

# EP&T



electronic products and technology - NOVEMBER-DECEMBER 2014

## POWER SUPPLIES, BATTERIES

# POWER



AN EP&T SPECIAL REPORT  
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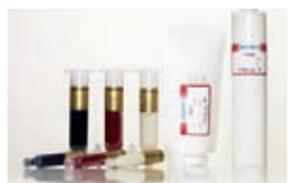
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## Research experts discuss the mapping of Canada's innovation future

In an effort to shed some light on Canada's position from a global innovation scale, the Xerox Research Centre of Canada (XRCC) in Mississauga recently convened a panel of internationally renowned thought leaders who shared some lessons and insights learned, with a view to charting a way forward.

According to the World Economic Forum's (WEF) most recent global competitiveness rankings, Canada is losing ground in comparison to other industrialized nations. At #15 out of 144 countries, Canada's current ranking has reached its lowest point on the annual index since 2006. The analysis seems to suggest that Canada's inability to conquer the innovation barrier is holding us back. Questions were raised: is this really the critical success factor affecting global competitiveness? Does Canada have a chronic innovation problem? If so, what should be done to reverse the downward trend?

The gathering at XRCC featured an 'Open for Innovation' panel where experts, including Xerox chief technology officer Sophie Vandebroek, outlined what steps business must take to keep Canada innovative. "Innovation is only innovation if it makes a positive impact for our clients," she said. "Best practices start with people ... relationships across the value chain and most importantly with customers."

Vandebroek also stressed the importance of collaboration between all players within the tech field, pointing out Xerox's recent arrangement with GreenCentre, a national centre of excellence for identifying and developing green technologies.

GreenCentre aims to leverage XRCC's expertise and state-of-the-art engineering facility and chemical pilot plant, accessing its infrastructure and expertise. In another sampling of collaboration, R&D specialists Battelle Memorial Institute signed a strategic alliance with XRCC to co-market and collaborate on materials science research services.

The session was moderated by Dr. Daniel Muzyka, president and CEO, The Conference Board of Canada and the panelists included: Dr. Peter Nicholson, founding president of Canadian Council of Academies; Marty Toomajian, president, Battelle Memorial Institute, Scott Crump, chairman, Stratasys Ltd.; and Dr. Sophie Vandebroek, president, Xerox Innovation Group and global CTO, Xerox Corp.

During a presentation on what 'the next 40 years' could be like, XRCC's scientists put on their visionary hats, describing how materials science could enable the development of new sensor technology, organic semi-conductors, molecularly design films and coating and battery technology that would significantly change how society operates.

As Canada continues to grapple with the hydraulics of innovation and global competitiveness, meetings such as this one certainly play an integral role in helping formulate a clearer picture to the future.

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# NEWSWATCH

## New e-labeling rules open up wearable tech market

**Technology manufacturers** will be able to give consumers mandatory information about their telecommunication devices as a result of new electronic labeling regulations rolled out by Federal Industry Minister James Moore. Canada is the sixth country worldwide to bring in e-labeling, opening Canada's markets to the latest wireless wearable devices, such as Google Glass and Apple Watch.

These regulations are expected to bring benefits for businesses and consumers and put Canada at the front of the pack in today's global digital economy. By allowing manufacturers to use e-labeling, the government is reducing costs, administrative burdens and barriers to market for businesses, enabling them to get products into the hands of consumers more quickly.

The move towards e-labeling is estimated to benefit at least 75% of companies currently putting paper labels and etchings on their devices. E-labeling minimizes the impact on product design as there is no longer a need to make room for stickers or etchings, it eliminates the need for costly equipment used to etch information onto devices, and it reduces waste by eliminating the need for stickers. Consumers will continue to be protected because boxes and other packaging will contain a notice informing the buyer that the product inside is e-labelled.

## Digi-Key, Aspen Labs offer free design tool

**Aspen Labs**, Boise ID, in cooperation with Digi-Key Corp., Thief River Falls MN, launched a free schematic capture and layout EDA/CAD tool for design engineers called PCBWeb Designer. The new software is available globally as a full-license application with no limitations on number of parts, size or layer count, supporting a standard Gerber output.

PCBWeb Designer is exclusively linked to Digi-Key's broad inventory of over four-million searchable electronic components including 300,000 ready-to-place parts. The easy-to-use schematic and layout tool is available today, free of charge, at [www.pcbweb.com](http://www.pcbweb.com).

PCBWeb Designer includes built-in board and component ordering, allowing engineers to easily send their design to fabrication or order a complete bill of materials with the single click of a button. The free software enables multi-sheet and multi-gate schematic capture, multi-layer pcb layout with copper pour and a custom parts editor. In addition, PCBWeb features an integrated bill of materials (BOM) manager and an optional web publishing feature that allows for design-sharing within a browser format.

## Electro Sonic continues alliance with Amphenol

**Electro Sonic**, Markham ON, a leading Canadian electronic component distributor serving thousands of customers for more than 60 years, will continue its strong alliance with Amphenol, focusing on delivering products from Amphenol Industrial and Amphenol RF divisions.

Electro Sonic currently has thousands of Amphenol parts in stock and ready to ship, continuing a relationship between both firms that has lasted for numerous decades.

"With competitive pricing and 600 additional parts on order, we are continually preparing ourselves to serve our customers with a supplier that has held strong in the Canadian market," says Sandra Mandell, product manager at Electro Sonic.

Providing leadership in the interconnect system market for harsh environments, Amphenol Industrial manufactures leading cylindrical connectors globally. Product lines include rectangular, standard miniature, fiber optics, EMI/EMP filter and additional special application connectors. In conjunction with the firm's innovative RADSOK contact technology, Amphenol connectors provides approximately 50% more product than competing products in the marketplace.

## JLT to rep Mechatronics Fan Group

**The Mechatronics Fan Group**, Preston WA, has signed a manufacturers' representatives agreement with Toronto-based JLT & Associates Inc., providing sales coverage for the Eastern Canadian region.

The Mechatronics fan group has been a leading source of ac and dc cooling fans, blowers, value-added assemblies and cooling solutions since 1985. The firm enables same day shipment from its ISO 9001:2008 certified headquarters and warehouse.

## Canadian Microelectronic industry discusses challenges at symposium

**The largest gathering** of its kind for representatives from all areas of the Canadian microelectronic industry participated in a two-day symposium in Gatineau QC this week, demonstrating their support towards innovations in all sectors of this nation's economy.

Nearly 300 participants ranging from academic network, industrial leaders, R&D centers and partners, assembled under the theme 'Innovation by Design', a symposium described as enabling the microelectronic systems industry to demonstrate its ability to support and develop technologies for the digital life.

