrading the existing projects to benefit from the improved performance simply involves an update to the operating system.

The new Raspberry Pi 2 is available to buy from the element14 Community at www.element14.com/raspberrypi2.

element14
au.element14.com



HANDHELD ENCLOSURES

OKW has completed its range of Datec-Compact outdoor handheld enclosures by adding sizes S and L to the existing M models.

The units have been designed for mobile applications in harsh environments, including data recording and transfer; measuring and control; and stock and sales logging. All three sizes can be specified with or without gold-plated integrated contacts (<15 A, 1-pole), which provide an all-in solution for charging and data transfer.

Versions with battery compartments - 3 x 1.5 V AAA (size S) or 3 x 1.5 V AA (sizes M and L) - provide slots for SD cards and USB connectors. The highly robust device is rated to IP65, manufactured from UV-stable ASA+PC-FR (UL 94 V-0) and assembled using tamper-proof Torx T10 screws. Sizes are: S - 136 x 74 x 32 mm; M - 172 x 92 x 39 mm; and L - 206 x 110 x 47 mm. Standard colours are off-white and lava grey, with special colours available on request. Accessories include desk stations and wall holders, both of which can be specified either with or without gold-plated spring contacts (<15 A, 1-pole). Nickel-plated battery clips are also available, along with spare contacts, non-slip pads, self-tapping screws for mounting PCBs and a Torx T10 screwdriver. Customising services include CNC milling and drilling, printing or engraving of legends and logos, special finishes, keypads and assembly.

ROLEC OKW Australia New Zealand Pty Ltd

www.rolec-okw.com.au





EXPANDED MULTI-INSTRUMENT CAPABILITIES FOR DIGITAL OSCILLOSCOPE

Teledyne LeCroy has introduced additional multi-instrument capabilities to enhance the debug capabilities of the WaveSurfer 3000 oscilloscope.

Protocol analysis capabilities with CAN and LIN trigger and decode enable users to gain further insight into their systems, correlating physical layer signals and protocol layer data on a single display. The CAN and LIN trigger can isolate frame IDs, specific data packets, remote frames and error frames. The decodes use a colour-coded overlay that clearly identifies different parts of the data being captured, allowing the user to quickly identify different parts of the CAN and LIN data such as frame IDs, status bits and message data.

Generating arbitrary waveforms is critical for complete design debug and validation. With added capabilities in the built-in WaveSource function generator, arbitrary waveforms can be generated by loading .csv files saved from an oscilloscope or offline waveform creation software. The waveforms can then be controlled, manipulated and output directly from the oscilloscope for use in closed-loop circuit analysis.

Measuring and monitoring voltage levels is easy with the product's digital voltmeter capability. The feature provides real-time measurements that can be viewed on the screen at all times, even when the oscilloscope is not triggering. A dedicated DVM user interface, offered as a free download, is available for set-up and more measurement details.

Scientific Devices Australia

www.scientific-devices.com.au

**new
PRODUCTS**

DIGITAL SIGNAL PROCESSORS

Analog Devices (ADI) has released the Blackfin ADSP-BF70x digital signal processor (DSP) family. The high-performance series delivers 800 MMACS of processing power at less than 100 mW.

The eight-member processor family includes up to 1 MB of internal SRAM, eliminating the need for external memory in many applications while also offering an optional DDR memory interface. The range offers designers flexibility and functionality through an array of connectivity options, such as USB, SDIO, CAN, ePPI, SPORT and QuadSPI, while extending the life of battery-driven devices by enabling low-power applications through the bus.

The processors are suitable for a wide array of markets, from automotive, industrial and control applications to instrumentation, video/image analysis and biometrics.

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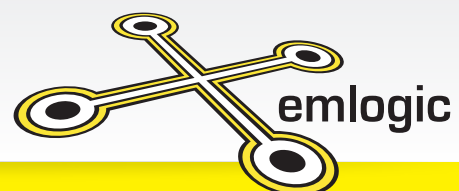
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DC POWER SUPPLIES

The Series 2268 850 W DC power supplies, providing voltage from 20 to 150 V and current

from 5.6 to 42 A output levels, are well suited to automated test applications. The power supplies allow for the output of any current, including the maximum current, at any voltage.

They provide both analog and digital control options and a number of digital interface options and can operate in constant voltage (CV), constant current (CC) or constant power modes to address a broad array of applications. The high-efficiency, soft-starting power supplies provide reliable performance and long life.

For large power systems that require multiple power supplies, up to 30 supplies can be controlled through a single interface by linking all the supplies together through their RS485 interfaces. The products are said to be the only power supplies to offer outputs higher than 760 W in a compact, half-rack enclosure.

Vicom Australia Pty Ltd
www.vicom.com.au

SIC MOSFET EVALUATION KIT

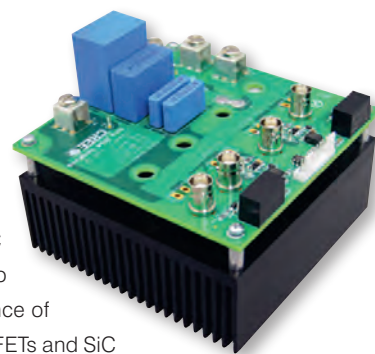
Cree has released the KIT-8020CRD8FF1217P-1, a SiC MOSFET evaluation kit. Used to demonstrate the high performance of the company's 1200 V SiC MOSFETs and SiC Schottky diodes, the kit includes two C2M0280120D

Cree SiC 1200 V, 80 mΩ, TO-247-3 MOSFETs; two C4D20120D Cree SiC 1200 V, 20 A, TO-247-3 Schottky diodes; an evaluation board with an Avago gate driver; a compatible heatsink; all mounting hardware; and a user manual.

The kit can be easily configured for several topologies, such as basic phase-leg configurations. The evaluation board may be used to evaluate the SiC MOSFET performance during switching events and steady-state operation; to configure different topologies with SiC MOSFETs and SiC diodes; to perform functional testing with SiC MOSFETs (eg, double-pulse test to measure switching losses); as a PCB layout example for driving SiC MOSFETs and SiC diodes; and as a gate-drive reference design for a TO-247 SiC MOSFET.

