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AUTOMATION/ ROBOTICS

AN EP&T SPECIAL REPORT
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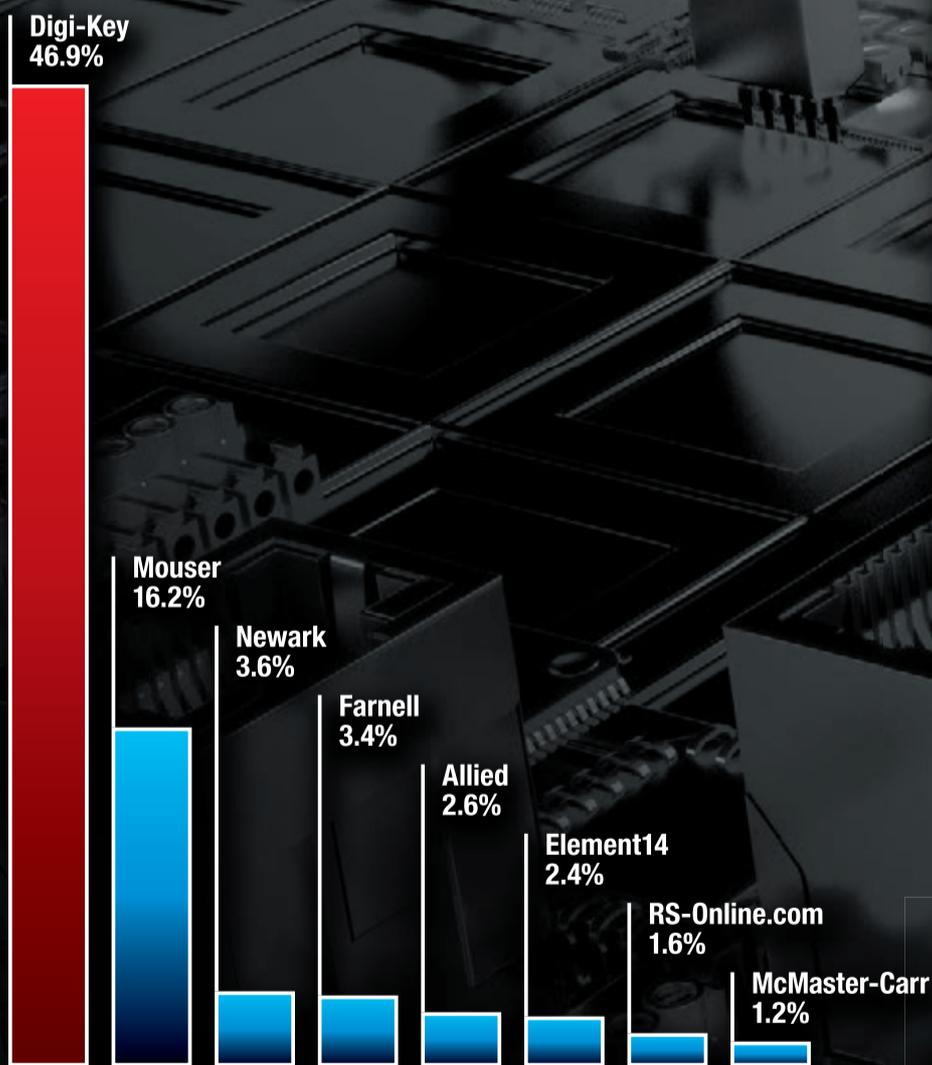
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*Which Website Offers the Easiest Checkout Process?**



*AspenCore's 11th Design Engineer and Supplier Interface Study gathered information from engineers regarding their need for product information and other services, as well as how and when they interface with suppliers and how they see the quality and value of that interface. 1,750 U.S. engineers participated in this year's web-based survey. The results represent those surveys completed by April 2016.

When asked "When purchasing electronic components online, which website offers the easiest checkout process?" The chart above shows the results among the industry's electronic component distributors.



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EP&T publisher Peter Loney retires

After a long and illustrious career, full of accomplishments, Peter Loney, publisher of EP&T Magazine and manager of EPTECH trade shows is retiring.

Peter began his career with EP&T nearly three decades ago – oddly enough – in the editorial department? Quickly realizing after just three months that sales was his true calling, Peter made his debut in the electronics marketplace armed with a media kit and his charm and never looked back.

Along with the great team he assembled and led, Peter has been instrumental in making EP&T far and away the market leader in this space and one of the largest magazines at Annex Business Media. Under his leadership and development, the EPTECH tabletop shows have become an industry benchmark for effectively connecting customers with suppliers.

Holding a variety of titles throughout his 29-year tenure (sales associate, account rep, sales manager, general manager and publisher) Peter has steered EP&T through times of great change, including multiple ownership changes.

Demonstrating a zest in giving to others, Peter was also one of the organizers of the Electronic Industry Hockey Tournament raising over \$300,000 for the Crohns and Colitis Foundation of Canada, and most recently, with the help of EP&T staff, helped organize the Electronics Industry Golf Tournament, it too raising in excess of \$250,000 for The Children's Wish Foundation, among others.

Everyone at EP&T and Annex will miss his personable nature, good humour and his relentless focus on customer service. While we know he will miss his time spent with our advertising community, Peter should now have more time for some retirement hobbies – among them, mountain biking, hockey, home improvement projects, travel and – of course – sipping a cold beer on the dock at the cottage.

Enjoy your retirement Peter – it is well deserved!

Stephen Law, Editor
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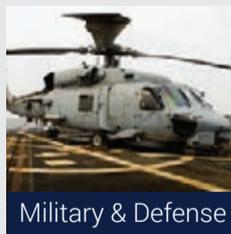
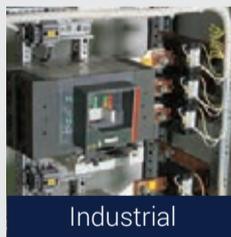


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NEWSWATCH

Feds commit \$32M to Waterloo engineering

The federal government recently announced it will contribute \$32.6-million for the construction of a state-of-the-art engineering building at the University of Waterloo.

Engineering 7, the seven-storey, 240,000-square-foot building, will accommodate expanding demand from student enrolment and feature advanced research labs. It is under construction on Waterloo's east campus at a total cost of \$88-million, with a scheduled opening in the spring of 2018.

Home to growing biomedical and mechatronics engineering programs, as well as research on disruptive technologies, including machine intelligence, mobile robotics, autonomous vehicles and wearable biomedical devices, Engineering 7 will be one of the largest buildings on campus when complete.

"This new facility is a prime example of Waterloo's unconventional, creative, innovative thinking," says Feridun Hamdullahpur, president and vice-chancellor at U Waterloo. "It will be home to world-leading talent and research, continuing to expand the impact of disruptive technologies that will help to put Canada at the forefront of the global economy."

A focal point of Engineering 7 will be the Engineering Ideas Clinic, a novel space allowing professors from different engineering disciplines to collectively teach theoretical concepts through experiential, hands-on learning. Waterloo Engineering's 7,500 undergraduate students will use the facility.

In addition to study and social areas, lecture halls and 20 garages for student design teams, the facility will house a cutting-edge additive manufacturing – or 3D printing – lab and the RoboHub, a unique testing facility for aerial, mobile and magnetically levitated robots.

Chan Zuckerberg group to acquire Toronto AI start-up

iGan Partners recently announced the pending acquisition of its Toronto-based portfolio company, Meta, by the Chan Zuckerberg Initiative. Launched in 2015 by Mark Zuckerberg and Dr. Priscilla Chan, the Chan Zuckerberg Initiative is dedicated to advancing human potential and promoting equal opportunity, with a current focus on scientific research, education, and building strong communities.

Meta is a technology company that helps researchers understand what is happening globally in science and shows them where science is headed. Meta uses artificial intelligence to read the world's scientific papers, understand what is in them and deliver their insights to researchers in real time.

This information can help researchers and experts make faster progress in all areas of science to accelerate medical advances.

As part of the Chan Zuckerberg Initiative, Meta's capabilities will get united into a single, powerful tool and be made available to the entire scientific community. The Chan Zuckerberg Initiative and Meta are committed to offering these tools for free to all researchers.

Schleuniger acquires leading software supplier

Schleuniger has become the sole owner of Munich Germany-based DiIT AG, a leading global producer of software systems for wire processing and wiring harness production.

Schleuniger already held a minority interest in DiIT AG, prior to taking full ownership. DiIT will continue to operate as an independent company within the Schleuniger Group. All DiIT customers will continue to benefit from current and future software versions that have highly efficient interfaces for machines from all major manufacturers.

DiIT is a globally active supplier of integrated software systems for wire processing and wiring harness production. Based on electronic drawings, the company's solutions are capable of controlling and optimizing the entire production chain from the cutting area right through to shipping, including generating all necessary production data.

Harting appoints head of Canadian sales

The Harting Technology Group appointed Carl Maalouf as its new head of Canadian sales.

Hoping to leverage his extensive engineering background and expand Harting's presence in the Canadian market, Maalouf graduated from McGill University with a BEng degree in chemical engineering and is fluent in both English and French. He joins the firm after eight years in industry, focusing on technical sales and key account management.

Harting Americas also recently reached an agreement with interconnect distribution specialists Heilind Electronics, Wilmington MA, which aims to increase the German connector firm's growth through online sales and industry presence.



Carl Maalouf

#BCTECH Summit to showcase industry leaders

An impressive list of local and global thought leaders will converge in Vancouver this spring to participate in a leading-edge gathering of prominent high tech minds. Delegates will be inspired by keynotes including JB Straubel, CTO & co-founder of Tesla Motors; Beth Smith, GM of Watson Technology, IBM; and Shahrzad Rafati of BroadbandTV – to name only a few.

The #BCTECH Summit takes place on March 14-15, 2017 at the Vancouver Convention Centre. Hosted by the BC Innovation Council and the Government of B.C., the two-day event will include important conversation and revelations around how tech is redefining the way we work and play and is providing critical solutions to major industry challenges.

To learn more about the #BCTECH Summit lineup of speakers and the agenda, visit bctechsummit.ca.

CPES2017 unveils 30+ keynotes, industry speakers

The Canadian Printable Electronics Industry Association (CPEIA) has released the speaker lineup for CPES2017, a conference and trade show exhibition for printable, flexible and wearable electronics (PE) taking place in Toronto this spring.

With more than 30 speakers and over 200 participants from 120 organizations in attendance, the event serves as a meeting ground for technology developers, industrial companies and end-users to discuss how they can work together to manufacture and commercialize new products and applications. Academic researchers showcase their research and discover how they can link it to market needs and opportunities.

Day one of the program features Key Applications, while Day two is dedicated to Manufacturing. The optional Day 3 provides master classes, a financing session and mentoring.

The conference runs from May 24-26 at Centennial College's new Conference Centre in Toronto. Early bird registration ends March 3. Please visit the conference website at <https://cpes2017.ca> to learn more and to register.

"I am proud to say that our ecosystem has grown considerably over the last year and many of this industry's products are now reaching commercial production," says Dr. Paul Smith, vice-president, Xerox Research Centre of Canada and Chairman of the CPEIA Board of Directors. "An outstanding network is forming under the auspices of the CPEIA, bringing together the key players in the Canadian and global supply chains. This year's symposium features an exciting lineup of world-class speakers to talk about areas that will be critically important to Canadian industry and the world."

The confirmed keynotes include:

- Christine Di Fabio, global R&D, print & connectivity/intelligent packaging Unilever;
- Ron Zimmer, president & CEO, Continental Automated Buildings Association (CABA);
- Michel Popovic, president, AFELIM;
- Russell Schwartz, chief technology officer, Sun Chemical Corp.;
- Stan Farnsworth, chief marketing officer, NovaCentrix.

CPEIA partners with Alberta Council of Technologies

The Alberta Council of Technologies (ABCtech) have signed a Memorandum of Understanding (MoU) with The Canadian Printable Electronics Industry Association (CPEIA) and to develop Alberta's printable and flexible electronics industry and boost the regional diversification of Canada's knowledge-based economy.

ABCtech is a 'network of networks' that advocates on behalf of Alberta's technology-based enterprises, entrepreneurs and industries for the creation of wealth in Alberta. It focuses on the commercialization of disruptive technologies that will place Alberta and Alberta companies at the forefront of emerging economies, to wean the province's economic fortunes from their dependence on natural resources.

Through the creation of cross-discipline and cross-industry dialogue on emerging technologies and their impact on society, ABCtech germinates unique opportunities for collaboration amongst stakeholders who may otherwise not interact. ABCtech achieves this through a series of carefully constructed and executed events.