Symposium 2014 was hosted by the MiQro Innovation Collaborative Centre (C2MI) in collaboration with CMC Microsystems and the Information Technology Association of Canada (ITAC). The event presented a diversified and captivating program and was addressed to all industries using electronic components. Several speakers and panelists from the academia and industry ecosystems demonstrated the important role played, as well as the beneficial impacts of microsystems in areas such as information and communications technology, aerospace, transports, environment and health. Other speakers addressed topics on the process surrounding the commercialization of advanced manufacturing.

Statistics show that the information and communications technology sector distinguished itself through vibrant research and development, as the industry accounted for 2.8% of GDP in 2011. It also generated 6.2% of the national growth since 2002, and also produced 30% of all private R & D in 2011, according to Industry Canada.

"We must not forget that the electronic systems industry supports a number of important sectors of our economy. Electronic systems are ubiquitous in our everyday lives and its use is rapidly increasing," says Normand Bourbonnais, CEO of C2MI. "Let's just think about the automobile industry that continues to improve not only the driving experience, but the safety and comfort of the vehicle by adding electronic components. Let's think about the medical industry where sensitive surgeries can now be performed remotely with greater accuracy through mechatronics. Microelectronics is part of many innovations that change and improve our lives, which make information and services accessible from anywhere around the world."

Since its official opening in 2012, C2MI members devoted their research efforts in microsystems prototyping. Their activities are designed to accelerate the commercialization of products required by the markets in which they evolve and to improve the tools, materials, techniques and tests in a unique collaborative Centre. As part of its recent activities, the Centre has greatly contributed to the development of new markets such as photonics, infrared imaging, energy sensors, LEDs, CMOS high power electronic and mono memories.

In May, the Université de Sherbrooke, in association with IBM Canada through a unique business-university partnership, launched the IBM-NSERC Industrial Chair on Canada's innovative packaging of microelectronic chips. C2MI, with its state-of-the-art facility and technology for advanced packaging provides an unprecedented opportunity to introduce students to an industrial environment.

## Electro-Meters to represent Chroma in Canada

**Expanding its sales force** in North America, Chroma Systems Solutions Inc., Foothill Ranch CA, recently appointed Electro-Meters Co. Ltd., Pickering ON, as its distributor in Canada.

Electro-Meters will be representing Chroma's complete line of power conversion testing instruments and automated test systems. Chroma is a leading global provider of power testing instruments and systems including programmable ac power sources and dc power supplies, ac loads and dc electronic loads, multiMeters and automated testing systems. The firm provides solutions for applications in aerospace, defense, military, automotive, medical, battery, solar, marine and regulatory testing.

"We like the fact that Electro-Meters delivers good synergistic lines that will provide our customers with complete bench and rack test solutions," says John Vela, Chroma's RSM for Canada.

Chroma is celebrating 30 years of delivering customized systems and instrumentation for power supply test and characterization, including architecture and platforms built to fit diverse bench-top, R&D, design verification and automated test system technical requirements and specifications. Applications include testing of battery chargers, dc-dc converters, ATX and other types of ac power supplies, batteries, fuel cells, photovoltaic arrays and point-of-load voltage regulators.



From left are John Vela, Chroma RSM for Canada, Frd Sabatine, president of Chromas System Solutions, Steve Gurr, national sales manager of Electro-Meters.

## GreenCentre to collaborate with Xerox Research Centre of Canada

**GreenCentre Canada Inc.**, Kingston ON, is looking to accelerate industry implementation of its game-changing green chemistry technologies by collaborating with the Xerox Research Centre of Canada (XRCC), a leading materials research centre in Mississauga ON.

GreenCentre, a national centre of excellence for identifying and developing green technologies, aims to leverage XRCC's expertise and state-of-the-art engineering facility and chemical pilot plant. The collaboration is expected to also help further GreenCentre's mission to advance sustainable chemistry innovations into the marketplace.

### XRCC marks 40th anniversary

**The Xerox Research Centre of Canada (XRCC)** celebrated its 40th year of conducting specialty materials science research at its Mississauga facility. Dr. Sophie Vandebroek, Xerox's global chief technology officer, left, joined centre director and vice president, Dr. Paul Smith, to cut a cake designed in the shape of the facility to commemorate the centre's latest milestone.



## EPTECH draw winners

• **Jason Theriault**, pcb designer with Turbulent Research, Dartmouth NS, had his name selected as the lucky winner of a \$500 gift certificate to Petro Canada after attending the EPTECH Regional Tabletop Show at the Dartmouth Sportsplex.

• **Andrew Cress from Moog Inc.** had his name selected as the lucky winner of a draw held by Dorigo Systems Ltd. at the recent Eptech trade show in Halifax. The prize was a Jolt Charger battery backup module for charging mobile devices.



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## Thermal Management & Enclosures

# Why metal filtered fans beat plastic for enclosures

By Barry Slotnick, product manager, Thermal Edge Inc.

There are many options to consider for cooling solutions for your electronic enclosure. Depending on the ambient conditions, anything from a closed loop air conditioner to a filtered fan could be used. All cooling solutions have a few different options to choose from and can be sized to fit the heat load, temperature requirements of each enclosure.

Using a filtered fan for your cooling system is the practical approach when extreme temperatures, humidity, or harsh conditions are not anticipated. Installation and maintenance for a filtered fan is fairly inexpensive, making a fan your most cost-effective option when the ambient environmental conditions allow for it.

After determining that a filtered fan is the best approach for cooling your enclosure design, the decision comes down to whether you prefer metal or plastic filtered fans. Here's a breakdown of the features for each type of fan.



### Plastic filtered fans

With a plastic filtered fan for your enclosure, the electrical equipment inside is kept at a proper temperature. By directing airflow both into and out of your enclosure, the filtered fan can remove the warmer air and draw in cooler air from the outside environment. In addition, the plastic filtered fan removes particulate matter from the ambient air prior to introducing it to the equipment in your enclosure. Your equipment is protected not only from overheating, but from potentially harmful particles in the air as well.

The plastic filtered fan's snap-on grille allows you to gain access to the fil-

ter. With no special tools required, replacing the filter is quite simple. All plastic filtered fans are supplied with polypropylene filter mats. When inspecting filter use, they can be washed to reduce contaminant build-up and extend the life of the filter. If your maintenance employee determines that the washing does not adequately reduce contaminant level, replacing the filter will be a necessary, but quick and easy, step.