Wireless Components

www.wirelesscomponents.com.au



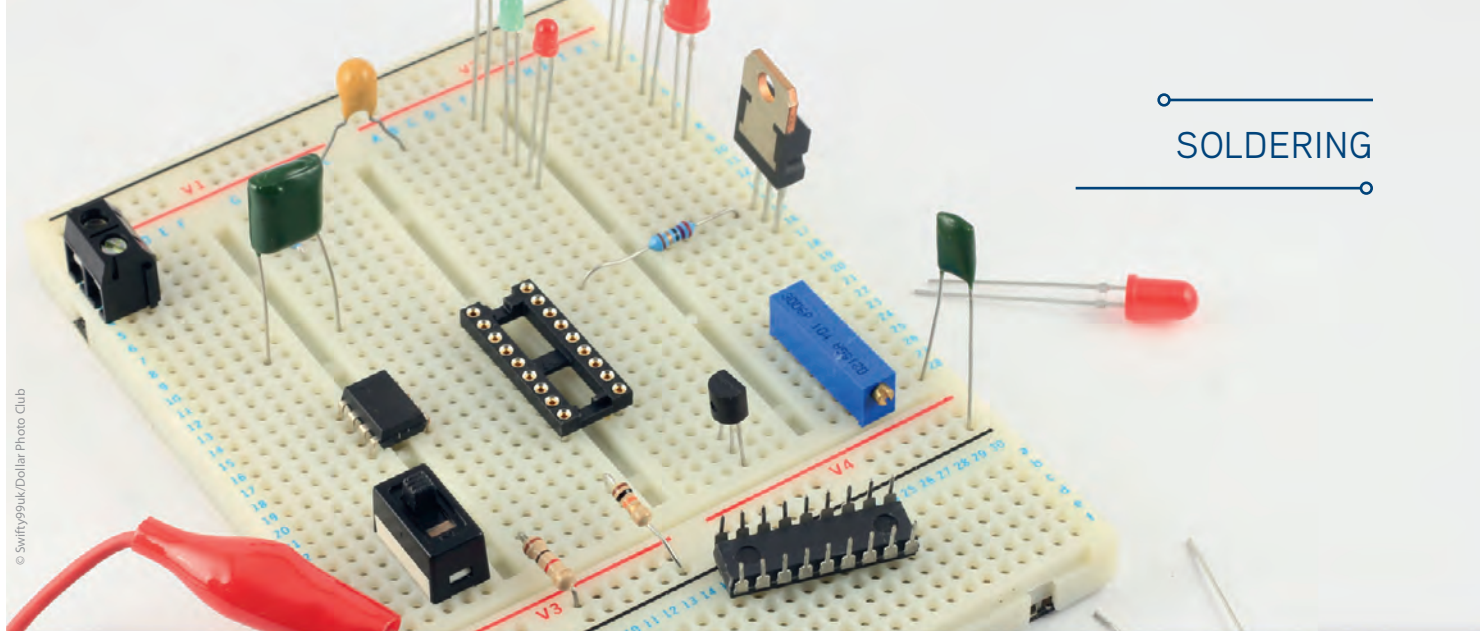
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THE CASE FOR SOLDERLESS ASSEMBLY

Elimination of solder from electronic circuit assembly has been suggested as one way to avoid solder's many shortcomings. In the article below, Joe Fjelstad* makes the case for solderless assembly.

Soldering is a key step in the manufacturing process of electronic assemblies and has been since the earliest days of the electronics industry. It is also one of the most challenging processes to control and predict and a major source of defects and assembly failure.

In recent years, elimination of solder from the electronic circuit assembly manufacturing process has been suggested as one way to get around solder technology's many shortcomings. The term solderless assembly for electronics (SAFE) is one of the monikers which has been applied to the general concept and one of its guiding principles is the Occam Process, which refers to 13th-century philosopher William of Occam's words of caution to his followers: "It is vanity to do with more that which can be done with less."

Elimination of solder can in fact be accomplished relatively easily and the benefits are substantial. It can be achieved by simply reversing the manufacturing process of building printed circuit boards, placing components and then soldering them together. Instead, all the components would be locked in place, with the component's planar terminations exposed on the surfaces, and then the circuits applied to these 'component boards' would use PCB build-up technologies, which are now well established in the PCB industry.

Bypassing the soldering process offers significant prospective improvement potential for electronic assemblies in terms of cost, reliability, security and environmental friendliness among others. A brief review of these will help to substantiate the assertion.

Cost

Soldering technology, inclusive of the machines, materials and processes used to make, inspect, clean, test, and rework and repair electronic assemblies, is a multibillion-dollar industry. Elimination of solder would obviate that expense. Some argue that it is impossible, but look at the recent efforts and success at embedding components to gain a measure of that argument's validity. It is possible and it is being done; unfortunately, most of those designs still use solder to attach components to outer surfaces, which is unnecessary.

As additional support, a recent demonstration using Occam principles to redesign an assembly yielded a product with half

the number of layers (six rather than 12), was ~70% smaller in terms of total area and capable of being folded into an assembly which can occupy a footprint less than 20% of the original design with minimal increase in height. The assembly was designed to use aluminium as a base and weight was projected to be 55-65% less than the original.

Reliability

Reliability experts know the many problems with solder both in process and in the field. The vast majority of electronic assembly failures can be traced to solder joints. Moreover, the high temperatures associated with lead-free solder can damage or destroy electronic components and PCBs. In contrast, plated copper vias have proven highly reliable. Aluminium also closely matches the CTE of copper (22 versus 18 ppm/°C) and it is an excellent thermal spreader.

Security

Design security is an intrinsic benefit because components are embedded and, therefore, out of sight. Teardown is still possible but much more tedious and challenging.

Environmental concerns

Finally, with no solder and only aluminium and copper metals used, the devices have no proscribed materials, making the assemblies automatically compliant to RoHS. The fabrication of SAFE assemblies using Occam's principles is possible using today's infrastructure. The only thing missing is a general will to make them.

**Joseph Fjelstad is a 43-year veteran of the electronics manufacturing industry and an internationally recognised thought leader, author and innovator in electronics interconnection technology with more than 175 US patents. He has received the IPC Presidents Award and has been inducted into both the Paul Eisler Printed Circuit Manufacturing Hall of Fame and the Jim Raby Printed Circuit Assembly Hall of Fame. For more information, please contact Robin Pearce, Bishop & Associates, via email at rpearce@bishopinc.com.*

Bishop & Associates
www.connectorindustry.com

SOLID-STATE INTERFACE RELAYS

IDEC Corporation announces the RV8S solid-state interface relay, featuring 100 mA to 3A switching capability in a compact 6 mm wide space. Other features include high switching cycles, extended operating life and high-speed load switching.

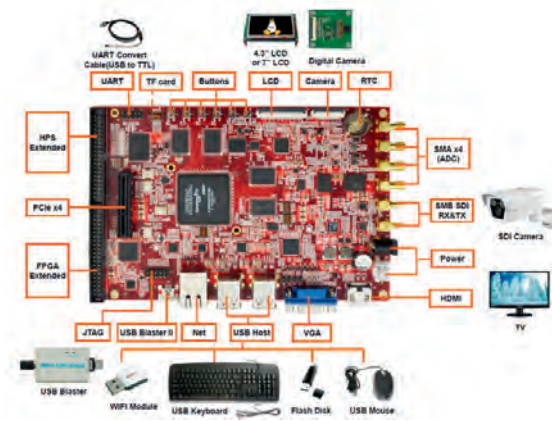
The product can switch loads up to 240 VAC. Common uses include general load switching in control systems for assembly machines, solenoids, moulding machines and other applications requiring a high repetition rate. A common application is as an interface device between a PLC or other controller outputs and a load with high power requirements.



The relay's operate and release times are said to be faster than electromechanical relays. The relay also generates no acoustic and less electrical noise than its electromechanical counterpart because it makes use of semiconductor outputs instead of electrically sparking contacts. It requires about 5-10 times less power to operate than an equivalent electromechanical relay.

The product is suitable for DIN-rail mounting and has appropriate UL/c-UL and CE ratings. It has IP20 protection and can safely operate in temperatures from -20 to 60°C and humidity from 5 to 85%. It supports flexible wire termination options, including screw terminal and spring clamp models.

IDEC Australia Pty Ltd
www.idec.com/australia



SOC FPGA DEVELOPMENT KIT

element14 has announced the Lark Board, a high-performance development board based on Altera's Cyclone V SoC. The board is designed for development of high-volume applications includ-

ing automotive, medical equipment, video surveillance and industrial control.

The board features a 5CSXFC6D6 SoC FPGA, which integrates an FPGA and ARM-based dual-core hard processor system (HPS) that operates at speeds up to 800 MHz and is coupled together through an AXI high-speed interconnect backbone to the FPGA fabric. A single monolithic device combines the performance and power savings of hard intellectual property with the flexibility of programmable logic.