"Alberta wants to, needs to and is diversifying its economy," says Perry Kinkaide, founder and past president of ABCtech. "Analytics, big data and machine learning are the foundation of the new economy and technology areas that can benefit from the application of printable and flexible electronics. This partnership will help those that can benefit from printable and flexible electronics in our province get the recognition and support they need to take advantage of these market opportunities."

AI firm Coveo opens office in Montreal

Coveo, a leader in artificial intelligence (AI) powered search and predictive analytics, recently opened a new Montreal office, situated in the heart of the Innovation District – in historic Windsor Station.

Coveo has invested close to \$5-million in the creation of the new office, representing the latest expansion to the firm's 300-person team, headquartered in Quebec City, with other offices in San Francisco and Amsterdam.

"Coveo is experiencing tremendous growth and has already created 20 high-value jobs in the Montreal area, and we plan to create more than 30 new jobs over the next 18 months," says Louis Tetu, chairman and CEO of Coveo.

GM Canada launches tech centre in Markham

General Motors aims to drive future car development at its new Canadian Technical Centre - Markham Campus, where the firm will develop new autonomous vehicle software and controls, active safety and vehicle dynamics systems, infotainment and connected vehicle technologies.

With its specific focus on increasing its eco system of Canadian engineering, GM's Markham Campus adds a new focus on advanced mobility innovation to the region's fast growing technology cluster of some 4400 ICT firms.

Brownsburg Elektronik extends partnership with Optimum Components

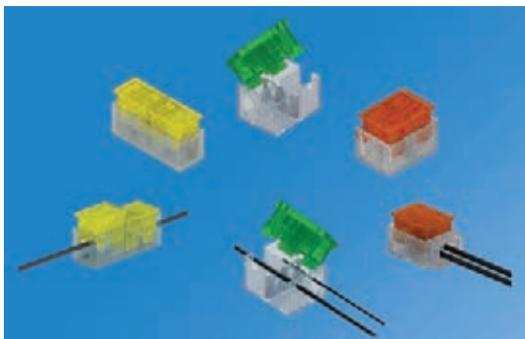
Brownsburg Elektronik Inc., Lachute QC, manufacturer of transformers, inductors and specialty coils, has extended its relationship with manufacturers' representative Optimum Components in the province of Ontario.

Peter Robinson, president of Optimum Components, will cover Ottawa and surrounding area. John McKinnon will cover the Toronto metropolitan area. Both companies have had a strong relationship with the previous owner of Optimum Components, Mike Potter, who has since moved on to other interests.



IDC wire connectors are quick, reliable

Keystone Electronics 'i-Clamp' insulation displacement connectors (IDC) for wire connectivity provide a tamper proof, quick and reliable method for wire connections without stripping wires. Devices cleanly pierce the wire insulation and make a secure connection in one easy step. No need for wire nuts or electrical tape. Product comes in 3 styles to accommodate all common wire connectivity configurations: The T-Series wire connectors are used for branching off a common wire run, allowing a connection without cutting or stripping insulation. The Two-Way Series connectors feature a unique dual channel that enables pre-assembly to a component or fixture. Designed to withstand shock and vibration, devices can be used with wires from 10 to 22AWG.



EMX ENTERPRISES

<http://ept.hotims.com/65986-36>

100G electrical test solutions automate for sampling oscilloscopes

CAUI-4/KR4/CR4 test automation solution provides equivalent time automated compliance test solutions for 4-lane 100G electrical interfaces defined in the IEEE 802.3bm and 802.3bj specifications. Available for firm's performance oscilloscopes including the DSA8300 >70GHz bandwidth sequential equivalent-time sampling oscilloscope and the DP070000SX real-time oscilloscope series with bandwidth up to 70 GHz, this TekExpress application supports 100G Ethernet (IEEE 802.3bj and IEEE 802.3bm Annex 83) electrical validation and characterization needs. Specific supported technologies are 100GBASE-CR4, 100GBASE-KR4 and CAUI-4, which are the principal electrical specifications for 100G Ethernet.



TEKTRONIX

<http://ept.hotims.com/65986-40>

Elbow plug connector permits eight potential positions



Anglissimo patent pending elbow plug connector can be orientated into

one of eight possible positions during its assembly. The solution is suitable in designs where many cables need to be positioned in a precise way to prevent cable clutter or a jungle of cables. Product provides 2 to 32 electrical contacts and is available in 3 sizes 0B, 1B and 2B series.

LEMO

<http://ept.hotims.com/65986-37>



Compact hybrid connector system saves installation space

SuperCon series compact hybrid connector system combines power supply and data transmission in one single device, providing equivalent to the modern connection and interface wiring technology. Depending on the application, three sizes, B12, B17 and B23, are available. While the number of pins and the permitted voltages vary depending on the size, the 360° shielded data core is always the same and designed for industrial ethernet Cat 5 with wire cross section AWG22. Each pin layout is available with min. 2 different codings - optically marked by different colour rings. Thus, misplugging is impossible in different applications.

CONEC

<http://ept.hotims.com/65986-38>

Hermetic EN2997 connector provides 22 contacts

DEUTSCH 983 Series hermetic EN2997 connectors improve



connection extension with gauge 22 contacts in less space with same reliability. Ideal for commercial air and military applications, device is capable of withstanding extreme vibrations and high-temperature (up to 260C) environments in many rugged military and commercial aircraft engine and booster systems. Products are self-locking, anti-rotation and have shell-to-shell metal bottoming for high performance.

TE CONNECTIVITY

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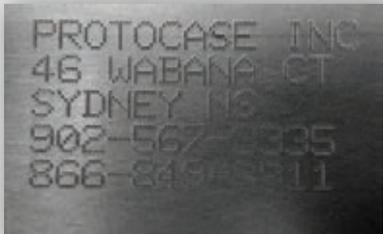


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Power Supplies

Smart battery guide will reduce costly design errors

Professional battery manufacturer Accutronics Ltd., Staffordshire UK, has published an infographic providing guidelines for original equipment manufacturers (OEMs) on what should be considered when specifying a rechargeable smart battery to power their next product. The infographic highlights the importance of considering batteries at the earliest possible stage in the development process.

Accutronics believes the most common and most costly mistake a design engineer can make when choosing a power source is leaving specification until it's too late. With smart batteries becoming increasingly common in industries such as medical and military, the demands placed on them are also becoming increasingly challenging. The infographic can be downloaded here.

The infographic highlights the key features a design engineer or purchasing team should look for in a smart battery, including fuel gauging which can provide accurate state of charge prediction regardless of temperature, load and age. An accurate fuel gauge provides confidence whilst an inaccurate gauge can result in 'runtime anxiety' with the user constantly in fear that their device will run out of power. If the device is being used in a medical or mission-critical military application, then the premature depletion of battery power could have severe implications.

Other essential features include protection circuitry which prevents the battery cells from being over-charged, over-discharged, or operated at extreme temperatures. Smart power management ensures the battery only receives charge when it is required - this enhances both the life and safety of the battery. The ability for the battery to operate under differing power modes also allows it to hibernate when it is stored, maximizing the shelf-life of batteries which may be in the supply chain for prolonged periods.

"As the complexity of battery powered applications increases, OEM buyers need to ask themselves how fit for purpose their current design methodology is," explained Michele Windsor, global marketing manager for Accutronics and Ultralife. "By choosing a smart battery, OEMs can rest assured that their device will continue to deliver optimum performance in a variety of applications. Whether it's the reliability and security demanded in the medical industry, or the extreme temperatures and harsh conditions faced in military and defense use, smart batteries can step up to any environment."

"Because smart batteries are used in many life-critical situations, we're also concerned about the rise of counterfeiting in the battery industry. Counterfeit batteries may be built using inferior battery cells and often lack the critical protection electronics which are required to make them operate safely. Also, a lack of quality control during manufacture, or forged regulatory certification means that fake batteries could prove costly for many OEMs."

The infographic also highlights the importance of selecting a battery with built in digital algorithmic security, which can be used by a host device or charger to ensure that the installed battery is the genuine article."

For more information on smart batteries from UK based battery and charger maker Accutronics Ltd., go to <http://ept.hotims.com/65986-41>



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What should OEMs look for when choosing a smart battery?

Robust

If batteries need to operate in harsh environments, smart batteries ensure that safe and efficient operation is maintained at all times.



Accurate fuel gauging

Smart batteries can reliably predict their state of charge regardless of temperature, load or battery age.

Protection

Smart batteries protect themselves from external abuse such as over-charge, over-discharge, over-load or short circuit, maximising safety.



Power management

Smart batteries have multiple power levels and can 'power down' to promote prolonged storage.

Algorithmic security

SHA-1 security allows a host device to interrogate a smart battery and determine if it is genuine. This allows fakes to be identified.



Smart charging

When used with a compatible charger, smart batteries request the appropriate charging strategy based on prevailing environmental conditions.

newswatch

3M sells NMC cathode intellectual property

Agreement expands existing battery materials relationship

3M has entered into an agreement transferring its Nickel-Manganese-Cobalt (NMC) cathode intellectual property and related intellectual property licenses to Umicore, a global materials technology and recycling group. The sale includes U.S. Patents 6,660,432, 6,964,828, and 7,078,128, their corresponding global equivalents, and all related license agreements.

"We are very pleased to deepen our successful technology collaboration with Umicore," says Christian Milker, global battery materials business manager, 3M Electronics Materials Solutions Division. "The agreement enables 3M to focus on its unique strengths in silicon anodes, while Umicore continues to develop and commercialize high energy NMC cathodes. In combination, these technologies may substantially increase electric vehicle battery life."

3M will continue to pioneer the development of innovative battery technologies with an increased focus on next-generation silicon anode materials, electrolyte additives and advanced thermal management solutions for electric vehicles, he added.

"Umicore has been a valuable partner in the commercial growth of NMC cathode technology, which 3M developed in partnership with Professor Jeff Dahn of Dalhousie University," Milker said.

GaN transistors enhance power system accuracy

Ottawa-based GaN Systems has experienced a surge in the number of customers designing and deploying power systems using the firm's GaN transistors. Recognizing that GaN devices improve power efficiency and power density, customers are using GaN transistors instead of legacy silicon components; gaining a competitive advantage as they enter the market with 50W to 50kW power systems that are up to 5-times smaller and 3-times lighter.

To support customers who are modeling new systems using SPICE simulations, GaN Systems has released individual computer models for each of their products, as well as a new application note, GN007.

Southwest Energy to deliver Lutze power supplies, Nader products in Canada

Southwest Energy Control Systems of Canada Ltd., Pickering ON, is now supplying Lutze brand automation components in Canada, including a full selection of DIN Rail power supplies and LOCC Box products.

"With a robust inventory on Canadian soil, delivery of Lutze components is now measured in days, not weeks. This is a huge benefit to our customers," says national sales manager, Bob Ashmore.

Founded in 1958 in Weinstadt Germany, Lutz builds technologically advanced and reliable industrial power supplies with 1, 2 and 3-phase units. Both Lutze lines, Compact and Delta series, provide DIN rail mountable power supplies suitable for a wide variety of different applications.

"We're especially excited to offer Lutze's compact power supplies" adds Philip Hughes, general manager of Southwest Energy, "Lutze's compact system is about 50% smaller than the standard, but offers more than 94% efficiency and operates at temperatures between -25C and +75C. This is game changing technical innovation for many critical applications."

Intelligent dc circuit control protection reduces down time

Lutze LOCC-Box provides reliable load monitoring and protection in 24Vdc control circuits. Innovative features include adjustable trip current range (1-10A), adjustable characteristics (fast, med, slow 1, slow 2 and slow 3), output alarm signal at 90% of the load setting, remote reset and remote on/off functions. In addition to factory floor applications, LOCC-Box serves very well in remote locations and other hard to access applications. Narrow construction ensures compact design even with multi-channel configurations.

"When factory uptime is important, Lutze LOCC-Box monitors and protects the control circuits to minimize manufacturing downtime and keep equipment running," Ashmore says. "With the real time output status indicators our customers are able to remotely and proactively monitor devices to ensure reliable operation on the plant floor. This results in a huge savings on service and maintenance costs while at the same time increasing operational reliability and plant safety."

Southwest Energy to deliver circuit breaker brand Nader

Southwest Energy has also reached an agreement that will bring Nader and its cost-saving circuit breakers to Canada. Nader is recognized around the world as a company providing exceptional quality and value in circuit breakers. Beating leading brand prices by as much as 30%, while still meeting or exceeding cULus standards for UL 489 and cURus standards for UL 1077 and offering current ratings of 1A to 63A.

"The reason Nader is one of the fastest growing terminal block brands in the world is that they've figured out how to produce high quality at a lower price - including on large scale projects," Ashmore says.