### Metal filtered fans

When your enclosure is in a highly visible area and aesthetics are essential. Having the flexibility to select the exact color you need for your filtered fan grille can help your company make a good visual impression. Metal filtered fans come standard in ANSI 61 gray, perfectly matched to the color of electrical enclosures. If you prefer a different color, the metal filtered fan can be custom painted upon request, or supplied with a stainless steel grille. Whether the preference is to

match the enclosure or create a striking visual contrast, a metal filtered fan can achieve the exact look you desire.

On top of the aesthetic benefits, metal filtered fans are supplied with the same high quality internal components as plastic filtered fans, and the filters can be changed quite simply. By removing just two thumbscrews, employees can access and inspect the filter. Every metal filtered fan is supplied with a woven polypropylene electrostatic filter, which helps to filter more contaminants than the polypropylene mat supplied with the plastic filtered fans. Filter maintenance is no different from the plastic fan filters. Wash or replace the filter as necessary to keep airflow unrestricted and your equipment cool and clean.



For more information on filtered fan applications in your enclosures from Thermal Edge Inc., go to <http://ept.hotims.com/51129-45>



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IPV Series PC/PC wide opening external vent is suitable for outdoor use and allows circulation of a large volume of air while providing basic protection from rain water and falling debris. It is equally useful indoors on larger cabinets where a large vent helps to protect electronics from heat and moisture. Product is optimal for cooling and pressure equalizing where protection from rain water is required. The continuous gasket between the enclosure and the vent facilitates moisture protection.

The RoHS compliant fiberglass enclosure features material that is non-chlorinated and non-brominated flame retardant with a UL-94 V0 rating.

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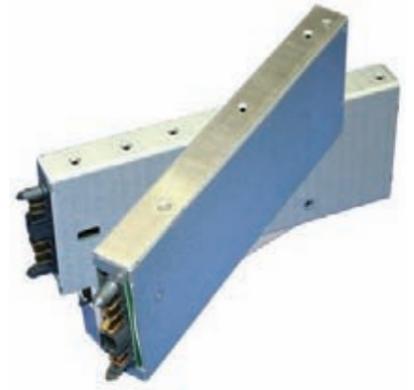
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## Front-end rectifier is fanless, conduction-cooled

CCR0512FP 12-volt, conduction-cooled, front-end rectifier measures half the height of traditional, industry-standard rectifiers. The 'tablet-sized' device delivers 19W per cubic inch of high-efficiency power to low-end data and telecom applications. Device's fan-less operation eliminates audible noise typically produced by the power supply, providing a more reliable solution. Conduction-cooling feature enables system designers to consider alternative methods of cooling including air, liquid and convection.

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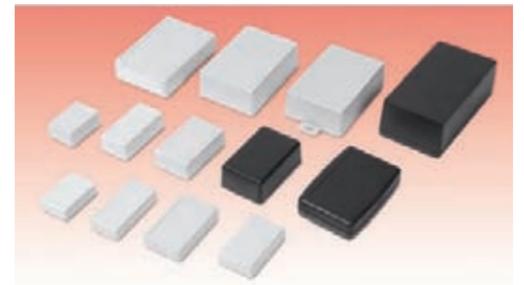


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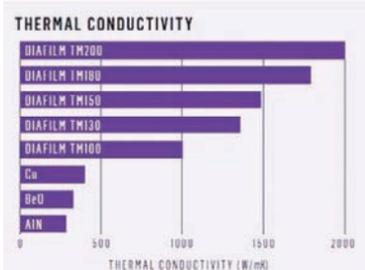
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design higher power systems within an existing module footprint.

**ELEMENT SIX**

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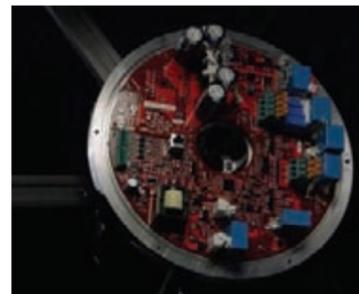
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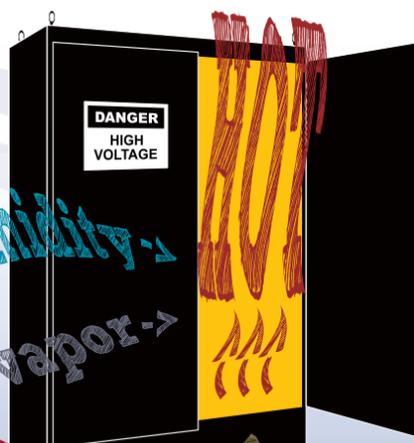
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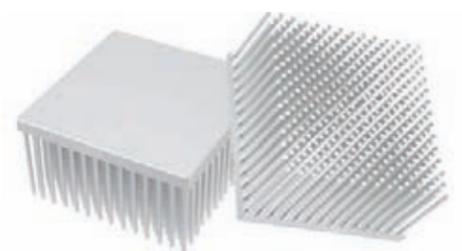
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## Square heatsink's pin fin design enhances thermal performance

Igloo FS127 cold forged heatsink for 60W LED thermal solutions, uses a pin-fin heatsink design for improved airflow and surface area. Device provides an efficient 0.89C/W thermal resistance, appropriate for high performance LED applications up to 60W. Anodized surface treatment gives device corrosion resistance, scratch-resistance and heat tolerance, making it more physically robust than untreated aluminum. Compared to straight fin designs, device performs well regardless of orientation, making it suitable for lighting applications.

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## Creativity from the Protocase Community

*Recreating a Truly Classic Musical Product: Unique-Vibe*

What started out as a weekend hobby, ended up turning into a re-creation of a truly classic musical product. James J. Klacik, a professional engineer by trade, has always had a deep passion for the iconic guitar sound of rock n roll's 60s and 70s era. One of those iconic and unique sound effects was produced by the Uni-Vibe, made most famous by Jimi Hendrix at Woodstock.

Understanding that there was a market for the re-creation of this classic product, Klacik set out to take on the task of re-creating the pedal to the exact 1969 specifications.

Read the full article here: <http://www.protocase.com/about/spotlight/unique-vibe/>



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## Data Acquisition & Sensors

### Miniature data recorders deliver flexible modularity

Seal SLICE MICRO and SLICE NANO miniature, modular data recorders are suitable for emerging test and monitoring applications. Products enable users to create flexible, customized systems by stacking and chaining units together to achieve the exact feature set and channel combination desired. Configurable in three-channel increments with up to hundreds of channels possible, product is fully software-configurable (sample rate, recording time, gain, offset, triggering, anti-alias filtering, etc.) and exceeds both SAE J211 and ISO 6487 requirements.