The board provides 1 GB DDR3 SDRAM to each of the HPS and FPGA as well as 4 GB eMMC Flash and a Transflash card slot for mass storage. The board features I/O interfaces including PCI Express, Gigabit Ethernet, USB 2.0 Host ports, UART, JTAG and 3G SDI. It supports VGA display up to 1920 x 1080 and 1080 HDMI digital output, making it suitable for video-intensive applications. It also features a 30-pin digital camera connector for surveillance applications.

The board also integrates a 12-bit high-speed and a dual-channel 3.3 GHz RF/IF differential amplifier alongside a 12-bit 105 MSPS high-accuracy ADC to enable analog signal amplification, filtering and sampling. The board uses an Altera Enpirion power solution to provide stable and efficient output for all the Cyclone V SoC's power rails.

element14
au.element14.com

POLYMER TANTALUM CHIP CAPACITORS

Vishay Intertechnology has announced the vPolyTan series of surface-mount polymer tantalum moulded chip capacitors in five compact case sizes. Optimised for computer, telecom and industrial applications, Vishay Polytech T55 series devices feature ultralow ESR down to 30 mΩ at +25°C and 100 kHz.

The low ESR of the capacitors is a result of their polymer cathodes, which are said to offer enhanced performance over manganese dioxide devices. In addition, the series offers a ripple current rating up to 1.78 A IRMS and provides low equivalent series resistance (ESR) for enhanced charge and discharge characteristics. The capacitors will be used for power management, battery decoupling and energy storage in computers, tablets, smartphones and wireless cards.

Offered in the J, P, A, B and T (low-profile B - 1.2 mm max) case sizes, the devices feature a wide capacitance range from 3.3 to 330 μF overvoltage ratings from 2.5 to 10 V, as well as a capacitance tolerance of ±20%. The devices operate over a temperature range of -55 to +105°C with voltage derating above +85°C.

Featuring lead-free terminations, the capacitors are RoHS compliant, halogen free and Vishay Green. They are compatible with high-volume automatic pick-and-place equipment and offer a moisture sensitivity level (MSL) of 3.

RS Components Pty Ltd
www.rsaustralia.com

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UNITED STATES RUSS PRIZE FOR

COCHLEAR IMPLANT INVENTOR

Professor Graeme Clark AC from the University of Melbourne is the first Australian to receive the US Russ Prize for an outstanding achievement in bioengineering innovation: the cochlear implant.

The US National Academy of Engineering and Ohio University announced the winners of the biennial prize of US \$500,000 and recognised Professor Clark's pioneering role in the development of the multichannel cochlear implant for people with severe-to-profound deafness.

Professors Clark, Ingeborg and Irwin Hochmair from Austria and Michael Merzenich and Blake Wilson from the US are the pioneers in developing the multichannel cochlear implant for giving speech understanding to severely and profoundly deaf adults and children.

Professor Clark, Honorary Professor, Electrical Engineering in the Melbourne School of Engineering, who is a lead researcher at the University of Melbourne's Centre for Neural Engineering, worked with a multidisciplinary team at the University of Melbourne after he commenced cochlear implant research at the University of Sydney in 1967.

In the late 1970s, Professors Clark and Hochmair created prostheses that deployed multiple electrodes and routed particular sounds to different parts of the cochlear. These devices improved the ability of deaf people to understand speech. Professor Clark also helped to create Cochlear, the company that has over 250,000 patients implanted with the Australian device.

"I am honoured to have been given this award by the US National Academy of Engineering as it represents work that was developed through true multidisciplinary teams in engineering and medicine to solve a major health issue," Professor Clark said.

Professor Iven Mareels, Dean of the Melbourne School of Engineering, said Professor Clark has made a significant difference to the lives of the severely and profoundly deaf. "His work has inspired a whole generation of engineers to work in the development of new technologies to improve health," he said.

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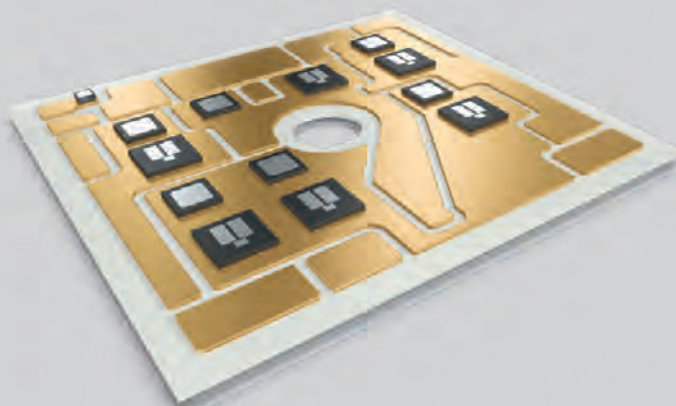


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RUGGED STORAGE SYSTEM

Crystal Group has announced the RSS13S17 JBOD Rugged 1U Storage System - an extreme-duty system designed for military operations, commercial industries and demanding mission-critical applications. The product features several storage options, compatibility with existing Crystal Group hard drive sleds, individually removable drives and reliability based on successful experience with current servers.

The company provides an SAS direct attached storage array that is 43.18 cm deep. With an aluminium chassis weighing 4.54 to 5.44 kg, the product provides high capability and storage capacity in a small, rugged package. It holds up to six removable 6.35 cm SATA/SAS hard drives or three removable 8.90 cm SATA/SAS hard drives, and contains rear I/O for power and SAS connections. As storage needs increase, additional units may be connected together in a daisy chain manner.

Innovative packaging techniques ensure the product runs cooler and performs at wider temperature extremes than other devices. The design limits deflection and extends circuit-board solder joint life, providing high processing power, in a rugged package, with long life.

Metromatics Pty Ltd

www.metromatics.com.au



NPN AND PNP TRANSISTORS

Diodes has introduced the DFN0606-packaged NPN and PNP bipolar transistors. Occupying a board space of 0.36 mm², the transistors are said to be 40% smaller than the DFN1006 (SOT883) parts and deliver the same or better electrical performance. With their off-board height of 0.4 mm, they are suitable for wearable technology such as smartwatches, health and fitness devices, as well as other space-constrained consumer products such as smartphones and tablets.

The company's initial DFN0606 bipolar transistor offerings are two NPN and PNP devices handling a power dissipation performance as high as 830 mW. The 40 V-rated MMBT3904FZ and MMBT3906FZ boost power density and also provide a 200 mA collector current, while the 45 V-rated BC847BFZ and BC857BFZ provide a collector current of 100 mA. All devices switch on at a base-emitter voltage of less than 1 V, enabling them to be fully turned on under conditions of low portable power.

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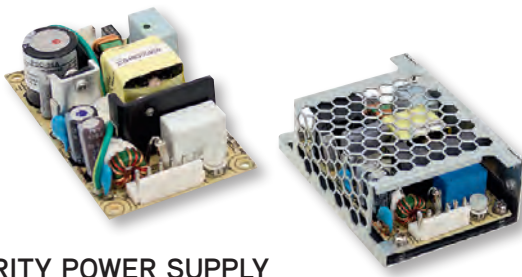
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35 W SECURITY POWER SUPPLY

The Mean Well 35 W PSC-35 series security power supply features the primary output as well as an additional charger output with a relatively small current, which can be used for DC UPS applications with a back-up battery. The range is suitable for low-power security applications; small-scale battery back-up projects; emergency lighting systems; alarm systems; DC UPS systems; central monitoring systems; and access systems.