Based in Shanghai and established in 1999, Nader adds high quality to Chinese production efficiencies.

The firm has received ISO9001-2000 certificate since 2001 and now is one of the few companies that has a quality and environment protection system as ISO9001 plus ISO14000 and QC080000.



Power IC model library supports PSpice

AEI Systems version 4.2 Power IC Model Library for the Cadence PSpice simulator provides more than 600 high fidelity and correlated simulation models for power electronic designs. Product adds test sources for automotive applications covering ISO 76750/ISO 7637-2 and FMC1278 including CI220 (load dump), CI230A (power cycling), CI250 (voltage offset) and CI260A-E (voltage dropout). These sources are useful for testing transient disturbances and electromagnetic compatibility in automotive systems.

EMA DESIGN AUTOMATION

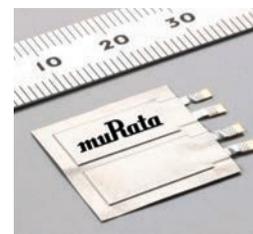
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Ultra-thin, high capacitance supercapacitors surmounts design challenges

DMH series of supercapacitors with a thickness of 0.4mm, a mF order capacitance, low ESR and the capability to output instantaneous power. Product line delivers a solution to devices with limited space that are challenged by power consumption issues since its slim package can be mounted in underutilized space. Device can enhance functionality and improve system operations when used in conjunction with limited power batteries.

MURATA

<http://ept.hotims.com/65986-43>



UL listed ac-dc converters support many apps

AME1-JZ, AME2-JZ and AME3-CJZ series ac-dc regulated converters are available in 1, 2 and 3 watt configurations. The 1 & 2 watt series are packaged in a miniature size of only 33.70(l) x 22.20(w) x 18.00(h) mm. The 3 watt measures 37 x 24.50 x 18mm. Devices provide input / output isolation of 3000Vac, over current protection, over voltage protection, short circuit protection and Energy Star compliance (no-load power consumption less than 0.3 watt).

AIMTEC

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VERIFY TEST EXPORT

With the Interpower® International Power Source



The Interpower International Power Source is an AC power source used to verify your product design and for product testing. The unit can be used on a bench top or is rack mountable.

Interpower has four models available which have an input of 100-240VAC/50-60Hz. The first two models are supplied with a NEMA 5-20 plug and have an output of 2200VA maximum with a Low Range variable of 10-138VAC at 16A RMS maximum and High Range variable of 10-276VAC at 8A RMS maximum, 47-450Hz. The second two models are supplied with a NEMA 5-15 plug and have an output of 1725VA maximum with a Low Range variable of 10-138VAC at 12.5A RMS maximum and High Range variable of 10-276VAC at 6.25A RMS maximum, 47-450Hz. For each output option we offer a model with a RS232 and USB port and a model with no communication ports.

The Interpower® International Power Source can also be ordered for international use with a country-specific input power plug. We offer a 1-week U.S. manufacturing lead-time on non-stock Interpower products and same day shipping on in-stock products. From 1 to 1,000 pieces or more, we have no minimum order requirements.

- Remote control operation ideal for automated test applications using optional IPS Interface Software
- Software available for use with models equipped with RS232/USB interfaces which are easily integrated into ATE systems
- Made in the U.S.A.
- Interpower carries a variety of North American and international power cords and cord sets
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<http://ept.hotims.com/65986-5>

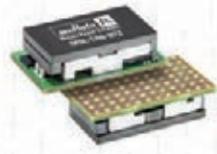


Digital PMBus compliant PoL converter delivers dynamic loop compensation

OKDL-T/60-W12 a 60Amp, 94.9% efficient, digitally controlled point of load (PoL) dc-dc converter is suitable for FPGA and processor applications. Power module is specified to operate over a V_{in} range of 4.5V to 14Vdc and provides a user adjustable output in the range of 0.6V to 1.8Vdc with an industry leading efficiency of 94.9%. The SMT/LGA module measures 25.1 x 14.1 x 7.0mm. The efficient, PMBus compliant PoL module is delivered with a default firmware configuration suitable for a wide range of applications and is fully configurable to meet specific application requirements.

MURATA POWER SOLUTIONS

<http://ept.hotims.com/65986-45>



Industrial dc-ac sine wave inverters use high frequency PWM technology

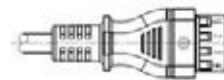
CSH-400-F6 series of heavy-duty, high input voltage dc-ac sine wave inverters use microprocessor controlled, high frequency PWM technology to deliver 400VA pure sine wave output voltage. Devices convert 600Vdc industrial input voltage (450V to 800V operating range) to an isolated sine wave output of 115Vac continuous at 60Hz or 400Hz, or 230Vac continuous at 50Hz. Unit's high frequency conversion enables high efficiency, compact construction of 210 x 64 x 365mm and low weight. Design topology allows for input voltages of up to 1200Vdc. Devices suit industrial applications that require clean sine wave ac-output voltage.

ABSOPULSE ELECTRONICS

<http://ept.hotims.com/65986-46>



Card edge power connectors speed interconnect



PC440 range of card edge power connectors over mold a 4 space receptacle with 5mm pitch distance between the spaces and using fork type for pcb. Edge mating terminals, in conformity to Molex 94529 or Mikroplax WB5004H, provide plastic receptacle material made of Nylon 66 UL94V2. Upon request, product can be ordered to have a ground wire that comes out from the body of the connector, which can be customized in length and termination. Product family accepts up to 5 conductor cables, 4 conductors in the edge connector and 1 as external ground. The terminals accept conductor sizes between .5mm to 1mm or AWG 18-20.

MEGA ELECTRONICS

<http://ept.hotims.com/65986-47>

100W GaN power amplifier designed for X-band radar

TGM2635-CP X-band GaN power amplifier operates from 7.9 to 11GHz and provides 100W of saturated output power with 22.5dB of large signal gain and greater than 35% power-added efficiency. Device comes in a 10-lead 19.05mm x 19.05mm bolt-down package with a pure Cu base for superior thermal management. Both RF ports are internally dc-blocked and matched to 50 ohms, allowing for simple system integration. Device is suitable for military and commercial X-band radar systems, satellite communications systems and data links applications.

QORVO

<http://ept.hotims.com/65986-48>



Dc-dc buck converter senses, supports telemetry voltage remotely

TPS546C23 high-density, 18V input, 35A synchronous dc-dc buck converter provides full differential remote-voltage sensing and PMBus to support telemetry. Device integrates high and low-side MOSFETs into a small-footprint package that is significantly denser than competitive devices. Designers can stack two converters in parallel to drive loads up to 70A for processors in space-constrained and power-dense applications.

TEXAS INSTRUMENTS

<http://ept.hotims.com/65986-49>



THINK™

HIGH PERFORMANCE BATTERY HOLDERS

- For AA, AAA, 1/2AA and CR123A cylindrical batteries
- Coil Spring and Polarized contacts assure low contact resistance and proper continuity for circuit protection
- Available in Thru Hole Mount (THM) or Surface Mount (SMT) configurations
- THM versions use nickel-plated stainless steel contacts
- SMT versions feature gold-plated stainless steel contacts
- Durable, rugged High Temperature Nylon housing
- Quick & easy battery installation/replacement
- Retains battery securely
- Optional Covers are available for additional retention, if required
- Ideal for low profile, space saving PCB applications
- Suitable for Industrial and Consumer product applications
- Request Catalog M65

IT'S WHAT'S ON THE INSIDE THAT COUNTS

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<http://ept.hotims.com/65986-6>

closing
the
gap

Introducing InfiniiVision 1000 X-Series Oscilloscopes from Keysight Technologies

Scrap the Toys. Get a Real Oscilloscope!

Available at Gap Wireless, the InfiniiVision 1000 X-Series oscilloscopes are engineered to give you quality, industry-proven technology at unbelievably low prices.

Key Features:

- 50 to 100 MHz
- See more signal detail with 50,000 wfms/sec update rate
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- Test quickly and easily with a simple, intuitive user interface and built-in help and training signals
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<http://ept.hotims.com/65986-7>

Automated Test Equipment

Chroma draws on over 30 years experience when supplying power conversion, battery, component and electrical safety test solutions to global industries. Chroma provides test engineers, technicians, and students with a wide range of programmable test instrumentation and automated test systems that support their efforts in bringing new technologies to market.

AC Power Sources



	Standard Low Power	Standard High Power	Advanced Low Power	Advanced High Power	Regen Grid Simulator
Model	61600	61611, 61612	61500	61511, 61512	61800
Power Rating	500VA - 4000VA	12kVA / 18kVA	500VA - 4000VA	12kVA / 18kVA	30kVA / 45kVA / 60kVA
Voltage Range	0-150V/0-300V/Auto	0-150V/0-300V/Auto	0-150V/0-300V/Auto	0-150V/0-300V/Auto	0-330V _{LN} / 0-571V _{LL}
Frequency	DC, 15Hz-1kHz	DC, 15Hz-1.5kHz	DC, 15Hz-1kHz	DC, 15Hz-1.5kHz	DC, 30Hz-100Hz
Remote Interface	GPIB, RS-232C	GPIB, RS-232, USB, Ethernet	GPIB, RS-232C (opt)	GPIB, RS-232, USB, Ethernet	GPIB, RS-232, USB, Ethernet
LIST, PULSE, STEP modes			✓	✓	✓
Programmable voltage and current limit	✓	✓	✓	✓	✓
Programmable slew rate setting	✓	✓	✓	✓	✓
Harmonic synthesizer (up to 50)			✓	✓	✓
Turn on/off phase angle control	✓	✓	✓	✓	✓
Comprehensive measurements, including current harmonics			✓	✓	✓
Analog programmable interfaces	✓	✓	Optional	✓	✓
Optional Graphic User Interface	✓	✓	✓	✓	✓

Electronic Loads



	Programmable AC/DC Load	NEW High Power DC Load	Standard DC Load	Advanced DC Load
Model	63800	63200A	6310A Modular	63600 Modular
Power Rating	1800W / 3600W / 4500W	3kW - 24kW, up to 480kW	100W, 200W, 250W, 300W, 600W	100W, 300W, 400W
Voltage Range	50V - 350Vrms	0-150V / 0-600V / 0-1200V	0 - 500V	0 - 600V
Current Range	up to 45Arms	up to 2000A	up to 240A	up to 80A per module
Dynamic Loading	45-440Hz	50kHz	20kHz	50kHz
Remote Interface	RS-232, GPIB	USB, GPIB, Ethernet	USB, GPIB, RS-232	USB, GPIB, Ethernet
Max Channels per Mainframe	1	1	8	10
Master/Slave Parallel Control	✓	✓		✓
Synchronize with Multiple Loads	✓	✓	✓	✓
Load Modes	CC, CR, CP	CC, CR, CV, CP, CZ	CC, CR, CV, CP	CC, CR, CV, CP, CZ
Programmable Slew Rate		✓	✓	✓
LED Array Simulation			✓	
Constant Impedance Mode	✓	✓		✓
V & I Digitizer		✓		✓
Analog Input		✓		✓
Optional Graphic User Interface	✓	✓	✓	✓

For Programmable DC Power, Power Meters, Hipots, LCR Meters, Wound Component Testers, Battery Testers and Automated Test Systems visit: chromausa.com



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Red Danish hospital-grade cord sets are customizable

Part number 86281160 red Danish hospital-grade cord sets are made in firm's Iowa, U.S.A. facilities, expanding the current line of customizable international products. Red is the preferred color for select medical facilities in Denmark for hospital-grade cord sets. Product consists of a Danish hospital-grade plug and a straight IEC 60320 C13 connector with H05VV-F 1.00mm² cable—all in red. Custom options include power cords, custom lengths, straight and angled IEC 60320 C13 and C19 connectors, all in a wide range of colors.

INTERPOWER

<http://ept.hotims.com/65986-50>



Single output switching power supply has low profile

LRS-150F series 150W Single Output Switching Power Supply is an enclosed type unit with 30mm of low profile design. Adopting the full range 85 thru 264Vac input, product series provides an output voltage line of 5V, 12V, 15V, 24V, 36V and 48V.

Delivering high efficiency up to 90%, unit's design of metallic mesh case enhances the heat dissipation, operating from -30°C thru +70°C under air convection without a fan.

MEAN WELL

<http://ept.hotims.com/65986-51>

1U MicroTCA Chassis delivers versatility in power

PXS0108 1U MicroTCA Chassis provides versatile power options for development or deployed MicroTCA applications. Unit delivers a mix-and-match approach for the MicroTCA Carrier Hub (MCH), power and payload modules. There are options for 1 or 2 MCHs, single or dual power supplies and multiple size variants of AMCs. The upgraded unit has full power module functionality including failover, remote management, power sequencing and more.