**DIVERSIFIED TECHNICAL SYSTEMS**

<http://ept.hotims.com/51129-53>



### Protocol analysis solution performs for DOCSIS 3.0 and 3.1 next-gen cable networks

DP-1000 protocol analysis solution is designed for both DOCSIS 3.0 and DOCSIS 3.1, used to analyze, debug, maintain and monitor local networks and Internet connections. Multiple systems operators (MSOs), chipset manufacturers, product developers and certifications bodies can use it to quickly find and correct trouble spots in order to maintain the highest quality of service possible. Optimized for real-time signal processing with FPGA technology, product analyzes up to 32x8 single or bonded US/DS channels (DOCSIS 3.0) and 2x1 OFDM US/DS channels (DOCSIS 3.1), and includes numerous channel-filtering, demodulation, triggering, display, and upgrade features.

**AVERNA**

<http://ept.hotims.com/51129-58>



### Firmware triggers simultaneous acquisition, readout capability for PCIe digitizers



Signal processing firmware (option -TSR) for family of U53xxA PCIe digitizers allows simultaneous capture and transfer of acquired data in triggered applications.

Digitizer's architecture, with the new firmware, is able to sustain triggered acquisitions of thousands of samples at hundreds of kHz rates without missing any events. Firmware makes it

possible to acquire and read substantially higher trigger rates during a shorter period of time (or non-periodic triggers) depending on the internal memory options selected. Users now can view the memory as a multi-bank circular memory, and can optimize the data throughput for their application by configuring the number of memory banks.

**KEYSIGHT TECHNOLOGIES**

<http://ept.hotims.com/51129-54>

### Integrated EOL programmable hall sensor supports direct connection

MLX92242 Hall effect switch/latch IC has a built-in capacitor so device can be implemented directly into the design without inclusion of supplementary board level components which would increase the overall dimensions and necessitate additional soldering. Device provides end-of-line (EOL) programmability and support for 2-wire operation, while still delivering identical performance and functionality to the original MLX92242, as well keeping the standard industry TO-92/UA package form factor, enabling drop-in replacement solutions.

**MELEXIS**

<http://ept.hotims.com/51129-59>



### 5mm flat angle and speed sensors mount easily

Vert-X 05E Series of dual angle/speed sensors allow for easy mounting in small and narrow spaces with a 5mm body depth and mounting flanges with metal inserts. Devices provide measurement only 6mm from edge of product for close-to-wall measurement applications. Products measure angles from 0 to 360°, rotational speed and direction. Device specifications include independent linearity to  $\pm 0.3\%$  of measurement range, resolution to 12-bits (analog output) and 1,024 pulses per revolution (incremental outputs), repeatability to 0.1. Measurement speeds are up to 120,000RPM. Vert-X 05E life is specified as unlimited mechanical movements and 390 years MTBF.

**NOVOTECHNIK US**

<http://ept.hotims.com/51129-55>

### Pressure temperature data loggers boost accuracy, repeatability



OM-PR Series pressure/temperature data loggers provide a temperature range of -20 to 85C, pressure ranges are 35, 150, 350, 550, 2000, 5800 psia and vacuum ranges are 760 and 380 Torr. Device is packaged in a rugged submersible 316L stainless steel housing and has a standard 1/4 NPT fitting. This CE compliant product has 150% over range protection, programmable start/stop time and sample rates, up to 64,000 samples per record, alarm set points and a five-year battery life. Windows software (included) turns your PC into a real time data acquisition system.

**OMEGA ENGINEERING**

<http://ept.hotims.com/51129-60>

### Precise capacitive displacement sensor adds capabilities, expands measurement ranges

CPL490 Capacitive Displacement Sensor measures position/displacement with 50 picometer precision or less. Relative to the noncontact sensor's measurement range, that translates to a resolution value of less than seven parts-per-million even at 15kHz bandwidth. Device can resolve target position changes of less than 100 picometers while objects are moving at 15kHz. When bandwidth is increased to 50kHz, the precision remains less than 0.3 nanometers. A wider selection of probes and ranges puts more flexibility and capability in the hands of user.

**LION PRECISION**

<http://ept.hotims.com/51129-56>



### Compact optical sensor improves mobile monitoring

SFH 7050 integrated optical sensor for use in mobile devices, contains three light emitting diodes with different wavelengths, based on highly efficient chip technology. Device saves power and provides high signal quality for particularly reliable measurements. A built-in photodetector receives the reflected optical signals and is separated from the emitters by an opaque barrier. The three emitters built into the sensor have wavelengths of 530nm (green), 660nm (red) and 940nm (infrared), and can be controlled individually, so the sensor can be used for different applications.

**OSRAM OPTO SEMICONDUCTORS**

<http://ept.hotims.com/51129-61>



### Miniature flush diaphragm pressure transducers deliver demanding process measurements

Model 188/288/388 miniature flush diaphragm pressure transducer series provides accurate pressure measurements of high-viscosity fluids, even within high shock and vibration environments, without port plugging and clogging. Products provide an all-welded stainless steel construction and incorporate a 7/16-20 UNF pressure port that eliminates any zero installation effect. Standard wetted parts are made from stainless steel, with optional substitution of Inconel or Hastelloy. Standard operating temperature range is -54C to +121C, with an optional high-temperature version to +177C.

**GP:50 CORP.**

<http://ept.hotims.com/51129-62>



### Temp/RH data logger supports mobile devices

OnSet HOB0 MX1101 data logger measures and transmits temperature and relative humidity data to mobile devices wirelessly via Bluetooth Smart technology. Device works with firm's free HOB0mobile app for iOS, simplifying configuration and managing data right from user's iPhone or tablet. Product requires no Internet access, cables, or PC required. User may download data any time from 100ft. away and can set real-time alerts for temp/RH variations.

**HOSKIN SCIENTIFIC**

<http://ept.hotims.com/51129-57>



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<http://ept.hotims.com/51129-6>



## Contract Manufacturing & Production Equipment

# To clean or not to clean



## Electronic OEM's & CEMs ponder options of pcb assembly process

By Tim Luke, regional sales manager,  
Alpha, Toronto

There are many factors that come into play when determining between the 'No Clean' process versus a 'Cleaning' process of printed circuit boards (pcbs). Complicated by two key drivers, the first factor is increasing pressure to reduce the cost to build the assemblies, while the second is the need to build increasingly complex pcbs that are potentially going into harsh environments. The fact remains that there is a choice and how one goes about deciding what is right choice for your assemblies involves looking at a number of issues and making an educated decision. This article looks at all the factors that go into making the choice.