The product is available in either the PCB type or the enclosed type (with L-bracket and cover) form factors, giving greater flexibility when it comes to security system designs. It has an input range from 90 through 264 VAC and there are two output options: 13.8 VDC (adjustable range 12-15 VDC) and 27.6 VDC (adjustable range 24-29 VDC). These cover the most frequently used voltages seen in security applications.

The series has an efficiency rating of up to 86% and can operate between -30 and +70°C under free air convection. It has been designed complete with short-circuit, overload, overvoltage and battery-low protection. A fuse protects against battery reverse polarity.

ADM Instrument Engineering Group

www.admtech.com.au

SATELLITE MODEMS

M2M Connectivity introduces the IDP 200 Series satellite modems, developed by SkyWave Mobile Communications, in Australia and New Zealand. M2M Connectivity will take advantage of SkyWave's packaged modems and satellite connectivity using the IsatData Pro (IDP) service over Inmarsat's global satellite constellation for a variety of industrial assets in remote locations, including vehicles, heavy equipment and fixed assets used in oil and gas applications.

The satellite modems offer easy-to-integrate monitoring of vehicles and industrial equipment. They are quick to deploy, with a built-in GPS, antenna, power supply and AT Command set, and encased in a rugged, fully certified, environmentally sealed enclosure for harsh environments.

The series offers two-way communication using the IsatData Pro service, which is said to deliver up to 37 times more data and have a lifetime beyond 2023. Delivering simplified architecture for off-the-shelf satellite messaging, the series offers an intuitive AT Command set for quick integration with external PLCs and general-purpose controllers. The modems are available in two versions: the IDP-280 with standard antenna or the IDP-290 with low-elevation antenna.

M2M Connectivity

www.m2mconnectivity.com.au



SERVO DRIVE WITH INTEGRATED SAFETY

The Allen-Bradley Kinetix 5500 servo drive with integrated safety can help machine builders take advantage of a single EtherNet/IP network, as well as a common design environment with Rockwell Software Studio 5000 Logix Designer software.

With high-speed coordination to meet demanding motion requirements,

the drive uses the EtherNet/IP network for streamlined machine safety functions. The network allows safety signals to travel via the same wires and IP addresses used for control and motion. This eliminates the need for a hardwired safety system and removes potential points of failure, resulting in less troubleshooting and downtime. Machine and equipment builders can quickly install the drive and provide users with ease of use via the Logix Designer development environment and Allen-Bradley GuardLogix safety controllers. In addition to motion and control parameters, users can configure the safety system within the Logix Designer software. They can unlatch the safe torque off function, program an unlimited number of setpoints, change safety zoning and re-use code to maintain system validation. Users also gain improved diagnostics information through the drive's integration with the GuardLogix safety controller. Details on safety-related faults, such as safe torque off requests, are shown on the drive's LCD display. This information can be pulled into existing information databases and reporting solutions already in use.

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DUAL REMOTE PANEL HMI UNIT FOR ACRS

NOJA Power has introduced its Dual Remote Panel HMI Unit for control and configuration of OSM series automatic circuit reclosers (ACRs). The unit is intended for use inside a substation control room, allowing an engineer to control and configure two ACRs or access network information - such as feeder voltage, current levels and advanced power protection configurations - in a safe and comfortable environment.

The product houses two human-machine interfaces (HMIs) designed for safe and easy operation. Each HMI is connected to an ACR, allowing the engineer to control and configure two network protection devices from a single unit. The HMI comprises a large backlit LCD display which presents an ACR's operational parameters in a single 'page' format, eliminating the need to scroll. Hot keys allow quick access between custom group settings and preconfigured protection settings.

The unit is a standalone product that requires only a power point and interference-immune fibre-optic cables to link each HMI to its associated ACRs RC10 control cubicle relay via an outdoor substation relay module. Units can be grouped in a self-contained 19" rack that fits neatly into the substation control room and allows engineers to configure multiple ACRs, access network information, take notes or operate a computer in a climate-proof environment.

Noja Power Switchgear Pty Ltd
www.nojapower.com.au



3G M2M ROUTER

The Netcomm Wireless NTC-6200 Series 3G M2M router, available from M2Mzone (powered by GLYN), delivers connectivity to a range of M2M and IoT applications. The series brings together the choice of three powerful gateways with different connectivity options so users can choose the best gateway to suit their individual requirements.

The series connects to worldwide 3G networks at speeds of up to 14.4 Mbps. With no dependence on a landline, the routers can be deployed in any location to allow remote access, monitoring and control of connected devices. Featuring ethernet, serial (RS232/422/485) and USB 2.0 connectivity, the series can interface with a diverse range of equipment used in a wide variety of vertical applications. Some models also include PoE (Power over Ethernet), ZigBee, GPS and I/Os. PoE enables the router to draw power via the ethernet port so it can be positioned in areas that are not serviced by mains power. The multipurpose I/O ports can be used to attach a number of sensors that can relay information about the physical environment.

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6U VME SINGLE-BOARD COMPUTER

Acromag's XVME-6410 is a high-performance 6U VME single-board computer based on the 4th Generation Intel Core i7 or i5 processor and utilising the Intel 8-Series QM87 PCH chipset for extensive I/O support. The product allows users to update their systems, rather than undergoing a total redesign.

With up to 16 GB of high-speed DDR3L removable memory and 1-64 GB flash memory (optional), Acromag built-in test (BIT) software provides test coverage though power-on BIT (PBIT). The air-cooled board features dual PMC/XMC sites which can be used in any combination, expansion capabilities, Microsoft Windows and Linux software support, and removable memory.

Intel processors deliver performance advancements such as enhanced microarchitecture and integrated graphics. The product also takes advantage of Intel Advanced Vector Extensions 2.0 for enhanced performance on floating point-intensive applications and Hyper-Threading Technology that enables each core to use two software threads for more efficient use of the CPU.

The module can support either one or two DDR3L ECC SODIMMs for a total of up to 16 GB. The SODIMMs are firmly attached to the module with screws and surrounded by heat sink material to provide a mechanically and thermally robust mechanism. Extended temperature models are available for operating in a -40 to +75°C range.

Metromatics Pty Ltd
www.metromatics.com.au



DEVELOPING MOTION ANALYSIS ALGORITHMS

Edgar Charry, *dorsaVi*

Elite athletes want to return to match play as quickly as possible after injury. As a result, they often convince themselves and their physicians that they are fit to play before they have fully recovered. Advanced technologies such as optical tracking systems, which capture motion, and force plates, which measure ground reaction forces, enable athletes and trainers to determine when the athlete can safely return to full activity.

These technologies provide metrics and insights that are impossible to obtain by simply observing the athlete, but they have several drawbacks. In addition to being costly, they typically depend on specially trained technicians and lengthy set-up procedures. Further, because they often require the athlete to perform in a constrained environment, such as on a treadmill, they make it difficult to assess natural movement.

At *dorsaVi*, my colleagues and I have developed wearable, wireless motion analysis devices that precisely measure and track movement while the athlete moves freely in any environment. *ViPerform* incorporates inertial measurement units (IMU) and magnetometers, as well as electromyography sensors for measuring muscle activity. Sensor data is transmitted to a recording and feedback device (RFD), which can be worn on the arm or carried in a pocket. The RFD sends the data to a PC, where it is processed and displayed by the *dorsaVi* software package.