PIXUS TECHNOLOGIES

<http://ept.hotims.com/65986-52>



Low profile power supply requires less space on DIN rail

DRL ac-dc DIN rail mount power supplies delivers efficiencies of up to 90%, waste heat has been reduced, allowing the use of very narrow width package sizes ranging from 18mm for the 10W, to 72mm for the 100W model. Less space on the rail provides additional room for other components or the use of smaller enclosures. Unit provides an operating input range of 85 to 264Vac and can withstand 300Vac for 5 seconds.

TDK-LAMBDA

<http://ept.hotims.com/65986-53>



Programmable dc power sources simulate voltage variations

62000P series of programmable dc power sources allows devices to be verified under a wide range of voltage dropouts, spikes and other voltage variations. Due to their constant power operating envelope, product series is suitable for test applications requiring a wide range of high voltage/low current and low voltage/high current stimulus thereby reducing the number of supplies required.

Product includes built-in 16 bit readback capability for accurate input voltage and current readings. This means ATE systems no longer need complex shunt/multiplexers to make accurate pass/fail readings of the UUT's input parameters.

CHROMA ELECTRONICS

<http://ept.hotims.com/65986-54>



Universal input, multiple output ac-dc power supplies suit medical apps

MUI65 and MUI40 series of universal input ac-dc power supplies for use in medical applications provide dual and triple output. MUI40 single output devices boast 0.15-watt low standby power consumption, 85 to 264Vac, 47 to 63Hz voltage range and low leakage current under 75 microamps.

Available in a 2" x 3" package, unit is intended for applications up to 40 watts.

POLYTRON DEVICES

<http://ept.hotims.com/65986-55>



Low-power, noise dc converters are programmable



P series of micro-power dc to HV dc converters provide a programmable 0V to 1,200V or 0Vdc to 2,000Vdc output in a miniature, lightweight, PC-mount package. Positive and negative outputs are available. The output-voltage is linear to the programming voltage, from turn on to maximum output-voltage, enabling easy low-voltage control of the high voltage. A precision on-board voltage reference allows for simple configuration for full scale, fixed, or variable output. Voltage monitoring is provided at a 1000:1 ratio.

XP EMCO

<http://ept.hotims.com/65986-56>

Powering healthcare innovation

40/65/120/250/400W power supplies

Features

- Universal input 90-264Vac
- Active power-factor correction
- Up to 250W natural convection cooling
- 20°C to +70°C operating temp.
- Class B conducted EMC
- UL 60950-1; 60601-1 MOOP & MOPP, CCC: MVAC400 & 250

Series	Convection Cooling	Forced Air 250LFM	Input Voltage (Vac)	Output Voltage	Efficiency
MVAC400	250W	400W	90-264	12V 24V 50V	93%
MVAC250	170W	250W	90-264	12V 24V 50V	93%
MVAB120	75W	120W	90-264	12V 24V 28V 48V	91%
MVAD065	65W	65W	90-264	12V 24V 48V	90%
MVAD040	40W	40W	90-264	12V 24V 48V	89%

For more information visit <http://power.murata.com>



MVAC Series



250 or 400W

80 PLUS GOLD

3"x5"

MVAB Series



75W

2"x4"

MVAD Series



40 or 65W

muRata
INNOVATOR IN ELECTRONICS

<http://ept.hotims.com/65986-9>



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- Wall Adapters with Interchangeable Plug Option to 40W
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- DIN Rails to 960W
- Medical Approvals 4th Edition

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www.megaelectronics.com
sales@megaelectronics.com

<http://ept.hotims.com/65986-10>

High-reliability power supply supports marine environment

P/N 94088 shipboard ac-dc power supply, is a reconfiguration of firm's proven DCS1000D Series of COTS power solutions. Designated DCS1000D-8-(15, 33.3)- (15, 33.3), to identify its special ability to provide redundant 500 Watt outputs of 15Vdc @ 33.3 Amps, unit is both rugged and compact and can support the special requirements of military shipboard systems. Product meets the input power requirements of MIL-STD-1399, Section 300, Type II. Unit accepts 3-phase Delta 115Vac input from 360Hz to 440Hz and has protection from short circuit, over current, over voltage and over temperature.

BEHLMAN

<http://ept.hotims.com/65986-62>



10W DIP dc-dc converters come in 24 pin DIP package

MIW10 series of 10W isolated / regulated dc-dc converters come in small 24 pin DIP package measuring 1.25 x 0.80 x 0.40" where

space is critical. Product series consists of 21 models offering 9-18 / 18-36 / 36-75Vdc input ranges with single and dual output models ranging 3.3 - 15Vdc delivering 10 Watts of output power in the standard 24 pin DIP package. All models provide: Remote On/Off control, I/O isolation of 1500Vdc; high average efficiency up to 89%; operating temperature range of -40°C to +85°C (with derating); fully regulated outputs; no minimum load requirement; low no-load power consumption; shielded metal package; design-in EMI filter meets EN55022 Class A; and under-voltage / overload / short-circuit protection.

MINMAX

<http://ept.hotims.com/65986-63>

Programmable dc power system supports high-power applications

Sorensen HPX programmable dc power system for high-power applications is a highly configurable solution available from 36kW - 240kW+ power levels. The extensible platform boosts quality and reliable low-noise performance, fast and precise programmability with premium features at an affordable price, all in a convenient rack-mount cabinet. With advances in programmability, modularity and low-noise performance, unit provides two modes in one: automatic constant voltage and constant current mode crossover.

AMETEK PROGRAMMABLE POWER
<http://ept.hotims.com/65986-64>



Multiple output ac-dc power supplies serve medical designs

MUI65 dual and triple output and MUI40 single output universal input ac-dc power supplies, for use in medical applications, provide 0.15-watt low standby power consumption, 85 to 264Vac, 47 to 63Hz voltage range and low leakage current under 75 microamps. MUI65 for use in applications up to 65 watts delivers ultra low cross regulation under 1.5% and is delivered in a 2" x 3.5" package. Model MUI40 comes in a 2" x 3" package and is intended for applications up to 40 watts.

POLYTRON DEVICES

<http://ept.hotims.com/65986-65>

Power supplies boost efficiency in marine apps

PT570, PT571, PT576 and PT577 Marine Line power supplies complying with the major classifications and approved by Det Norske Veritas (DNV), Germanischer Lloyd (GL) and major marine approval organizations. Designed for demanding applications requiring peak power, products can deliver 50% extra peak current for 10 seconds and exhibits high efficiency, up to 92%. Units can be operated from -25°C to +70°C without derating in convection cooled conditions. Built for robustness the new products are suitable for use in harsh environments with high vibrations.

POWERBOX

<http://ept.hotims.com/65986-66>





TDA Series
35A Non-isolated SMT Point of Load with PMBus™

- ◆ Only 0.45 in² Board Space
- ◆ 8 to 14V Input
- ◆ 0.6 - 3.3V Output
- ◆ Digital Adaptive Control
- ◆ Configurable Sequence and Fault Management

<http://us.tdk-lambda.com/lp/products/tda-series.htm>



TDB Series
60A Non-isolated SMT Point of Load with PMBus™

- ◆ Only 1.0 in² Board Space
- ◆ 8 to 14V Input
- ◆ 0.6 - 2V Output
- ◆ Digital Adaptive Control
- ◆ Configurable Sequence and Fault Management

<http://us.tdk-lambda.com/lp/products/tdb-series.htm>



TDC Series
300-504W Isolated 1/4 Brick Converters

- ◆ Quarter Brick Footprint
- ◆ 48V Nominal Input
- ◆ 9.6 and 12V Output
- ◆ Up to 95% Operating Efficiency
- ◆ High True Usable Power

<http://us.tdk-lambda.com/lp/products/tdc-series.htm>



TDE Series
40A Non-isolated SMT Point of Load

- ◆ Only 0.69 in² Board Space
- ◆ 3.5 - 17V Input
- ◆ 0.7 - 5.5 Output
- ◆ No External Tuning Components Needed
- ◆ DOSA Compatible Footprint

<http://us.tdk-lambda.com/lp/products/dosa2-series.htm>



TDF Series
20A Non-isolated SMT Point of Load

- ◆ Only 0.36 in² Board Space
- ◆ 3.5 - 14V Input
- ◆ 0.7 - 5.5 Output
- ◆ No External Tuning Components Needed
- ◆ DOSA Compatible Footprint

<http://us.tdk-lambda.com/lp/products/dosa2-series.htm>

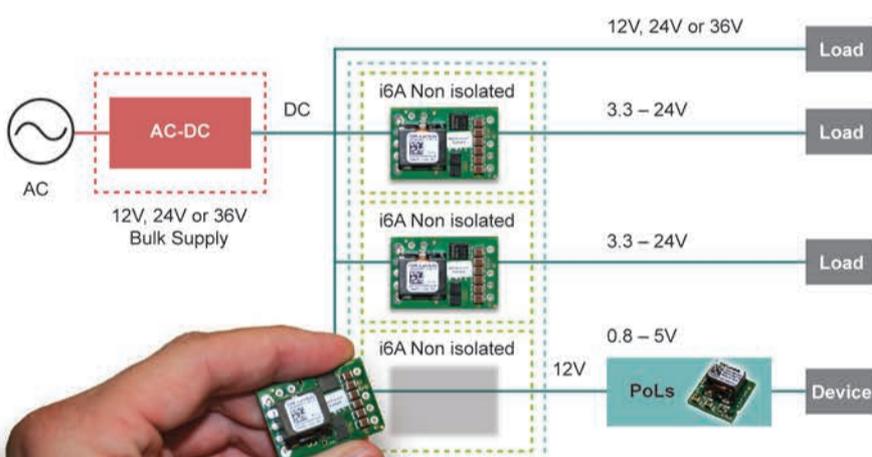


TDG Series
12A Non-isolated SMT Point of Load

- ◆ Only 0.23 in² Board Space
- ◆ 4.5 - 14V Input
- ◆ 0.7 - 8.5 Output
- ◆ No External Tuning Components Needed
- ◆ DOSA Compatible Footprint

<http://us.tdk-lambda.com/lp/products/dosa2-series.htm>

Create your own!



i6A SERIES - 250W, 3.3 to 24V 14A Output Non-Isolated Converters

The i6A is ideal for creating additional high power output voltages from a single output AC-DC supply. Rated at 250W, this 14A step-down converter can be adjusted across a 3.3V to 24V output, accepting a wide 9 to 40Vdc input.

- ◆ Only 1.2 in² Board Space
- ◆ 9 to 40V Input
- ◆ 3.3 to 24V Output
- ◆ Up to 98% Efficiency
- ◆ Minimal External Components Required

Packaged in the industry standard 1/16th brick footprint, with an ultra high efficiency of 98%, the i6A can operate in even the most demanding thermal environments.

Contact TDK-Lambda for an evaluation board or check our website for distribution inventory

<http://us.tdk-lambda.com/lp/products/i6A-series.htm>

For more information on how TDK-Lambda can help you power your unique applications, visit our web site at www.us.tdk-lambda.com/lp/ or call 1-800-LAMBDA-4



High-performance wideband optical spectrum analyzer speeds measurements

Model AQ6374 optical spectrum analyzer delivers faster measurements and a purging feature for general-purpose optical testing over 350-1750nm range. The powerful benchtop tool provides diffraction grating based monochromator technology delivering high-precision measurement performance and accuracy, an enhanced user interface and an air purging feature. Internal data storage of 512 Mbyte is included, and external data storage is supported via a USB interface. Ethernet RJ-45 and GP-IB interfaces are also incorporated. A built-in calibration source is provided for a full-automatic optical alignment and wavelength calibration, which takes just a few minutes.



YOKOGAWA

<http://ept.hotims.com/65986-67>

360W medical ac-dc power supply provides 4" x 6" footprint

Tumbler Technologies TWM360A series AC/DC switching power supply meets BF (Body Floating) rated output requirements, suitable for medical applications. Unit is capable of delivering 360W of continuous output power at 20CFM forced air or 250W at convection cooling. Form factor is an open frame pcb in a low profile 4" (L) by 6" (W) by 1.18" (H) package. Product series includes five single output models (12V, 24V, 28V, 48V, 54V), each with an earth leakage current measuring <math><100\mu\text{A}</math> @ 264Vac, 63Hz and 2-3% output regulation. Output voltage is factory preset specifically to meet the user's request.