### Introduction

The electronics assembly industry has evolved over the years and turned predominately to a 'no clean process' to the point where more than 90% of all pcbs assembled in the world use this process.

For many years high reliability pcbs have utilized no clean technologies successfully in the telecom, automotive, industrial controls and computer industries. A No Clean process was chosen to reduce the cost per assembly, decrease

cycle time and reduce material handling defects by eliminating the cleaning process. It also avoids the increasing costs of floor space, equipment, chemicals, water and electricity that are all required to run the cleaning process.

The early adopters of the No Clean process predominately used high rosin % liquid fluxes in the wave and traditional 'RMA' solder pastes with white water gum rosin. This was the same approach that was adopted earlier by the Japanese electronics industry, which to this day

uses high rosin content no clean fluxes in the wave and in the solder pastes. Rosin being the key element in ensuring that the residues would not be conductive or corrosive. Over time, our industry has changed and so to have the requirements of the solder paste and wave soldering fluxes. We expect our soldering chemistries to continue providing the same level of reliability but leave no visible residues while maintaining a high first pass yield.

The challenge is to provide no clean materials that satisfy today's process and reliability requirements have been met. Today's no-clean solder paste and flux technology are more reliable based on new chemistries. The formulators have been able to blend high reliability rosins with activation systems that allow for head-in-pillow defect resistance for BGA's and increased solderability of LGA's and QFN's, IPC Class III voiding and residues that can be pin tested at ICT while maintaining high surface insulation resistance (SIR).

The rosins used are clear and depending upon the design of the pcb, are not visible. Specifically, the solder resist keep out areas around each pad will allow for the flux not to spread onto the resist becoming visible. It should be noted that these same no clean pastes that have been developed are being cleaned effectively in the state-of-the-art cleaning machines with new chemistries used to effectively dissolve and rinse away the flux residues.

In order to come to an educated decision we must first understand the reasons for cleaning and how they apply to each situation.

### Reasons to clean

There are a number of reasons that pcbs should be cleaned. They can be classified into two categories; pcb functionality and incompatibility with downstream processes.

Pcb functionality can be further broken down to low impedance circuits, high voltage circuits and to a lesser degree RF circuits. These reasons are all a function of the pcb design compatibility with the flux residues. In all cases, failures will be the result of the flux residue remaining, thus preventing the circuit from functioning properly. Functionality does not guarantee Reliability. It is crucial for the test protocol to replicate the actual working environment so you are 100% confident that the assembly is reliable. Chemical suppliers test and report the reliability of their products to industry standards such as IPC, JIS and Bellcore, which will not always meet the same heat and humidity requirements

or voltage and SIR spacing requirements that are on your assembly. The lessons learned in this process can possibly lead to future designs that avoid the same issues where the failure took place. This is evident by the success that the RF circuit designers have had with 5-10GHz designs utilizing no clean processes.

Incompatibility with downstream processes can be such things as conformal coating compatibility and compatibility with post SMT processes.

Conformal coating is generally used when a product is going to be operating in a harsh environment where good coating adhesion is required to ensure no liquids or gases can penetrate the coating leading to a failure. A consistent and thorough cleaning process prior to an even distribution of coating is the key to a successful coating process. While it is true that there are a number of OEMs that have been successful coating over no clean solder paste and wave solder fluxes, the potential number of combinations of fluxes and coatings is staggering. As a result, full functionality and long term reliability testing should take place prior to coating over a no clean process. There is a potential to actually reduce the SIR results by coating a no clean paste residue. In some cases the residues from the solder paste or wave soldering flux will not allow the coating to completely cure at the interface leading to adhesion and reliability issues.

### The no clean process

The process of building reliability in starts with having a process of record (PoR) that is documented and regularly audited. The PoR starts with having a chemistry set that is compatible including the paste, flux, wire solder and touch up flux. Each step in the SMT and PTH process must then be measured and recorded.

This is accomplished by having a solder paste printing process that is consistent and documented. The stencil design will dictate the volume of paste deposited and it can be measured a number of ways with semi or fully automated systems. The key is that any changes made to the stencil design be kept on file once in production. We can measure the reflow process by taking the thermal profile of each assembly when it is first introduced to production. It is recommended that a 'profile board' be kept on hand to be used for future process audits to ensure the same profile is being used. The wave solder or selective soldering process can also be measured. The amount of flux applied is measured by weighing the actual amount of flux applied to the pcb using

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## Wireless test set module maximizes production throughput

**TRX module** with four full-duplex RFIO ports and other firmware enhancements for the E6640A EXM wireless test set allows manufacturers to test up to four connected devices with identical RFIO performance and therefore achieve maximum production throughput. EXM enhancements include an advanced sequencing of multiple WLAN formats within one test sequence to enable faster WLAN device production test; and speed-optimized firmware to help manufacturers enhance wireless device test plan efficiency and increase production throughput. The addition of DECT, PHS and Zigbee support adds to product's multi-format measurement capabilities.



**KEYSIGHT TECHNOLOGIES**

<http://ept.hotims.com/51129-63>

## Conformal coatings protect electronics in extreme environments

**Prima Protect CC7090E** and **CC7130-E** conformal coating products provide extreme moisture, salt fog and even direct immersion protection for electrical contacts, electronic circuits and devices, printed wiring boards, and structures made with metal, wood and plastics. Products are molecularly flexible for great adhesion and yet resist abrasion. Products have added flexibility to withstand low temperature cracking, fungicide to provide additional protection in submerged environments and are non-silicone and electrically insulating, so to not interfere with neighboring electronics. Products meet all of the IPC CC830 requirements with UV inspection dye and fungicide. Both coatings can be brushed, dipped or sprayed on and are flexible, highly hydrophobic and provide superior protection against corrosion in water, salt water, fog and many other types of environments.



**AI TECHNOLOGY**

<http://ept.hotims.com/51129-64>

## Profiling system alleviates soldering issues



**Automatic Profiling System (APS)** for wave and reflow soldering provides 100% checking of temperature profiles, an automatic analysis of the profile and checking of production parameters against production limits. The computer software tracks the progress of the pcb through the oven allowing for the most accurate calculation of the profile seen at product level. Product has temperature probes that are smaller and can be positioned closer to the pcb, providing a much more accurate temperature measurement in the vicinity of the electronic assembly during soldering. Product's smaller size reduces the danger of the probe shadowing the product, giving a precise and accurate reading.