At the heart of the *dorsaVi* technology are proprietary algorithms that filter and analyse raw sensor data, providing information that can be used to evaluate knee control, lower back range of motion, hamstring activity, hip and core control, and running performance. By developing and testing the algorithms in MATLAB and developing portable C code with MATLAB Coder, the development time was cut by almost half compared to our previous approach, which involved hand-coding in C#.

Developing algorithms for objective analysis

Objective analysis is made possible by sophisticated algorithms that process raw sensor data and present results in a meaningful form. For example, an algorithm may identify large negative spikes in the accelerometer output that occur on each step when an athlete is running. From the timing and magnitude of these spikes, the algorithm can calculate the runner's cadence and the

ground reaction force of each step, respectively. This analysis may detect an asymmetrical cadence or unequal ground reaction forces for each leg, revealing an inability or unwillingness for the athlete to apply equal force through both legs. Similarly, analysing knee deviation, flexion and rotation as the athlete squats or hops can guide recovery from ACL and other knee injuries. Even healthy athletes can benefit from such analysis, using feedback from the algorithms to refine their technique or optimise the efficiency of key movements.

When we implemented our algorithms directly in C#, we had to develop our own low-level signal processing and graphing functions. By switching to MATLAB, we have sped up development by using built-in functions for data visualisation and discrete Fourier transforms. Today, we use Signal Processing Toolbox and Wavelet Toolbox to further streamline development.

Verifying and testing the algorithms

After developing an algorithm in MATLAB, we verify it by comparing its results with results produced by an independent measuring device, such as an optical motion tracking system or a force plate. Once we are satisfied that the algorithm is performing well on a limited set of test scenarios, we run more than 1000 tests in MATLAB using recorded data from athletes around the world. We continue to fine-tune and optimise the algorithm until it meets our requirements for accuracy and performance.

Generating C++ code from MATLAB algorithms

DorsaVi software, which serves as the primary interface for viewing sensor data and evaluating an athlete's performance, is written primarily in C#. When we first began using MATLAB to develop signal processing algorithms, our workflow still relied on C++ and C# programmers to implement the production version of

TRACKING ALGORITHMS

the algorithm that was incorporated into the dorsaVi software. This approach was inefficient because it involved duplication of effort. It could take an additional month to reprogram and retest algorithms that had already been developed and tested in MATLAB.

To eliminate this inefficiency and shorten project delivery times, we decided to use MATLAB coder to generate C++ code from our verified MATLAB algorithms. We prepare our algorithms for code generation by initialising all variables and looking for opportunities to optimise loops. We verify that our algorithm is ready for code generation by generating a MEX function that wraps the compiled code, and then invoking the MEX function in place of the original MATLAB algorithm. After generating the C++ code from our algorithm, we compile the algorithm into a DLL. The C# programmers load this DLL into the dorsaVi software.

Translating the MATLAB algorithm into production code previously took up to a month. With MATLAB Coder it now takes a day or two. As a final step, we perform full system testing of the algorithms of the dorsaVi software. To date, we have not found any defects introduced during code generation. The extensive



TRANSLATING THE MATLAB ALGORITHM INTO PRODUCTION CODE PREVIOUSLY TOOK UP TO A MONTH. WITH MATLAB CODER IT NOW TAKES A DAY OR TWO.

testing we perform in MATLAB enables our C# programmers to spend their time developing new features for the dorsaVi software instead of recoding our algorithms in C# and then retesting them.

Re-using algorithms and responding to customer requests

We have re-used several algorithms initially developed for ViPerform in our ViMove and ViSafe products, designed for elite sports, clinical applications and occupational health applications, respectively. My team is currently working on new algorithms to analyse data from sensors placed on different body parts, as well as algorithm development and enhancement requests from existing customers.

With MATLAB and MATLAB Coder, we can respond quickly to customer requests. In a recent release, we updated two algorithm modules, created two new ones and delivered all four with a confidence that would have been impossible using our old workflow.

MathWorks Australia
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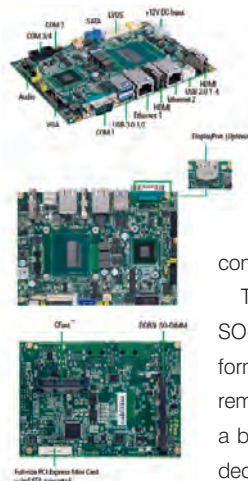
Using hardware-based data analysis and reduction technology, Spectrum has created firmware options that allow its high-speed M4i series digitiser cards to perform peak detection and output the corresponding statistical data.

The cards offer real-time sampling rates of up to 500 MSps with 14-bit resolution and 250 MSps with 16-bit resolution. The cards are available with two or four channels and use a fast PCIe bus to transfer acquired or processed data to a host PC at speeds of up to 3.4 GBps.

The firmware options, featuring ultrafast performance, are able to scan blocks of data and then extract a waveform's minimum, maximum, average, peak positions and trigger time stamp information. The analysis can be made on waveform block sizes from as small as 32 samples to as large as 2 gigasamples at rates of up to 5,000,000 events per second.

The peak detection and block statistics functions will be suitable in applications where users need to quickly characterise pulses or determine the time between them. Examples include radar, lidar, sonar, ultrasound, laser ranging, nuclear physics, power glitch monitoring and component testing.

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



EMBEDDED SINGLE-BOARD COMPUTER

Axiomtek has launched CAPA881, a 3.5" embedded board supporting 4th generation Intel Core i7/i5/i3 processors (Haswell) which provide high computing performance and good power efficiency.

The single-board computer comes with a DDR3L SO-DIMM socket up to 8 GB. It features good performance, graphics, power efficiency, security and remote management capabilities, making it suitable for a broad range of intelligent systems such as embedded applications, gaming, DSA, DVR, IoT/M2M-related, network computing and more.

The product's computing performance is suitable for mission-critical applications. It supports advanced processors and complex I/O functions, and is suitable for applications with space concerns but high performance requirements. Featuring a wide temperature range from -20 to +70°C and flexible machine-to-machine connection via rich I/O, the scalable SBC allows users to benefit from its versatile and rugged design.

The board is equipped with four COM ports, two USB 3.0 ports, four USB 2.0 ports, 8 in/out digital I/O and dual Gigabit Ethernet ports. It provides one SATA-600 socket, one CFast socket and one PCI Express Mini Card interface with mSATA supported. Intel Active Management Technology (iAMT) 9.0 can reduce manageability cost and enable service providers to manage and repair the system easily.

Mouser Electronics
www.mouser.com

RUGGED POWER INDUCTORS FOR AUTOMOTIVE ELECTRONICS APPLICATIONS

TDK Corporation has developed a series of rugged power inductors for use in automotive electronics.

The CLF6045NI-D wirewound SMD power inductors feature high efficiency over a wide temperature range extending from -55 to +150°C and offer rated inductance values from 1 to 470 µH (E6 series).

TDK Australia
www.tdk.com.au

THIN-CLIENT PANEL COMPUTER

Advantech's 12.1" and 15" TPC-1251T/1551T touch panel computers utilise the Intel Atom E3827 1.75 GHz processor. The computers feature iDoor technology, a flat screen and a multitude of I/O ports while being able to operate in a wide range of temperatures. The processor's enhanced performance enables a smooth operating experience in a wide array of industries.