TRUMPOWER

<http://ept.hotims.com/65986-68>

External power supplies have Class I or II inputs

DTM300-D external power supplies come with a choice of class I or class II (no ground connection) inputs and meets the stringent Level VI DoE standards for efficiency and off-load power. Products are certified to both the medical IEC 60601-1 and ITE IEC 60950-1 standards, making it suitable for a variety of power hungry applications. The convection-cooled devices are housed in



a rugged, vent-free enclosure, measuring 222mm x 112mm x 45mm (LxWxH). Ac is applied using the standard IEC 60320-C14 (3-prong) or 60320-C18 (2-prong) connector and dc provided through a ten-pin Molex Mini-Fit connector.

TDK-LAMBDA

<http://ept.hotims.com/65986-69>

Dc-dc converter series lowers isolation capacitance

AM2M-NZ 2 watt series dc-dc converters provides output voltages with 1500 or 3000Vdc input to output isolation tested over a 60 second cycle during manufacturing. Devices provide very low isolation capacitance and supports a wide variety of input voltages of 3.3, 5, 9, 12, 15 and 24Vdc convert to single and dual output voltages of 3.3, 5, 9, 12, 15 & 24Vdc. Devices operate within an ambient temperature range of -40°C to 85°C with no derating. The 1 watt models function at an ambient temperature range of -40°C to 105°C. Derating starts at 85°C and goes down to 80% at 105°C.

AIMTEC

<http://ept.hotims.com/65986-70>



Programmable ac power source includes dc output capability

AFV-P Series precision, programmable ac-dc power sources are compact rack-mounted units, available in four power levels - 600VA, 1250VA and 2500VA (2U) and 5000VA (5U). Units provide clean power with distortion less than 0.3% at 50/60Hz and deliver output voltage from 0 to 310Vac and frequency from 40 to 500Hz (15 to 1000Hz with the high-frequency option). Devices can also be programmed to provide dc power from 300W to 2500W at 0-210/0-420Vdc. Units deliver 300μs slew rate (for 0-90% change in output voltage) and can deliver up to 4.5 times peak current (crest factor) from its max rated current.

INTEPRO SYSTEMS

<http://ept.hotims.com/65986-71>



COMBITAC

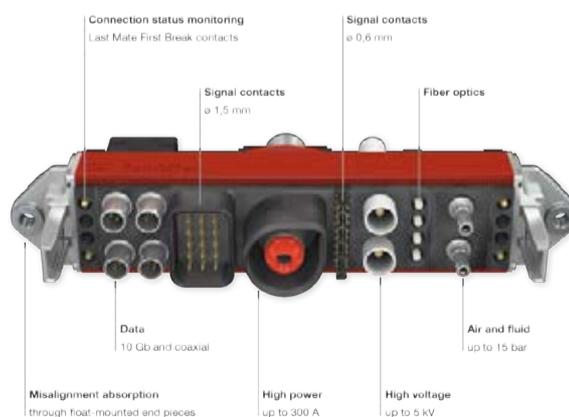
Modular Connector System

CombiTac modular connectors allow you to combine various contact types such as power, signal, data, thermocouple, coaxial, fiber optic, pneumatic and hydraulic connections in a compact frame or housing. Capable of withstanding significant shock and vibrational forces through the utilization of our proprietary MULTILAM contact bands, CombiTac connectors provide a consistent and stable connection, along with high mating cycle capabilities and modular design to fit your specific project's needs.

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Multi-Contact

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<http://ept.hotims.com/65986-12>



Circuit breaker protects SMPS from hiccup mode

Lutze Locc-box solid state circuit breaker isolates the over-current that can cause a SMPS to hiccup. Primary switching controllers and automatic power units nowadays form the basis of the 24Vdc supply level. Due to the operating behaviour of the devices, the specified selective protection of individual circuits especially in the case of an overcurrent, is virtually unfeasible. A complete system shutdown is inevitable. Selective load protection means that only the faulty current path is switched off with no effect on the SMPS.

SOUTHWEST ENERGY CONTROL SYSTEMS
<http://ept.hotims.com/65986-72>



Momentary, latching pushbuttons deliver capacitive sensor technology

Series of momentary and latching pushbutton switches provide capacitive touch sensor technology inside. Product family incorporates new features, including an elegant and modern look, delivering a high-quality aesthetic appearance. Besides a predefined standard offering, there are many visual and functional options available to choose from. Product's features allow designer to adapt the pushbutton, or the switch in general, to individual electrical and mechanical requirements.

SCHURTER

<http://ept.hotims.com/65986-78>



Switch firmware ramps up device security



Moxa Turbo Pack 3 firmware upgrade for industrial Ethernet switches provides enhancements for its security functionalities. Product is compliant with the IEC 62443-4-2 level 2 cybersecurity standard and also supports other security management features, such as MAC Address and RADIUS authentication to prevent from unauthorized access, known security leaks and unknown attacks. Firm's EDS-G500E and EDS-518E/528E DIN-rail switches support this product.

J-SQUARED TECHNOLOGIES
<http://ept.hotims.com/65986-73>

Rotary coded switch delivers wide operating temperature range

Elma C15 Rotary Coded Switch range is intended for cost sensitive applications where space is critical and is particularly suitable for frequency and channel selection in two way radios, portable appliances and instrumentation. The multifunction device provides enhanced switching feel with a body size of 7.7 x 9.35 x 11.1mm, operating lifetime of 15,000 switching cycles, operating temperature range from -30 to +60°C, 16 positions gray coding, shorting switching mode, up to 3.0Ncm switching torque, tray or tape and reel packaging and THT suitable for reflow soldering. Users can specify custom shaft dimensions and shape.

ELMA

<http://ept.hotims.com/65986-79>



Keystitches deliver noiseless operation

Silent and Silent RGB MX Keystitches come in red and black stem versions with integrated, patent-pending noise reduction feature and are available in multiple fastening configurations. Combined with optimal key-stroke feel and illumination, product provides a light linear feel and no pressure point. Gold Crosspoint contacts are self-cleaning, resistant to dust and dirt and they ensure the reliability of the keystitch. Devices provide a transparent case with a light scattering lens, optimized for even illumination.

CHERRY

<http://ept.hotims.com/65986-74>



Snap-action switches are accurate, repeatable



Honeywell Micro Switch BZ Series large snap-action switches provide precise operating characteristics, sensitive differential travel and enhanced life. Devices meet various international agency requirements. Some models have military qualifications. Configured options provide a wide variety of operating and interface characteristics.

ELECTRO-SONIC

<http://ept.hotims.com/65986-80>

Low-profile pushbutton supports handheld devices

MEC Switches Ultramec 6C low-profile pushbutton option for handheld devices is also suitable in applications that are limited in both space and height. Device provides a small dimension, including an 8x8mm footprint, maximum height of 2.5mm and standard J-bend terminals. Device is environmentally sealed up to IP67 and delivers a lifecycle of 3 million actuations. Product's specifically designed floating cap option provides a round, concave keycap for easy alignment of the pcb and front panel and comes in 5 color options.

APEM

<http://ept.hotims.com/65986-75>



Sealed pushbutton switches are long-lasting, reliable

PNP series sealed pushbutton switches are IP68 sealed to endure harsh environments and power wash down. Devices are available in multiple housing styles and provide an extended operating life of 1,000,000 cycles. Device combines rugged switch performance and 5A power capabilities inside a thermoplastic housing design. Device has longer solder leads for ease of wire installation and larger solder holes accommodating up to two 22 gauge wires.

C&K

<http://ept.hotims.com/65986-76>



Latching snap-action switch provides long life



VM3 Series latching snap-action switch is a long-life device with a latching option. These UL/CUL recognized devices are available the 0.187" or 0.250" termination. Available with operating force of 400gF, common applications for devices include industrial controls, lighting, security, gaming, automation and more.

Specifications and materials are dependent upon choice of switch.

CIT RELAY & SWITCH

<http://ept.hotims.com/65986-77>



Reduce Maintenance Costs And Save Space

Are you designing vehicles with limited space that require high current switching and tolerance to environmental factors? If so, standard solid state and mechanical relays are not the ideal solution. E-T-A's new EPR10 Electronic Power Relays are:

- **Compact:** 80% smaller package size than conventional solid state relays.
- **Robust:** Sealed circuitry (IP57 rated) protects the device from harmful environmental factors and reduces maintenance costs.
- **Cost effective:** Eliminate the need for heat sinks used in standard solid state relays.

Want to learn more?

www.e-t-a.ca/EPT_EPR10/



Micro rotary latch delivers strength, security in small package

R4 Rotary Latch series provides concealed latching and increased security without sacrificing strength or functionality, making it suitable for applications with significant space limitations. Device allows remote actuation rotary systems to be integrated into applications where space considerations are a major determining factor. Product is 60% smaller in size than firm's smallest rotary latch, allowing packaging space or protrusion into the application to be significantly decreased. With its symmetric design, device can be mounted on either side of an application for many design possibilities. Constructed of corrosion-resistant steel, these compact latches are available with cable or hand actuation, an integrated bumper feature that resists vibration, and single and two-stage latching.

SOUTHCO

<http://ept.hotims.com/65986-81>



Electronic circuit protectors deliver plug-in capability

ESX10-S plug-in electronic circuit protectors for overcurrent protection of 24Vdc applications provides quick and easy installation for groups of devices with several circuits on firm's power distribution systems Module 17 plus and SVS. With a width of 12.5mm, device provides selective protection for all 24Vdc load circuits. Product responds much faster to overload conditions than 24Vdc switch mode power supplies, commonly used in automation applications.

E-T-A CIRCUIT BREAKERS

<http://ept.hotims.com/65986-82>



High-intensity indicator delivers 180° visibility

Series 14 Indicator provides high-intensity, homogenous LED illumination with 180° all-around visibility in a compact, space-saving design. Devices provide safe and reliable status indication for use in a variety of applications such as machinery, industrial automation, robotics and specialty vehicles. With a minimal back panel depth of 9.5mm, a small

outer diameter of 33.5mm and a polyamide seal, units function reliably in confined spaces. Installation is made easy with connectivity through push-in-terminals (PIT).

EAO

<http://ept.hotims.com/65986-83>

Compact RF switches optimize transceiver performance

RF switches serve as easy drop in replacements for a wide range of existing RF products as well as for new designs. Used to route high frequency signals through transmission paths, devices come in different configurations, providing the flexibility to create matrices and automated test systems for many different applications. Typical switch options include: Single-pole-double-throw (SPDT or 1:2) switches that route signals from one input to two output paths. Multipoint or single-pole-multiple-throw (SPnT) switches that allow a single input to multiple (three or more) output paths. Double-pole-double-throw (DPDT) switches can be used to switch between two inputs and two outputs.

CEL

<http://ept.hotims.com/65986-84>



CPS



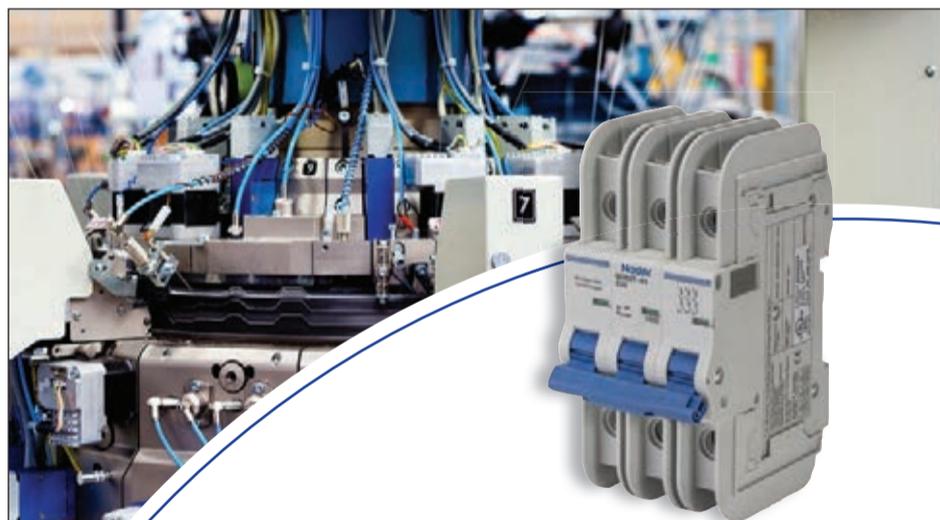
Metal pushbutton switch with capacitive touch sensor technology

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- momentary action (N.O. or N.C.), or latching action
- rated 100 mA, 42/60 VAC/VDC max., variable input voltage 5 – 28 VDC
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- operating temperature range -20°C - +60°C
- standard or customer specific legends

cps.schurter.com

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Building higher quality electronics through outsourcing North America or offshore?