**SOLDERSTAR**

<http://ept.hotims.com/51129-65>

## SMT adhesive allows self alignment of solder, components

**KOKI JU-R2S** self alignment type SMT adhesive for double-sided reflow allows self alignment of solder and components. Product prevents component falling in double-sided reflow. Product will not inhibit the self alignment and natural sinking of the component during waiting in the first reflow. Product eliminates the first curing process and withstands the higher reflow profiles, while eliminating dangerous goods costs, having achieved the UN transport class designation. Product cures in the same lead free reflow profile, eliminating a curing step. It has the ability to self center in the reflow process.



**SMART-SMT**

<http://ept.hotims.com/51129-66>

### newswatch

## Schleuniger hosts Oktoberfest themed open house

**German-based Schleuniger Inc.**, a leading international manufacturer of high-precision wire processing machines, hosted its 4th Oktoberfest themed open house at its U.S. headquarters in Manchester NH, recently.

Industry suppliers Cirris Systems, Gem Gravure, Panduit and Telsonic Ultrasonics joined the event with exhibit booths, providing live product demonstrations. Attendees were provided the opportunity to meet with experts in these fields and learn more through a series of technical seminars that were held throughout the day.



## Laser direct imaging system prototypes on resist-covered substrates



**ProtoLaser LDI** universal, high-resolution, table top laser direct imaging (LDI) system for prototyping on resist-covered substrates provides a software-selectable 1 or 3µm laser beam spot and a working area of nearly 4 x 4 inches. System is optimized for creating the ultrafine features required by the microfluidic and MEMS industry. The compact software combines functionality with powerful, yet user-friendly software. The UV based laser system activates UV resist-covered substrates – directly from CAD. Product eliminates the need for alignment equipment and expensive exposure masks with long lead-times. The process can be utilized on a wide variety of substrates without any special environmental conditions.

**LPKF LASER & ELECTRONICS**

<http://ept.hotims.com/51129-67>

## Polyurethane potting compound is environmentally-friendly

**20-2121 Polyurethane** plant-based potting, casting and encapsulating compound for electronic applications with low toxicity requirements, is an environmentally-friendly alternative to conventional potting compounds. Product is made from natural oil polyol instead of fossil fuel feedstocks. As a low toxicity product, it meets FDA food contact requirements and contains no TDI, MbOCA or Mercury. Product's other properties include little shrinkage or exotherm, while alleviating mechanical and thermal stresses on sensitive electrical components. Product provides a tensile strength of 2,000psi and a tear strength of 119PLI. It has a mixed viscosity of 2,000cps at 25C and a gel time of 20-minutes at 60C.

**EPOXIES**

<http://ept.hotims.com/51129-68>



## Circuit board shields ship quickly

**Large selection** of Quick Ship board level shields are ready for delivery in as little as 24-hours, helping alleviate time-to-market and material sourcing demands. Depending on the specific shielding requirements and delivery deadlines, customers can choose from a large selection of off-the-shelf surface mount shields (SMS) or a nearly unlimited selection of shapes and sizes from the company's standard circuit board shield (CBS) line. Products come in both one-piece and two-piece design styles to accommodate broad ranging assembly and rework requirements. Each board shield provides a shielding effectiveness up to 60dB and a cover retention of 1.5-2.5 lb./linear inch in the 2-piece configuration.

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**LEADER TECH**

<http://ept.hotims.com/51129-69>



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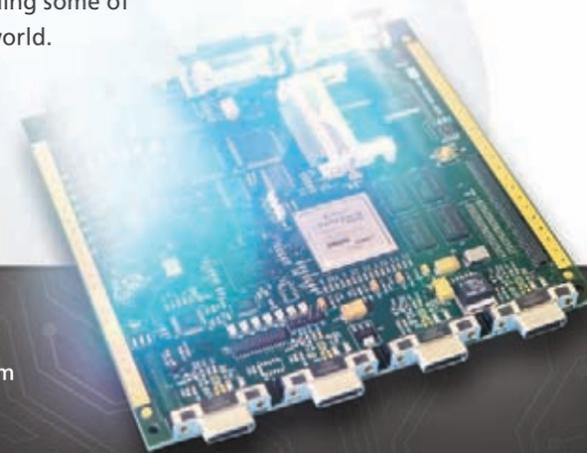


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## Pen tool removes sticky stuff in production area

TidyPen 60-second sticky stuff remover for electronics manufacturing, repair shops, medical facilities, classrooms and any other place sticky labels are used. Product's improved formulation is VOC and REACH compliant and improves cleaning effectiveness on almost anything sticky: glues, tapes, labels, most fluxes, some inks and many conformal coatings. Product is safe on plastics and gaskets, as well as other materials of construction found on pcbs.

MICROCARE



<http://ept.hotims.com/51129-70>

## UHF RFID reader boosts productivity, process reliability

F190 UHF Read/Write Head provides a robust sealed metal housing and a compact footprint for reliable operation in adverse environmental conditions and simple installation even in tight spaces. Because several products in a container can be detected at the same time using multi-tag reading, product simultaneously simplifies processes and reduces processing time. Unit easily integrates into existing IDENTControl systems, enabling users to connect to standard protocols such as Ethernet/IP, PROFINET, TCP/IP and EtherCAT. Three reader versions are available to cover worldwide operation.

PEPPERL+FUCHS



<http://ept.hotims.com/51129-71>



## Noise-isolating over-ear headphone are virtually indestructible

Klipsch STATUS noise-isolating, over-ear headphones are designed with pristine yet virtually indestructible materials. Constructed from the same durable material used in high-end eyewear and available in black and white finishes, product's frame, made of Grilamid TR material, provides improved durability, while a gloss finish with subtle reflective highlights exudes both fashion and luxury. Ergonomically designed for maximum comfort and stability,

product provides ear cups lined with high-density memory foam, optimized clamp force, as well as precisely dimensioned ear cup rotations to create a perfect seal around the ear.

KLIPSCH

<http://ept.hotims.com/51129-72>

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**10:05 AM**  
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**3:14 PM**  
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## Options of pcb assembly process

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accurate scales. The pre-heat is measured by attaching thermocouples to the pcb or recording topside temperatures via lasers or temp stickers prior to the wave. The contact time at the wave can be measured by using a glass plate.

If hand soldering is required the operators should be trained to use only the cored wire solder with enough flux to promote fast wetting. In cases where components need to be replaced or rework/touch up is required that is not part of the documented PoR, it is recommended that the flux residues be removed. This will avoid any question of long term reliability, providing you have a good manual cleaning process. There are fluxes that are designed for use in the touch up process that can be cleaned easily or when the left on the board after seeing a complete heat cycle will provide good SIR values.