The flat and seamless design of the product ensures easy maintenance, with IP66 protection against dust and water. This feature expands the environments in which the series can function. The front panel is IP65 certified, allowing it to be washed with water.

iDoor technology is a modular way of adding versatile functionality, giving system integrators the flexibility to choose the functions that they need without purchasing devices that have functions they'll never use. With isolated DI/O ports, Power over Ethernet, Profibus and CANOpen modules, the technology increases the functionality of the series. The series features two USB 3.0 ports for Power over Ethernet and other high-speed devices; a PCI slot for adding functions; and an HDMI port for an additional display. The iDoor technology slot uses a mini PCIe connector and, if not being used for iDoor modules, can be used for adding additional cards such as Wi-Fi, 3G and GPS. If further I/O ports and storage are required, the TPC-1251T-EHKE expansion kit provides additional storage for hard disks/solid-state disk and iDoor modules.

The product includes 4 GB DDR3L SDRAM and can be used with a variety of Microsoft Windows operating systems, Linux and Advantech software applications such as WebAccess, Panel Express and SUSIAccess. The TPC-51T series has used the same cut-out dimensions for the last 10 years, allowing the technology to be upgraded without changing the mounting environment.

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LOW-POWER RADIO CHIP FOR THE IoT

Larry Hardesty, MIT News Office

With the Internet of Things, everything in the human environment, from kitchen appliances to industrial equipment, could be equipped with sensors and processors that can exchange data, helping with maintenance and the coordination of tasks. However, this requires transmitters that are powerful enough to broadcast to devices dozens of yards away but energy efficient enough to last for months - or even to harvest energy from heat or mechanical vibrations.

MIT engineers have developed a new transmitter design that reduces off-state leakage 100-fold. At the same time, it provides adequate power for Bluetooth transmission, or for the even longer-range 802.15.4 wireless-communication protocol.

"A key challenge is designing these circuits with extremely low standby power, because most of these devices are just sitting idling, waiting for some event to trigger a communication," explained Anantha Chandrakasan, the Joseph F. and Nancy P. Keithley Professor in Electrical Engineering at MIT. "When it's on, you want to be as efficient as possible, and when it's off, you want to really cut off the off-state power, the leakage power."

"The trick is that we borrow techniques that we use to reduce the leakage power in digital circuits," Chandrakasan explained. The basic element of a digital circuit is a transistor, in which a semiconducting material, such as silicon, connects two electrical leads. In their native states, semiconductors are not particularly good conductors. However, in a transistor, the semiconductor has a second wire sitting on top of it, which runs perpendicularly to the electrical leads. Sending a positive charge through this wire - known as the gate - draws electrons towards it. The concentration of electrons creates a bridge that current can cross between the leads. Semiconductors are not naturally very good conductors, neither are they perfect insulators. Even when no charge is applied to the gate, some current still leaks across the transistor. It is not much, but over time, it can make a big difference in the battery life of a device that spends most of its time sitting idle.

Going negative

Chandrakasan - along with Arun Paidimarri, an MIT graduate student in electrical engineering and computer science and first author on the paper, and Nathan Ickes, a research scientist in Chandrakasan's lab - reduces the leakage by applying a negative charge to the gate

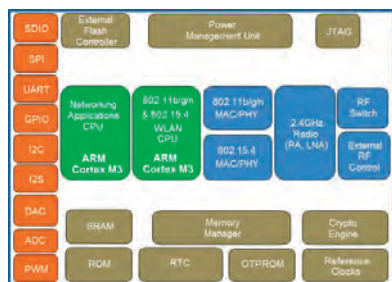
when the transmitter is idle. That drives electrons away from the electrical leads, making the semiconductor a much better insulator. Of course, that strategy works only if generating the negative charge consumes less energy than the circuit would otherwise lose to leakage. In tests conducted on a prototype chip fabricated through the Taiwan Semiconductor Manufacturing Company's research program, the MIT researchers found that their circuit spent only 20 picowatts of power to save 10,000 picowatts in leakage.

To generate the negative charge efficiently, the MIT researchers use a circuit known as a charge pump, which is a small network of capacitors - electronic components that can store charge and switches. When the charge pump is exposed to the voltage that drives the chip, charge builds up in one of the capacitors. Throwing one of the switches connects the positive end of the capacitor to the ground, causing a current to flow out the other end. This process is repeated over and over. The only real power drain comes from throwing the switch, which happens about 15 times a second.

Turned on

To make the transmitter more efficient when it's active, the researchers adopted techniques that have long been a feature of work in Chandrakasan's group. Ordinarily, the frequency at which a transmitter can broadcast is a function of its voltage. However, the MIT researchers decomposed the problem of generating an electromagnetic signal into discrete steps, only some of which require higher voltages. For those steps, the circuit uses capacitors and inductors to increase voltage locally. That keeps the overall voltage of the circuit down, while still enabling high-frequency transmissions.

What those efficiencies mean for battery life depends on how frequently the transmitter is operational. However, if it can get away with broadcasting only every hour or so, the researchers' circuit can reduce power consumption 100-fold. Shell and Texas Instruments funded this research.



WI-FI/ZIGBEE IP CHIPS AND MODULES

GainSpan has released its GS2000 chips and modules. The single-chip solution brings together two IEEE low-power standard wireless technologies: Wi-Fi (802.11b/g/n) and ZigBee IP (802.15.4). It is claimed that the Wi-Fi/ZigBee IP chip will accelerate development and market adoption of battery and line-powered connected devices for the connected home, smart energy, metering, healthcare and high-speed audio, video and security applications.

Device and appliance manufacturers will no longer have to design for one or the other protocols, as they can use the same SoC to develop a design that supports either ZigBee IP and/or Wi-Fi, with IPv4 or IPv6, all in the same product. The product thus extends IP connectivity everywhere - Wi-Fi brings local connectivity to smart phones and remote connectivity through the internet, while ZigBee IP extends the reach of IP to more battery-operated devices, through the use of smaller channelisation and meshing.

The device is also suitable for Wi-Fi-only applications. It offers multi Mbps throughput for high-definition video and audio applications; good idle power consumption; fast wake-up performance from idle state; a long battery life; and a high receiver sensitivity capability for extended range operation.

Glyn Ltd
www.glyn.co.nz

TOUCH SCREEN LCD MODULES

Kyocera is expanding its range of liquid-crystal displays to include two 7" widescreen (800 x 480 pixels) WVGA on-cell touch LCD modules with built-in touch sensors: the TCG070W VLRPC-GD117 and TCG070W VLRPC-GD118. Both modules feature a capacitive touch sensor built into the display's front glass. Combining these two separate components into one results in a compact on-cell touch display with good optical performance. The five-point multitouch screen controller is also included. Screened circuits help reduce EMC problems. The displays are suitable for lightweight applications where an additional front glass would be intrusive or for applications that already feature a front glass for design reasons. The modules have a wide temperature range of -30 to +80°C, plus a 170° viewing angle.

The modules measure 169.8 x 109.7 x 9.2 mm and include a built-in LED driver for easy integration, eliminating the need for additional backlighting components for the display. The LVDS interface ensures easy operation using a 20-pole plug. The touch sensor's output can be checked using USB or I²C.

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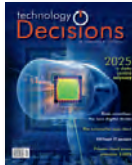


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WHY ARE BLUE LEDs SO TRICKY TO MAKE?

Scientists have uncovered the mystery of why blue LEDs are so difficult to make, by revealing the complex properties of their main component - gallium nitride - using sophisticated computer simulations.

Blue LEDs were first commercialised two decades ago and have been instrumental in the development of new forms of energy-saving lighting, earning their inventors the 2014 Nobel Prize in Physics. LEDs are made of two layers of semiconducting materials. One has mobile negative charges, or electrons, available for conduction, and the other positive charges, or holes. When a voltage is applied, an electron and a hole can meet at the junction between the two and a photon (light particle) is emitted.