When Nautilus LifeLine chose a name-brand, offshore vendor to build its first product, they were surprised by all the added hidden costs, long lead times and varying quality of the finished goods. For their newest product, Nautilus Marine Rescue GPS, they repatriated production with great success. Most companies go offshore believing that it is a cost-saving option to bring new products to market – but is it?

“Building a relationship with your electronics manufacturing services (EMS) partner is critical to effectively bring a product to market from concept to fulfillment,” according to Richard LaLau, president, Quadrant Electronics Inc (QEI). “But be careful when assessing your EMS culture, as it makes a big difference knowing how to properly manufacture an electronic product and how parts are bought and sold globally.”

In Nautilus LifeLine’s case, the firm’s first offshore manufacturing experience became more expensive due to unexpected issues relating to a lack of onsite management for their new product introduction according to LaLau. As a result, Nautilus chose QEI’s Original Device Manufacturer (ODM) services. “You can cost efficiently build a quality product in North America through better design and partnering with a local manufacturing partner,” says LaLau. “Together with Dorigo Systems, we were able to leverage their contract manufacturing services, coupled with our design, to seamlessly fit into the manufacturing process, obtaining 99.4% first pass yields for Nautilus.”

Outsourcing is an efficient approach

Outsourcing design and manufacturing is a cost and resource efficient approach to product development. In fact, Dorigo Systems is one of the Pacific Northwest’s leading contract manufacturers of printed circuit board assemblies (PCBA) and the preferred choice for QEI. According to LaLau, “Dorigo interprets and rapidly prototypes our designs to the highest level of quality – by closely coupling design and manufacturing we can quickly resolve product quality and production efficiency problems – this successful combination enabled Nautilus LifeLine to introduce a new product that has already sold out its first build and is being reordered.”

In the world of high technology, being first to market with a new product can mean the difference

Top 5 criteria when choosing a design and manufacturing partner

1. Fit and style
2. Capability and track record
3. Product life cycle process
4. Stability
5. Cost

High power terminal blocks serve electrical distribution panels

HP Series High Power Terminal Blocks are rated 175 Amp and 600 Volt suitable for high power distribution in electrical panels, to transition larger wire gauge, high power mains to smaller gauge lower power branch circuits. Product series can also be used for lighter power applications and therefore has extended utility as a ‘one size fits all’ device. Product provides an optional integrated cover, optional clear plastic covers and a wide variety of terminations.

BLOCKMASTER ELECTRONICS

<http://ept.hotims.com/65986-86>



between success or failure. Turning your vision into a reality requires engineers to quickly design the next generation of electronic devices. “At Dorigo, we offer precision quick turn electronic manufacturing services for a variety of printed circuit board assemblies (PCBA’s) that ensure prototypes are built right the first time and are cost-efficient to manufacture,” says Paul Vasvary, business development manager, Dorigo Systems. “We deliver the turnaround times that our customers need, whether it’s a complex prototype device utilizing the most sophisticated new SMT packages or a production build of a PCA with 4,000+ components.”

Marine Rescue GPS for Nautilus

Starting with a list of requirements, QEI designed and manufactured the Marine Rescue GPS for Nautilus. This 425-foot (130-metre) depth rated, emergency use, Marine VHF beacon with Digital Selective Calling (DSC) and Automatic Identification System (AIS) marine protocols is designed specifically for divers. The Marine Rescue GPS has user replaceable batteries, an ON/OFF battery disconnect, and a smart phone user configuration with apps on Google Play and iTunes.

QEI developed the design concept, mechanical components, electronics, test systems, wrote product firmware and completed all protocol verification testing. QEI sources all components globally and Dorigo Systems provides world-class SMT placement services with automated optical inspection. QEI then electrically tests and programs the PCBA, assembles the finished unit and ships in master cartons to Nautilus.

Is offshore manufacturing always the best option?

If you want to manufacture between 1,000 and 100,000 units per year, offshore manufacturing isn’t always practical states LaLau.

Consider the following:

- Offshore manufacturers often require a 100% deposit to buy, source, build and ship finished goods
- Shipping finished goods by sea or air is costly and logistically challenging
- Small runs offshore can have variable quality
- Offshore vendors are often set up for large runs only
- New product introduction often requires onsite representation (at offshore factory) with the manufacturer to ensure manufacturing and quality integrity
- Testing new products offshore without a proven test system can miss potential problems.

In fact, in LaLau’s opinion, few offshore manufacturers offer the longevity, stability, capability and quality that Dorigo Systems provides to QEI. “It’s the key rea-

son we chose Dorigo Systems as our EMS partner and together we have become the electronic product manufacturing culture for our customers,” says LaLau. “It’s possible to efficiently manufacture in North America – our success with Nautilus proves it.”

For more information on outsourcing from Dorigo Systems Ltd., go to <http://ept.hotims.com/65986-85>

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Kindred AI's first deliverables

Robots to modernize our e-commerce warehouses



By Sohail Kamal,
West Coast Correspondent

As remarkable as humans are, we are limited. We have overcome many physical limitations through the use of machines. We can drill through mountains and fly over them. Our large scale factories increase productivity, however, we as humans still experience limited short term memory, unreliable long-term memory and our sensory experience and comprehension are perhaps only a small portion of what could be possible.

Vancouver-based OEM Kindred Systems Inc. has a goal for its robots to be able to perform tasks beyond their current scope, improving efficiency in e-commerce warehouses and autonomously organizing

items and parts. But that is just the tip of the iceberg. If Kindred succeeds, we can look forward to having robots infer goals, automate behaviour and come up with novel solutions without the inconvenience of human support or human limitations.

I recently had the opportunity to speak with Kindred's founder and chief science officer Suzanne Gildert, as well as Kindred's CEO Geordie Rose, about how their experiences at quantum computing company D-Wave Systems Inc. led to Kindred, what Kindred's first product application will be and what their 1000 year goals are.

Q: How did you [Gildert and Rose] get started at Kindred?

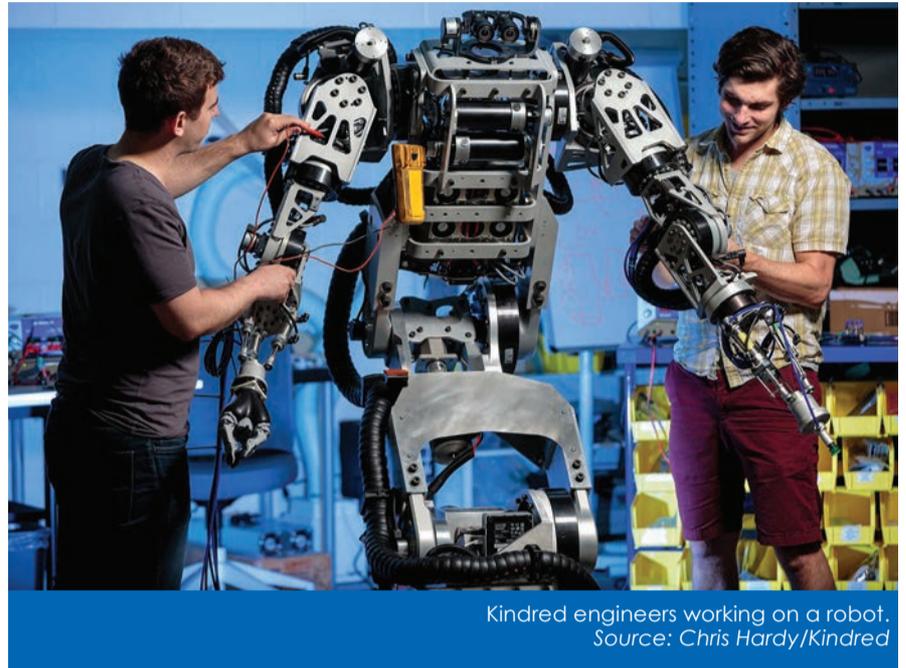
"I'm the founder and chief science officer of Kindred. We started Kindred in March 2014, and the mission of the organization is to develop human like intelligence in machines," says Gildert. While Suzanne was mulling over technology as a staff member of D-Wave, she recognized that Geordie Rose had a lot of experience



Suzanne Gildert,
founder and chief
science officer,
Kindred.



Geordie Rose,
CEO, Kindred.



Kindred engineers working on a robot.
Source: Chris Hardy/Kindred

on both the business and technical side which prompted her to approach Geordie to join her at Kindred.

Q: How does D-Wave tie into Kindred, or does it tie in?

"That's a good question, looking at it from the outside, they look very different. But there are many similarities between D-Wave and Kindred. Both are trying to tackle difficult problems that have really open research questions, and if they are successful, they will change the world in radical ways," explains Gildert. "So on one hand there's quantum computing, which can create a new computing resource that we've never had access to before. On the other hand, creating human level AI will fundamentally change our society, and everything that we think about that falls under the umbrella of intelligence today."

Q: Geordie, what drew you to joining Kindred's quest?

"I completed my PhD in Theoretical physics in 1999. I founded D-Wave and worked there for 15 years. I had the chance to work with many talented people, and Suzanne was right at the top of the list. She came to me with an idea about how to approach and understand minds, and intellectual properties of the mind. It was enthralling to me," says Rose. "So when she asked me to leave D-Wave and join Kindred as CEO, it was clear that this was something that I wanted to do. Trying to solve this problem is a grand challenge of the sort that you don't find very often."

The implications of success will be dramatic. Kindred have grown to 40 staff, they are about to launch a product, and they continue to deconstruct and understand the human mind in order to effectively provide those sorts of capabilities to machines.

Q: Kindred will change our lives starting with how we run our warehouses. What is this going to look like?

"There are a myriad of places where humans still work in warehouses, there are still tasks within these centres that have not been automated for a variety

of reasons. The types of tasks that we are targeting with our technology are ones that are not easy or possible to automate using conventional approaches to robotics," says Rose. Modern distribution centres for e-commerce are complex, with rows of shelves with hundreds of thousands of different products. Kindred's ground-breaking approach is based on the belief that humans and robots will be working together one day, and that both species will guide each other as they learn and interact with each other, and in doing so, tasks which are outside the capability of conventional control become quite easy.

Rose explains: "The first areas in which Kindred's robots have made significant progress is in the detection of objects. Think of a sock and a t-shirt of the same colour, which is not so easy for a machine to differentiate, especially with different lighting conditions. The second area is the ability to manipulate and grasp delicate objects, and in a way so that the barcode can be scanned."

Q: What are your overarching goals, what drives Kindred?

"It is real fundamental change that we are interested in with Kindred. What we are looking for is something that will be remembered in a thousand years. In a thousand years, will the things that we are doing now be remembered and stories be told about them? We want the answer to be yes," says Rose. If Kindred can succeed at their core mission, the result will be transformative to human history. Kindred wants to focus on these long term objectives.

Q: How will robots and humans work together in the future?

"The robots of the future will be much more human like. Robots will be learning from humans and humans will be learning from robots. Not only will [robots] be good at planning— but they will be able to learn and change strategies," explains Gildert. "The workforce of the future [will benefit from this] symbiosis of humans and robots doing the same types of jobs alongside one another rather than there

..... □
continued on page 17

Schleuniger



EcoStrip 9380

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The EcoStrip 9380 offers the most complete feature set at an economical price point. This flexible machine can be configured with rollers or belt feeding until capable of short mode processing and is easily operated via the 5.7" color touchscreen and underlying Schleuniger S.ON software. Turn the EcoStrip 9380 into a fully automatic processing line with a wide range of accessories for prefeeding, marking, stacking, coiling and tying.

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"The displays and software are similar from machine to machine. This makes integrating a new piece of equipment into production a smooth transition." **JR Palumbo, Owner, Royce Electronic Sales**

To Be Precise.

Online tool supports design of heavy-duty connector cable harnesses

HDC Cable Configurator is an online tool created to simplify the task of designing and building custom cable harness and mating assemblies for firm's Rockstar brand of heavy-duty connectors. The design-to-order tool simplifies the design and assembly of the end-to-end HDC connection, as well as saving time and reducing errors. Using this tool, a single part number is assigned to the completed cable harness and a single part number is created for each mating assembly required for a user's application. No more than three part numbers are needed for a complete and protected pluggable connection for use between panels, machinery, equipment and more.



WEIDMULLER

<http://ept.hotims.com/65986-91>

Sensor actor connector junction system distributes, combines signals

Y-splitter line of sensor actor connector junction systems distributes or combines signals in a small space. Helps reduce costs of wiring and avoids connection faults due to the pre-assembly. For this purpose, the appropriate known circuits are available. (Custom circuits upon request). A central mounting hole for M3 screws ensures secure attachment in the field. The IP67 protected device operates within a temperature range of -20°C - +85°C.