Document the process and test for functionality and reliability of the assembly.

### Document the process

There are two main choices once you have decided that you are going to clean. They are water soluble or no clean (includes rosin containing fluxes). In both cases it is important to have a PoR documented as we have in the no clean process and then we must also ensure that our cleaning process is consistent and measured.

There are tools that can be used to test the cleaning process efficiency such as ionic contamination testers for on-site testing or more in depth analysis. You can send out to an independent lab for detailed ion chromatography testing. With the introduction of low stand-off components such as 0201, QFN, LGA, Bottom Termination Components (BTC's) and Micro BGA the challenge of cleaning is more dramatic and requires a combination of chemistry and cleaning power to yield clean boards.

A thorough validation of the cleaning process is required for these low stand-off components. In general the lower stand off parts require the solvent to flow under the part, this requires the solvent to have a low surface tension and the cleaning machine to provide a constant flow of water on the surface of the assembly. Water surface tension is lowered with the addition of a saponifier and is strongly recommended when cleaning fine pitch or low stand-off parts with water soluble fluxes. Dynamic cleaning or high pressure sprays will not always penetrate the

smaller stand off heights in particular where there are adjacent components.

An additional consideration is the time between reflow and wave and the cleaning process. Remaining active, the water soluble residues become more difficult to clean the longer they are left on the board.

When using a water soluble flux it is very important to know that if you plan to operate in an environment that has high heat and humidity you are at an increased risk of creating a short caused by electrochemical migration with the exposed residue under tightly spaced components if you do not clean off all the flux residue.

Test the PoR for functionality and reliability in the environment you will be operating. The same can be said to a lesser degree when you are cleaning a No Clean Solder Paste if you are only partially cleaning the residue and leave some weak organic acids exposed that were previously encapsulated in the rosin. Destructive tests such as removing the component to visually check for residues are not practical in a manufacturing environment, but can be tested during process qualification or randomly during production.

### Pcb and component quality

The quality and cleanliness of incoming pcbs and components can have a direct impact on the quality of the assembly. It is incumbent upon the OEM or EMS provider to put procedures in place to measure the incoming quality. Depending on product requirements for reliability and the complexity of the assembly the appropriate amount of resources should be spent on testing upon arrival. The process of making pcbs and components uses a number of chemical processes that can leave unwanted residues. So, when not cleaned and subjected to harsh environments, this can lead to failures.

### Conclusion

The complexity of pcb design will continue to evolve leading designers to focus on functionality and reliability with no clean processes. There will always be a need to clean, ensuring that the cleaning equipment and solvent suppliers will continue to work together to improve efficiency.

For more information on pcb cleaning process from Alpha, go to <http://ept.hotims.com/51129-73>



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# Power Supplies, Batteries

## Digital 40 Amp 132 Watt PoL dc-dc converter comes in 3 formats

**OKDx-T/40 series** non-isolated point-of-load (PoL) dc-dc converters are available in three different package formats, through-hole, single-in-line and surface mount. The 40 Amp, 132 Watt digital dc-dc device is highly efficient (typically 97.2%), fully regulated and provides a high power density and measure just 30.85 x 20.0 x 8.2mm. The PMBus interface facilitates power management features not previously available in analog PoL converters. By interfacing the OKD converter to the system's I2C bus, a systems engineer can monitor critical system-level performance requirements that include Vin, Iin, Vout, Iout, and operating temperature.

**MURATA POWER SOLUTIONS**

<http://ept.hotims.com/51129-74>



## Rugged 3U open VPX power supply is conduction cooled

**VPXtra COTS 3U Open VPX VITA 62** compliant power supply is a rugged, highly reliable, conduction cooled, switch mode unit. The dc to dc power unit delivers up to 550 Watts of dc power via six outputs. The 12V, 3.3V, and 5V main outputs can be paralleled for higher power. Product can accept 18 to 36Vdc input, compliant with MIL-STD-704 and can supply a high-power dc output. Products have no minimum load requirement and have overvoltage and short circuit protection, as well as over current and thermal protection.

**BEHLMAN ELECTRONICS**

<http://ept.hotims.com/51129-78>



## Thin battery connector corresponds to 6A high current capacity

**Thin 0.6mm** battery connector with 6.0A (3.0A/pin x 2 pins) high electric currency capacity connects to flexible printed circuit board. By realizing a high retention force for powerful connection reliability, despite being compact and thin, this product is suitable as a connection point transmitting high currents, such as the battery connections of mobile devices, smartphones, tablets and other wearable devices.

**PANASONIC**

<http://ept.hotims.com/51129-75>

## High power resistors range from 50mOhm to 20Kohm

**TR Series** of T0-220 and T0-247 style power resistors starts at 50 milliohms and goes up to 20Kohms for most sizes (the TR30 value range extends up to 100K ohms). Devices are available in 0.5% tolerances and TCR as low as 50ppm, suitable for precision power resistor requirements. Power ratings for product series, assuming use with a heat sink and a 25C case temperature, ranges from 20W up to 100W.

**STACKPOLE ELECTRONICS**

<http://ept.hotims.com/51129-76>



## Power MOSFETs provide benchmark on-state resistance

**AUIRFN8459** and **AUIRFN8458** 40V automotive-qualified COOLiRFET power MOSFETs provide benchmark on-state resistance (RDS(on)) for automotive applications requiring compact size and high current performance. AUIRFN8459 achieves ultra-low 5.9mOhm Rds(on) per channel benchmark performance and 50A high current carrying capability. The 5x6mm dual devices deliver a low thermal path to the pcb and significant thermal performance improvement compared to an SO-8 package to provide higher efficiency, improved power density and overall system level cost savings.

The 5x6mm dual devices deliver a low thermal path to the pcb and significant thermal performance improvement compared to an SO-8 package to provide higher efficiency, improved power density and overall system level cost savings.