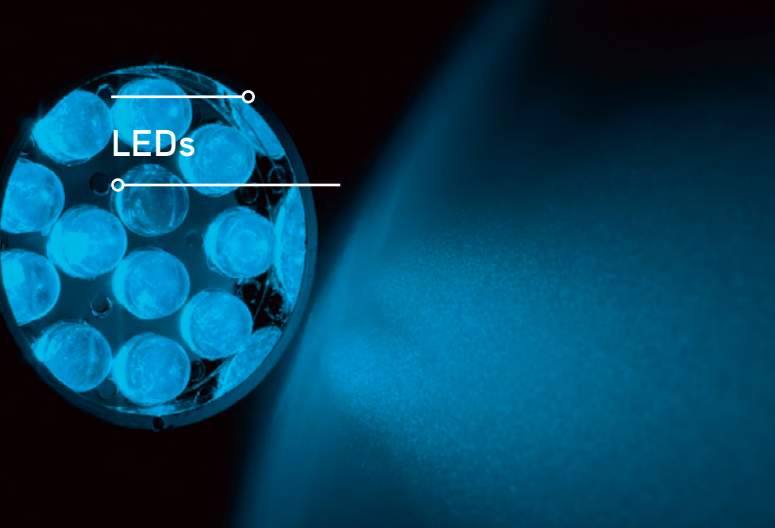
The desired properties of a semiconductor layer are achieved by growing a crystalline film of a particular material and adding small quantities of an 'impurity' element, which has more or fewer electrons taking part in the chemical bonding (a process known as 'doping'). Depending on the number of electrons, these impurities donate an extra positive or negative mobile charge to the material.

The key ingredient for blue LEDs is gallium nitride, a robust material with a large energy separation, or 'gap', between electrons and holes - this gap is crucial in tuning the energy of the emitted photons to produce blue light. While doping to donate mobile negative charges in the substance proved to be easy, donating

positive charges failed completely. The breakthrough, which won the Nobel Prize, required doping it with surprisingly large amounts of magnesium.

"While blue LEDs have now been manufactured for over a decade, there has always been a gap in our understanding of how they actually work, and this is where our study comes in. Naively, based on what is seen in other common semiconductors such as silicon, you would expect each magnesium atom added to the crystal to donate one hole. But, in fact, to donate a single mobile hole in gallium nitride, at least a hundred atoms of magnesium have to be added. It's technically extremely difficult to manufacture gallium nitride crystals with so much magnesium in them, not to mention that it's been frustrating for scientists not to understand what the problem was," said John Buckeridge (UCL Chemistry), lead author of the study. Buckeridge worked in collaboration with groups at the University of Bath and the Daresbury Laboratory.

The team's study, published in the journal *Physical Review Letters*, unveils the root of the problem by examining the unusual behaviour of doped gallium nitride at the atomic level using highly sophisticated computer simulations.



LEDs

"To make an accurate simulation of a defect in a semiconductor such as an impurity, we need the accuracy you get from a quantum mechanical model," explained David Scanlon (UCL Chemistry), a co-author of the paper. "Such models have been widely applied to the study of perfect crystals, where a small group of atoms form a repeating pattern. Introducing a defect that breaks the pattern presents a conundrum, which required the UK's largest supercomputer to solve. Indeed, calculations on very large numbers of atoms were therefore necessary but would be prohibitively expensive to treat the system on a purely quantum-mechanical level."

The team's solution was to apply an approach pioneered in another piece of Nobel Prize-winning research: hybrid quantum and molecular modelling, the subject of 2013's Nobel Prize in Chemistry. In these models, different parts of a complex chemical system are



IN FACT, TO PROVIDE ENOUGH ENERGY TO RELEASE THE CHARGE WILL REQUIRE HEATING THE MATERIAL BEYOND ITS MELTING POINT. EVEN IF IT WERE RELEASED, IT WOULD KNOCK AN ATOM OF NITROGEN OUT OF THE CRYSTAL AND GET TRAPPED ANYWAY IN THE RESULTING VACANCY.

simulated with different levels of theory. "The simulation tells us that when you add a magnesium atom, it replaces a gallium atom but does not donate the positive charge to the material, instead keeping it to itself," said Richard Catlow (UCL Chemistry), one of the study's co-authors.

"In fact, to provide enough energy to release the charge will require heating the material beyond its melting point. Even if it were released, it would knock an atom of nitrogen out of the crystal and get trapped anyway in the resulting vacancy. Our simulation shows that the behaviour of the semiconductor is much more complex than previously imagined and finally explains why we need so much magnesium to make blue LEDs successfully."

The simulations crucially fit a complete set of previously unexplained experimental results involving the behaviour of gallium nitride.

new PRODUCTS

APPLICATION PROCESSORS

Toshiba has announced the TZ2100 group application processors as the latest additions to its ApP Lite family's ARM Cortex-A9-based TZ2000 series. The high-performance application processors support enhanced sound and image data mining, communications and security functions.

The devices can operate at a maximum frequency at 600 MHz (a 300 MHz version is also available), supporting high-speed processing. They are suitable for a wide range of products, such as the embedded devices that will realise the Internet of Things (IoT), handheld devices and industrial equipment.

The product accommodates DDR3-800/DDR3L-800 16-bit width. The company's power-saving technology enables long-time data back-up and RTC operation with one single coin-cell battery. 1 MB of built-in SRAM supports processing of start-up code and data during program execution, without any need for external DRAM.

The device also features camera input, graphics and LCD output; a secure boot system and data encryption function; and an external expanded bus interface. Users can choose suitable specifications by setting up a 'configuration pin'.

The company has also launched development starter kits for the group, comprising a reference board and device driver. These will support a simple prototype development and evaluation environment for diverse applications.

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

EMBEDDED MULTI-CHIP PACKAGE (MCP) PORTFOLIO

Micron Technology's MCP portfolio combines high-performance, low-power Flash and DRAM into various density combinations, all packaged in ultra-small solutions to save board space and enable users to design optimum products. The company offers a wide range of technologies for users requiring industrial temperatures (-40 to +85°C), automotive-grade capabilities or more than five years of product longevity.

The company's MCPs combine both the critical non-volatile and volatile memory components needed for an application to function and operate. The non-volatile memory, either NAND or Parallel NOR Flash, is used for the critical boot, OS and application code storage. The volatile memory, consisting of either low-power DRAM (LPDRAM) or pseudo-SRAM (PSRAM), is used for temporary storage, working memory and high-speed operation. High-density NAND-based MCPs enable store-and-download (SnD) operation where code is shadowed into DRAM for data-intensive applications, while lower-density NOR-based MCPs enable fast execute-in-place (XiP) operation for enhanced boot-up performance and longer battery life.

Each MCP comes in scalable package sizes which provide small, low-pin count form factors that can simplify space-constrained applications. By combining the common address and data pins of the Flash and DRAM, the MCPs reduce the overall package ball count and required board space.

Arrow Electronics Australia Pty Ltd
www.arrowasia.com

CODE DEVELOPMENT TOOL

Microchip Technology has expanded its MPLAB Code Configurator plug-in to support more than 16-bit PIC MCUs, in addition to the 8-bit devices already supported. The code development tool enables developers to enhance the design experience with fast application development.