CONEC

<http://ept.hotims.com/65986-94>

Cable widths up to M25 mate with firm's connectors

Firm has expanded the choice of cables that customers can use in its Han 3A size connectors, including cable diameters as large as M25 instead of the previous limit of M20. This increase allows the connectors to be configured with any contact insert in the series, including those with higher rated current and bigger cross sections – such as the Han Q series. The hoods also meet the requirements of protection classes IP 65/67.

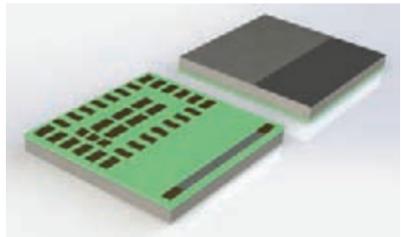


HARTING

<http://ept.hotims.com/65986-95>

Miniaturized WSM device equipped with antenna

WSM-BL241-ADA-008 Nordic-based WSM device provides BLE connectivity and consists of Nordic Semiconductor's nRF52832 IC, a 32 MHz crystal for timing. Device contains two pins for an off-board omni-directional antenna and a NFC antenna. Module provides a Serial



Port Interface (SPI) and UART interface to Nordic's nRF52832 M4 Cortex processor. Device provides BLE connectivity between tablets, cell phones, cloud services, and other proprietary functions.

MURATA

<http://ept.hotims.com/65986-92>

Kindred

continued from page 16

being this artificial divide between them. I really do see robots as being another species living alongside humans, helping us develop as a civilization."

Q: Any tips and trends to share with EP&T's readership?

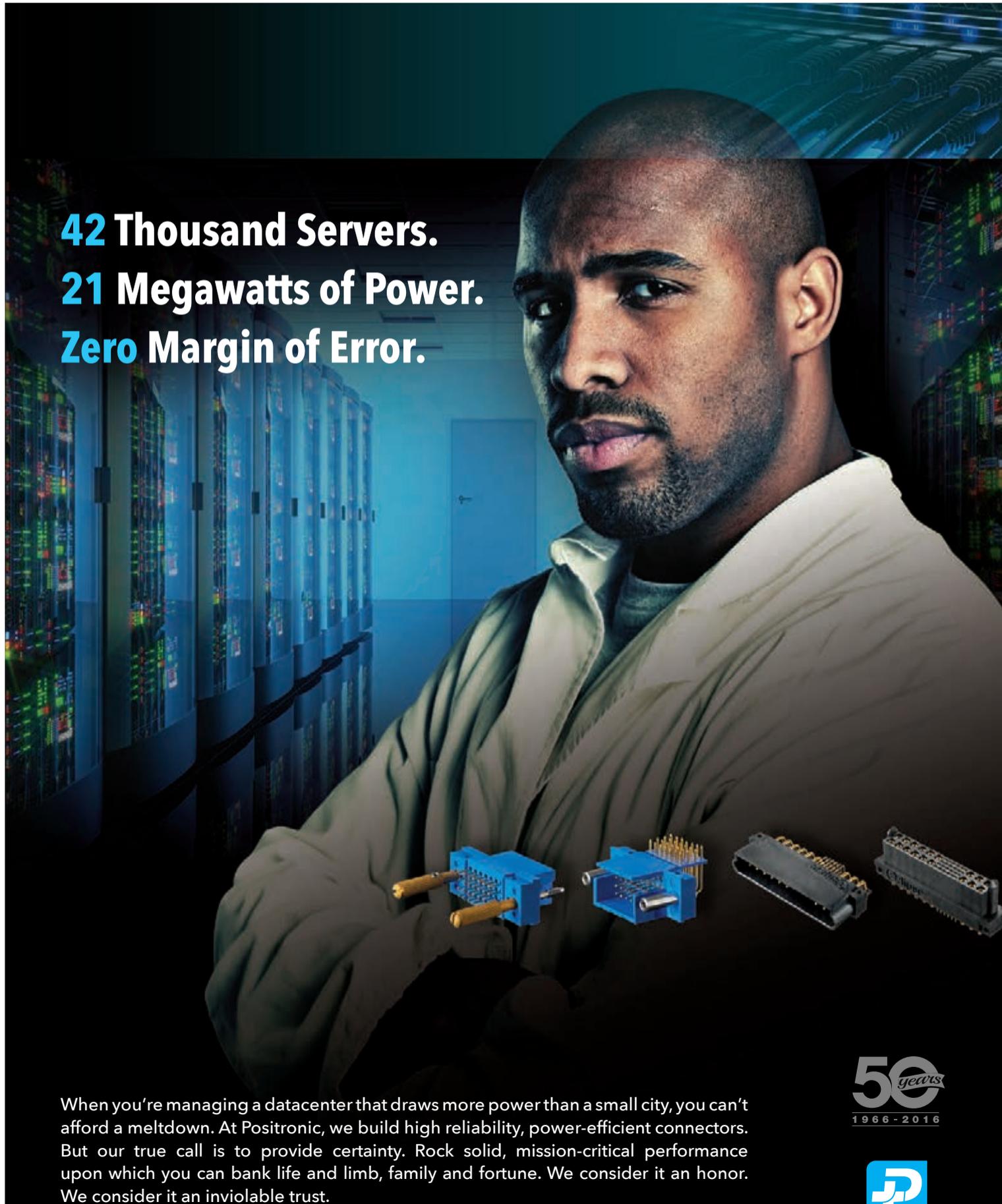
Gildert: "Over the last decade or so, there has been a lot of investment and a lot of hype around software and in the virtual world, but I think robotics and hardware are on the rise. I think that is something your readership would be interested in. Physical robots and physical hardware systems, we are going to see a lot more of that type of tech, and a lot more investment on the hardware side of things. Less fear of investing in hardware based companies as opposed to just pure software companies."

Geordie: "That's absolutely correct. Our position on the whole AI front is that intelligence and other properties of minds can only emerge when embodied in robots. That is one of our core hypotheses upon which our entire effort is built. Investment in hardware is going to be on the rise because — it is a vital part of this whole process."

What an exciting future in store for us."

For more information on the future of robotics and AI from Kindred, go to <http://ept.hotims.com/65986-93>

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Robotics Sensing: Why now?

By Dr Harry Zervos, principal analyst, IDTechEx

Innovation in robotics is moving ahead at a fast pace, spearheading the expected proliferation of robots in new and existing applications. Deploying sensors in robotics allows for the creation of robots that can 'see' and 'feel', in a biomimetic way, like humans do.

These sensor enabled, advanced robots are now able to undertake more complicated tasks and are being deployed into industrial, commercial, domestic, logistic and other sectors where robot penetration was previously limited.

The market for robotic vision and force sensing alone is expected to reach over \$16.1 billion by 2027, according to an IDTechEx report. The graph at right is a

plot of the forecasted short term growth of the value of vision systems deployed in industrial and collaborative robots, which represent only a segment of robotic systems impacted by the development of sensing platforms with extensive capabilities.

But, why are we experiencing such fast adoption at this point in time?

Software advances hand in hand with hardware innovation

Early robots were limited in performing tasks under highly organized conditions, with increased safety measures, due to their limited perception of any changes in their operational environments. Applying

Artificial Intelligence (AI) concepts in robotics, allows for reducing these limitations. Performance optimization through robotic sensing is allowing for decision making capabilities of new generations of robots based on processing of sensor data (such as visual, tactile etc.) gathered from their operational environment.

Data-driven task performance is allowing for higher precision even under conditions of increased randomness. In essence, robots with increased awareness are becoming better at performing the actions they are tasked with and capable of performing additional actions, previously thought of as too complex

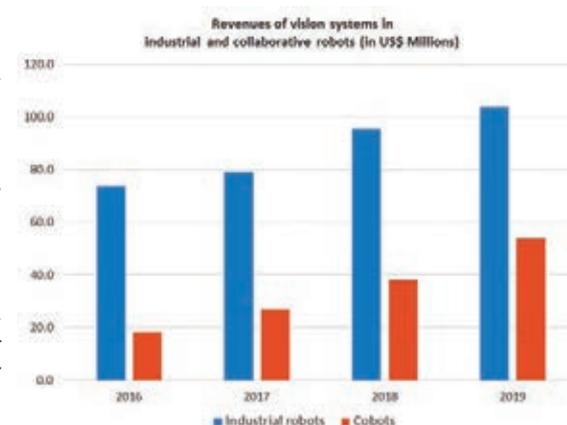


Fig 1. Revenues of vision systems in industrial and collaborative robots. Source: IDTechEx Report - Sensors for Robotics: Technologies, Markets and Forecasts 2017-2027.

for robotic systems. These improvements are enabling robot deployment in more demanding application spaces, a key explanation for the expected accelerated proliferation of sensor driven robotic systems.

Key enablers of this robotic revolution can be found in both software and hardware development efforts that have allowed for the creation of advanced sensors

Key enablers of this robotic revolution can be found in both software and hardware development efforts that have allowed for the creation of advanced sensor platforms and processing algorithms, along with intuitive, user friendly interfaces.

Henrik Christensen, executive director of the Institute for Robotics and Intelligent Machines at Georgia Institute of Technology in Atlanta, sees tremendous potential for robots coupled with such capabilities, especially as prices are coming down. He said back in 2015: "We're getting much cheaper sensors than we had before. It's coming out of cheap cameras for cell phones, where today you can buy a camera for a cell phone for \$8 to \$10. And we have enough computer power in our cell phones to be able to process it. The same thing is happening with laser ranging sensors. Ten years ago, a modest quality laser range sensor would be \$10,000 or more. Now they're \$2,000."

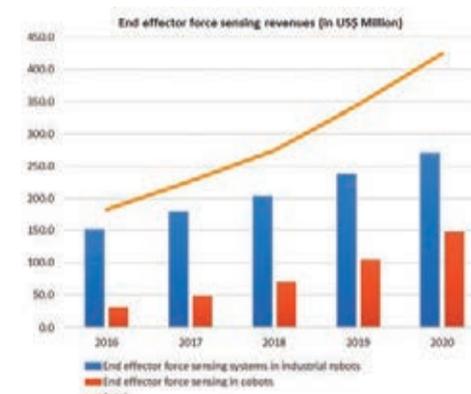


Fig 2. End effector force sensing revenues in industrial and collaborative robots Source: IDTechEx Report - Sensors for Robotics: Technologies, Markets and Forecasts 2017-2027.

All in all, machine vision and force sensing enable the design of more versatile, safer robots for a wider range of applications. Of course, different sensing systems fit different application spaces, hence, the variety of robots under development each have specific requirements and sensor platforms with the right type of features.

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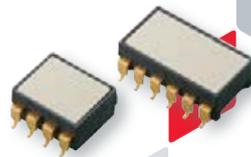
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C16, C18 snap-in inlets made in USA



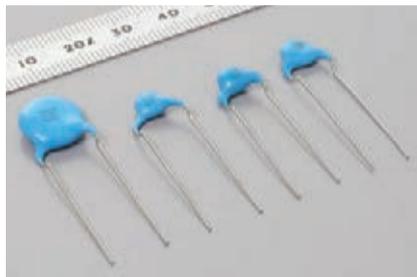
Firm is now manufacturing its own IEC 60320 C16 and C18 snap-in inlets at its facility in Iowa USA. Devices are rated 10A/250Vac international and 15A/250Vac North American. Devices can be used in applications that require an IEC 60320 C16 inlet to connect to a C15 connector or a C18 inlet to connect to a C17 connector. C16 units suit 1.0mm and 1.5mm thick panels and have QD and solder tab options. RoHS compliant devices are rated for 'hot' conditions (up to 120°C/248°F) and carry VDE and cURus approvals. C18 units suit 1.0mm and 1.5mm thick panels have QD and solder tab options and are rated up to 70°C/158°F.

INTERPOWER

<http://ept.hotims.com/65986-96>

Capacitor line boosts reliability in a small footprint

DE series of safety standard certified ceramic capacitors includes the X1/Y1 class, including the AC400V and AC500V rated products with high impulse tolerance making them suitable for use in large-scale equipment where high reliability is needed. Product



family also includes devices with AC250V and AC300V ratings and are smaller in size than competitive solutions, making them well-suited for smaller applications. Devices eliminate noise that originates in commercial ac power lines.

MURATA

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OCXO oscillator delivers best-in-class temperatures

NH20M20LB and NH37M28LK High-Precision Oscillators raise the bar for frequency accuracy in base stations for mobile communications systems, high-end routers, test and measurement equipment and other synthesizer applications. The NH25M22TA is available for SMT applications. The NH37M28LK and NH20M20LB each have through-hole PC mounting pins. The use of proprietary DSP technology for precise temperature control improves frequency stability over a -40 to +85C operating range, with low phase noise.

NDK

<http://ept.hotims.com/65986-98>

Wallmount enclosures have NEMA compliant 3-Point latching

24", 30" and 36" high stainless steel wallmount enclosures with a 3-point latching system improves resistance to harsh environments where high humidity, saltwater, moisture and other corrosive materials are present. Units meet UL Type 4X protection ratings, while latching system is paired with a foamed-in place gasket and knife-edge flange trough collar to create a tighter door seal to resist contamination.



RITTAL

<http://ept.hotims.com/65986-99>

Sawing, polishing units boost precision on crimp cross sectional analysis



SawPolish Units combine sawing and polishing processes in one device. The polishing disc is in line with the saw blade so the sample can be cut and polished in one motion. Test samples can be prepared in one step without having to remove the sample holder and processing time is minimized.

Product family is comprised

of three machine versions: SawPolish Unit 6, SawPolish Unit 60 and SawPolish Unit 6 Comfort. The SawPolish Unit 6 and Comfort can process crimp terminations with a maximum terminal height of 9 mm (0.35"). The SawPolish Unit 60 can accommodate terminals with a height of up to 25 mm (0.98").

SCHLEUNIGER

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Energy harvesting for a greener environment

By Advanced Linear Devices Inc.

Introduction

Energy Harvesting (EH) is the process of electronically capturing and accumulating energy from a variety of energy sources deemed wasted or otherwise said to be unusable for any practical purpose.

Energy harvesting, or energy scavenging as the process is sometimes referred to, is associated with capturing residual energy as a by-product of a natural environmental phenomenon or industrial process and is therefore considered free-energy.

More often than not, these residual energies are released into the environment as wasted potential energy sources. Examples of common target energy harvesting sources include mechanical energy resulting from vibration, stress and strain, thermal energy from furnaces, combustion engines and other heating sources, even biological, solar energy from all forms of light sources, ranging from lighting, light emissions and the sun, electromagnetic energy that are captured via inductors, coils and transformers; wind and fluid energy resulting from air and liquid flow, chemical energy from naturally recurring or biological processes and huge amounts of RF energy in the environment because of ubiquitous radio transmitters and television broadcasting.

A variety of well known devices, materials and sensors are typically used to convert wasted energy sources and sunlight into electrical voltages and currents, which can then be harvested, stored and conditioned for many low voltage wearable electronics and wireless sensor applications that heretofore required ac power supplies or batteries.

Examples of energy generators include materials such as, piezoelectric (PZT) crys-

tals or fiber composites, solar photovoltaic cells, thermoelectric generators (TEGs), and electromagnetic inductor coils to name a few. These materials generate a wide range of output voltage and currents – none however can be utilized directly as power sources for driving low-energy electronics without energy harvesting electronics designed to manage the available power and communicate handshake instructions to compatible wireless sensor systems.

In most cases, these sources provide energy as spurious, random and otherwise irregular energy spikes or very low level amounts to allow adequate energy capture and technologies did not exist to capture this energy with great efficiency. With recent developments however in MOSFET 'zero-threshold' transistor designs, energy harvesting electronics have catapulted to new heights enabling energy capture, storage (in a capacitor, super capacitor or battery) and management with more than 95% retention efficiency.

Classic energy harvesting electronics

The classic (high-efficiency) energy harvester system consists of an energy

generator, capture, storage, management electronics and load designed to be powered by the harvester, typically a wireless sensor network. In the block diagram below, a piezoelectric crystal membrane is shown as the energy generator. The piezoelectric generator transforms mechanical vibrations, strain or stress into electrical voltage/current.

This mechanical strain can come from many different sources including human motion, bridge or other low-frequency seismic vibrations, aircraft or vessel vibrations and acoustic noise are everyday examples. Except in rare instances the piezoelectric effect operates in alternating current requiring time-varying inputs at mechanical resonance to be considered the most efficient energy generator.

Most piezoelectric sources produce very high voltages but extremely small currents resulting in available power on the order of milliwatts – too small for most system applications, but an ideal generating source for energy harvesting electronics.

Ac Energy from the PZT is input to the detector which converts the voltage to dc and initiates the capture and storage operation. The detector can accept instantaneous input voltages ranging from 0.0V

to +/-500Vac and input currents from 200nA to 400mA in either a steady stream of pulses or intermittent and irregular manner with varying source impedances.

Early harvester electronics

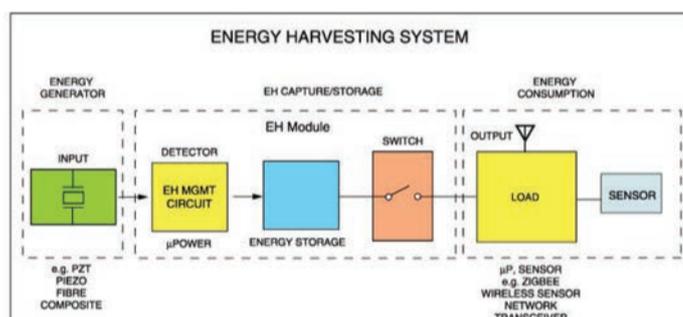
required a minimum of 4V input to capture and store the energy from PZT and other generators. More recent designs feature a front-end voltage booster and claim to initiate capture and energy storage with voltage inputs as low as 100mV.

Designing energy harvesting electronics

As the energy generating source injects energy into the detector electronics, these electrical charge impulses are collected, accumulated and stored onto an internal storage capacitor, super capacitor or battery. The capture mechanism is set to operate between two supply voltage thresholds, +V_{low} dc and +V_{high} dc, corresponding to the minimum (VL) and maximum (VH) supply voltage values for the intended 'load' application. When (VH) is achieved, further charging is terminated and the output can be switched 'on-demand' to power the load.

As the output diminishes and falls to (VL) the charging cycle begins again until it reaches (VH). Typical charge/cycle times are within four minutes at an average input current of 10mA and within 40 minutes at an average input current of just 1.0mA. For optimum performance and long energy retention times, designing energy harvesting electronics must incorporate micro-power devices so that the energy consumed by the harvesting electronics is much smaller than the energy input by the generating source.

The net captured energy is a direct function of energy available for capture minus the energy the EH circuit must consume to stay in the active mode. The following graph provided courtesy of Advanced Linear Devices Inc., depicts the EH300 Energy Harvesting Module current consumption in nA over time.

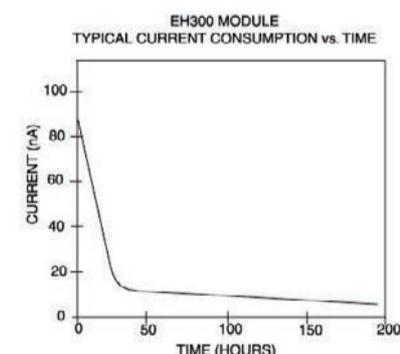


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Energy efficiency, retention and management

Proper management for capturing, accumulating and storing small electrical energy charges requires high energy efficiency harvesting electronics. Harvester efficiency is defined as the net captured energy as a direct function of energy available for capture, minus the energy that the harvester electronics consume to stay in the active mode. Note that the harvester circuit must stay in the active mode and be ready to perform the energy capture function whenever harvestable energy becomes available and be ready to power the application load on-demand.

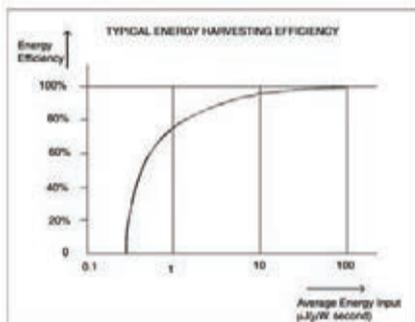
As an application example, let's say

continued on page 21

the charging energy for the harvester is derived from mechanical vibrations caused by an automobile(s) crossing a bridge whose surface has been outfitted with embedded piezoelectric crystal materials. The object of the application is to monitor roadbed displacement during certain traffic hours or at other times when such scientific monitoring would yield significant data for this specific purpose. The piezoelectric strip(s) are connected to the energy harvester electronics which in-turn is designed to power a wireless transmitter whose input is a series of displacement transducers, also embedded in the roadway surface.

If the harvester efficiency was typically low, the intermittent energy charges created by passing automobiles would have to charge the harvester almost continually while in the active mode in order to achieve the proper output power to drive the load. With a well designed harvester having greater than 90% efficiency however, the energy consumed by the harvester electronics would be much smaller than the random energy generated by the mechanical vibrations and captured for storage thus allowing for adequate powering of the transmitter even at times of lighter automotive traffic.

The graph below typically depicts the percent energy efficiency vs. available active energy input in terms of μJ (μW seconds) that one can expect from a harvester designed with micro-power, zero-threshold MOSFET arrays.



Energy retention

A second key component of energy management, also efficiency related, is High Energy Retention designed to store the captured energy for as long as possible with minimal leakage or loss. In the example of the bridge monitoring application discussed above, when automobile traffic and vibration is minimized, there may be extended time intervals before sufficient energy has been captured and stored by the harvester electronics to trigger a transducer data transmission.

Therefore, the harvester electronic design must possess extremely high energy retention for this type of monitoring, as well as other similar wireless applications where the energy generator function is randomly available or interrupted for long periods of time. Using alternative energy generators such as solar or thermoelectric generators may also be considered to improve available harvested energy when more frequent data collection is required.

Management

Energy conditioning is a third key component of energy management and refers to critical monitoring of the harvester minimum (VL) and maximum (VH) output supply voltage since the input energy is usually random and uncontrolled. To conserve power consumption, nanopower comparator circuits are typically employed to monitor and control the input capture and energy storage min/max limits. System ready and other hand-shake commands are also generated in concert with requirements of the wireless sensor network.

For more information on Energy Harvesting in electronic designs from Advanced Linear Devices Inc, go to <http://ept.hotims.com/65986-87>

Aurora Solar Technologies Inc.

BC OEM helps solar cell producers improve manufacturing yield

A BC-based tech company has created a control systems device that stands to save the global solar industry millions in production costs.

Aurora Solar Technologies Inc. of North Vancouver BC produces a family of measurement and control solutions that allows solar cell producers to improve manufacturing yield, lower costs, decrease waste and attain higher margins. The firm was founded in 2008 by CEO Michael Heaven, P.Eng., MBA, along with a team of experienced leaders in process measurement, semiconductor manufacturing and industrial automation.

The technology behind Aurora Solar's inline measurement, visualization and control systems is built on a quality control system for solar cell manufacturing. In process terms, this involves non-contacting mapping of wafer performance to optimize the diffusion process while using an ultra-high line speed measurement system, Decima. The company has lately introduced an enhanced version of its Decima inline measurement system.

Bifacial solar cells have an open

and active backside which enables collection of reflected light available from the earth, rooftops, etc. generating up to 25% more energy than traditional cells. Aurora's system, called 'Decima Gemini', consists of a specialized pair of Decima CD measurement heads. With this novel system, the sheet resistance of the wafers' back-surface field and emitter are measured accurately and simultaneously. Each Decima Gemini system is managed and controlled as a unit by Aurora's Veritas process visualization software.

This unique measurement capability results from Aurora's patented Infrared Reflectometry measurement technology, which measures doped semiconductor layers without contacting the cell or the need for an electrical junction between doped layers. Because of this, the Decima can accurately measure the bifacial cell's back-surface field without interference from wafer resistivity variations - a crucial need for this type of application. No other back-surface field measurement technique is currently available without the complicated use of monitor wafers that reduce production yield and prohibit complete monitoring of production.

The Decima Gemini product is designed as a unit to fit above and below a wafer conveyor, and measures 100 percent of wafers at full production line speeds. Aurora's Veritas™ process visualization software provides process engineers and operators with a simple, single point to monitor and control the critical back-surface field and emitter formation processes. Furthermore, the Decima Gemini systems provides spatially-resolved measurements to allow manufacturers to observe and control intra-wafer variations.



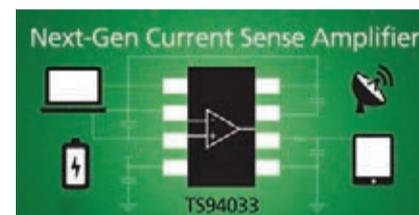
Decima Gemini' consists of a specialized pair of Decima CD measurement heads that enables the sheet resistance of the wafers' back-surface field and emitter to be measured accurately and simultaneously.

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