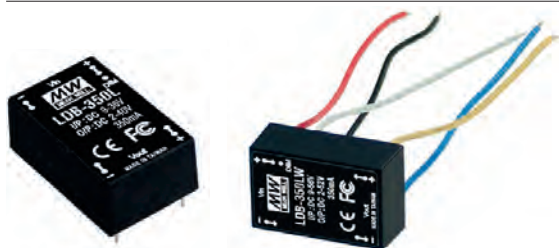


A free plug-in tool for the MPLAB X Integrated Development Environment, the product leverages drivers and GUI for controlling and driving the peripherals inside PIC microcontrollers with simple and clearly documented driver APIs. The configurator simplifies software development using an intuitive GUI to configure peripherals, accelerating time to market for users designing with 8- and 16-bit PIC microcontrollers. It is easy to change peripheral configurations or add/remove peripherals from the project. The generated code is designed for efficient use of CPU and memory resources.

The tool offers powerful features such as visual set-up for I/O pin management with both a chip-level and tabular view. Once a system-level clock rate is set, the tool will automatically calculate timer periods, duty cycles and baud rates for peripherals. With a simple drag-and-drop interface, the tool generates easy-to-read code that includes peripheral configuration set-up, drivers and pin mapping to efficiently solve application development obstacles.

Microchip Technology Hong Kong

www.microchip.com



BUCK-BOOST DC-DC LED DRIVER

The LDB-L/LW series buck-boost DC-DC LED driver from Mean Well is suitable for OEMs designing LED lighting for use in harsh environments. The fully encapsulated IP67-rated potted design makes it suitable for use in environments with high dust and moisture levels. Potential applications include mining, marine, street, landscape and tunnel lighting.

Multiple models are available with different current outputs: 300, 350, 500 and 600 mA. The product has a very wide input/output range and the rated output current will be maintained, regardless of voltage fluctuations. The built-in EMI filter means the series can comply with the EMC standard EN55015 and it is supplied complete with the C-Tick.

ADM Instrument Engineering Group

www.admtech.com.au

REFERENCE DESIGN FOR HIGH-POWER LED LIGHTING APPLICATIONS

Power Integrations has announced a reference design for LED streetlights, high-bay lights and other high-power LED lighting applications. RDR-382 describes a constant current, 43 V (nominal), 150 W reference power supply for 90-265 VAC solid-state lighting, utilising the company's HiperPFS-2 PFC controller ICs and HiperLCS integrated LLC power stage ICs.

The reference design uses a novel feedback and control scheme which enables the LLC to provide constant current directly at the output. As a result, component count is cut by approximately one-third, efficiency is increased to >93% and the elimination of the DC-DC converter stage significantly reduces size, in comparison to traditional dual-stage drivers with separate PFC and LLC stages. The high nominal LLC switching frequency (250 kHz) reduces the size of the required magnetics, while the use of a continuous-conduction-mode, variable-frequency PFC stage reduces EMI compared to fixed-frequency alternatives.

The design is highly efficient, with its reduced component count and low heat generation ensuring a long lifetime. The product can be used to drive single or multiple LED strings and allows analog dimming to be implemented with a 0-10 VDC input.

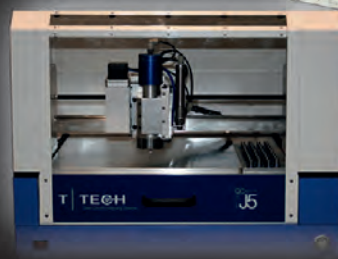
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the GRUMPY page

Mike Smyth, specialist technical writer

Why are not our railways taking more freight off our roads and easing the pressure to build more and more roads?

Our railway system for moving goods is a shambles. It is still in the mid-19th century era of steam and horse-drawn buggies in the station yard. Yes, it moves coal and iron ore, grain and other bulky commodities but it does not move the everyday manufactured goods such as groceries or mail. These commodities block our main roads and freeways loaded into the backs of behemoth trucks. Yes, it carries people, often in uncomfortably congested suburban rolling stock, and it carries some freight but a fraction of what it could, far less than it used to and far less than it ought to.

The infrastructure for handling goods traffic has become skeletal as across the country, freight sidings and sorting yards have been pulled up and goods sheds have been pulled down. In the golden years of railways, bulky goods were carried to goods yards, offloaded into relatively light road vehicles and taken to their final destination. Goods sheds were a major feature of most railway stations. In fact, early railways made their money carrying goods, not people.

Now we have semitrailers as big as a block of units and with countless wheels pounding down roads. We spend millions of dollars on new roads and on the upkeep of old ones. This encourages ever-bigger trucks, many of them poorly maintained, to emit abnormally high quantities of diesel particulates for all to breathe.

Why aren't we making better use of our rail system? The answer is that it has been left behind in the scramble for bigger, better and bonnier roads because politicians see them as electorally popular, providing an ideal platform for strutting and preening. Railways are regarded as out of date and governments have paid only lip service to upgrading rail.

Upgrading existing infrastructure is not easy or cheap. Some of our main lines have some fearsome curves on them, restricting speed and increasing wear on track and wheel tyres. However, steps are being taken to upgrade parts of the rail network. A third line more or less dedicated to goods is now under construction in the north-west of Sydney and there is the mainly passenger line that will link Richmond to Chatswood that is already controversial in that many are saying the tunnel should be bigger to accommodate double-decker trains. Is this another example of bureaucrats/politicians not thinking ahead?

We must regard rail as an economic priority and not take the easier option of forever building new roads and upgrading existing ones. Sure, there may be hardship in taking some trucks off the roads. Not as many drivers would be needed along with all the support maintenance crews not to mention the loss to governments of excise fuel tax. However, more people would be employed on the railways and new skills would be needed. And in any case, there are always going to be the oversize loads that can only travel by road, but they should be the exception.

On the upside, with the increasing use of electricity for rail traction, we could reduce our reliance on imported oil, and even with existing diesel locomotives, emissions and fuel consumption would be nothing compared to the number of trucks in use - to say nothing of reduced road accidents.

We should be using the railways as the arteries for goods distribution right across Australia.

Technology has improved since the days of steam. Electronics has played a major role in helping the railways through better versatility and reliability. Advances in signalling have enabled more trains to run on the same tracks and improve traffic density. The potential exists for high-speed travel - there is even the magnetic levitation train that still has some way to go before you can get on one near you. Yes, it will cost a lot of money, but it is not going to get any cheaper. It is time to bite the bullet and regard our railways as part of a national transport network and not something that is in deadly combat with roads.

The alternative is to pull up all the tracks, melt down the rolling stock and use the space for another freeway!



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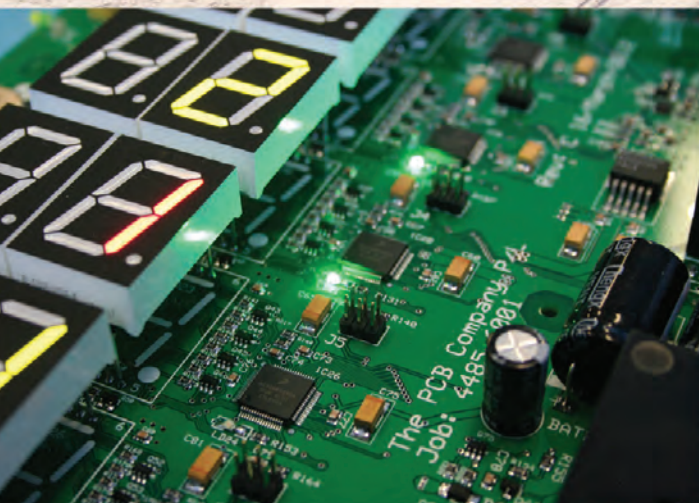
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