**INTERNATIONAL RECTIFIER**

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 <p><b>ALD6 Series</b> 1-6 string LED driver for LCD displays</p> <ul style="list-style-type: none"> <li>◆ 12VDC input</li> <li>◆ User selectable for 1, 2, 3 or 6 strings</li> <li>◆ Small size (&lt; 1" x 1")</li> <li>◆ Analog or resistive programming</li> </ul> <p><a href="http://us.tdk-lambda.com/lp/products/ald-series.htm">http://us.tdk-lambda.com/lp/products/ald-series.htm</a></p>	 <p><b>EFE Series</b> 300 to 400W high efficiency power supplies</p> <ul style="list-style-type: none"> <li>◆ AC input with Power Factor Correction</li> <li>◆ 12V to 48V outputs</li> <li>◆ High Efficiency (90% typical)</li> <li>◆ Medical versions available</li> </ul> <p><a href="http://us.tdk-lambda.com/lp/products/efe-series.htm">http://us.tdk-lambda.com/lp/products/efe-series.htm</a></p>	 <p><b>NV Series</b> 350 to 700W Modular Power Supplies</p> <ul style="list-style-type: none"> <li>◆ AC input with Power Factor Correction</li> <li>◆ 1 to 8 outputs</li> <li>◆ Up to 90% efficient</li> <li>◆ Suitable for 1U enclosures</li> </ul> <p><a href="http://us.tdk-lambda.com/lp/products/nv-series.htm">http://us.tdk-lambda.com/lp/products/nv-series.htm</a></p>
 <p><b>CFE400M Series</b> 300-400W high efficiency power supplies</p> <ul style="list-style-type: none"> <li>◆ AC input with Power Factor Correction</li> <li>◆ 12 to 48V outputs</li> <li>◆ 300W convection cooled rating</li> <li>◆ Medical &amp; industrial safety certifications</li> </ul> <p><a href="http://us.tdk-lambda.com/lp/products/cfe-series.htm">http://us.tdk-lambda.com/lp/products/cfe-series.htm</a></p>	 <p><b>Leave a smaller footprint</b></p>	
 <p><b>CSS500 Series</b> 500W high efficiency power supplies</p> <ul style="list-style-type: none"> <li>◆ AC Input with Power Factor Correction</li> <li>◆ 12V to 57VDC outputs</li> <li>◆ 360W convection cooled rating</li> <li>◆ Up to 92% efficient</li> <li>◆ Medical versions available</li> </ul> <p><a href="http://us.tdk-lambda.com/lp/products/css-series.htm">http://us.tdk-lambda.com/lp/products/css-series.htm</a></p>		
 <p><b>ZWS-BAF Series</b> 50 to 150W High Reliability Power Supplies</p> <ul style="list-style-type: none"> <li>◆ AC Input with Power Factor Correction</li> <li>◆ 3.3V to 48VDC outputs</li> <li>◆ Up to 91% efficient</li> <li>◆ 5 year warranty</li> </ul> <p><a href="http://us.tdk-lambda.com/lp/products/zws-series.htm">http://us.tdk-lambda.com/lp/products/zws-series.htm</a></p>	<p><b>DRB SERIES - Very Small, Efficient DIN Rail Supplies</b></p> <p>Save energy and space on your DIN Rail by using TDK-Lambda's new DRB series of 15 to 100 Watt DIN Rail mount power supplies.</p> <p>The DRB series' highly efficient design reduces waste heat, even at no-load, allowing the case size to be reduced while still maintaining conservative component temperatures.</p> <p>Put your foot down, contact TDK-Lambda for an evaluation unit or check our website for distribution inventory.</p> <p><a href="http://us.tdk-lambda.com/lp/products/drbs-series.htm">http://us.tdk-lambda.com/lp/products/drbs-series.htm</a></p> <p>For more information on how TDK-Lambda can help you power your unique applications, visit our web site at <a href="http://www.us.tdk-lambda.com/lp/">www.us.tdk-lambda.com/lp/</a> or call 1-800-LAMBDA-4</p> <ul style="list-style-type: none"> <li>◆ Excellent efficiency</li> <li>◆ ErP compliant</li> <li>◆ Very low no load power consumption</li> <li>◆ Extremely narrow width</li> <li>◆ Output voltages 5, 12, 15, 24, 48VDC</li> <li>◆ 15, 30, 50 &amp; 100W power levels</li> </ul> 	

# Battery welding

## A guide to selecting and using laser, micro-TIG and resistance technologies

Story submitted by Miyachi America Corp.

**Batteries** and battery packs have become an integral part of everyday life, in response to the ever-increasing demand for portable electronic devices, cordless power tools, energy storage, and hybrid and EV cars. This in turn, drives the need to manufacture batteries and battery packs that meet the quality and production requirements for these products.

There are a number of materials joining requirements for battery manufacturing, depending on the specific type, size and capacity of the battery. Internal terminal connections, battery can and fill plug sealing, tab to terminal connections and external electrical connections are a few key examples.

Several joining options can be considered for each of these requirements, including resistance, ultrasonic, micro-TIG and laser welding, including the newest fiber laser options. The decision to use one or the other is generally dictated by the specific type of weld required and production requirements.

Ultrasonic welding is commonly used for the joining of the internal electrode battery materials, which are usually constructed of thin foils of aluminum and copper. The remaining joining requirements – including the connections inside the can, and external terminal tab connections – are well suited to resistance, microTIG, and laser welding. For can and plug applications (seam sealing), laser welding is the joining technology of choice.

The following is an overview of resistance, microTIG and laser welding technologies, along with examples of battery joining applications, detailing when and where to use each technology.

### Resistance, microTIG, laser welding

Resistance welding has been an established joining technology for more than 40 years and has been used in the battery industry for almost as long. Since then, a steady stream of advances in resistance welding systems has given users significantly improved capabilities to control

various aspects of the process. For example, the introduction of dc inverter power supplies with basic closed-loop electrical modes provides the ability to accommodate changes in the secondary circuit (the electrical loop from cable connection on the negative side of the power supply or transformer, through the weld head and the parts returning to the positive side) to specifically address part resistance.

Also, polarity switching for capacitance discharge supplies to enable balancing of the weld nuggets, and more recently, the addition of displacement and electrode force measurement, provide manufacturers with more tools to ensure weld quality.

Similar to resistance welding, tungsten inert gas welding (TIG), also known as gas tungsten arc welding, has been used in manufacturing for many decades and has traditionally been used for the more challenging welding applications for nonferrous materials. Advances in high frequency power supplies increased low current control and arc stability, enabling much finer welding. This process became known as micro-TIG, a generally non-contact process that provides copper joining while offering a fairly relaxed process window with respect to part fit-up and positioning tolerances of the electrode to the parts.

Laser welding is a newer technology, introduced in the manufacturing marketplace in the mid-1980s. As laser technology has matured and the awareness of its benefits spread, it has become an established process. Today it is simply another tool in the manufacturing engineer's toolbox to be used and implemented as needed.



FIG. 1: Seam welding of aluminum cans



FIG. 2: Resistance tab welding applications

The laser provides a high intensity light source that can be focused down to very small diameters (0.01-inch). The concentration of light energy is sufficient to melt metals rapidly, forming an instantaneous weld nugget. The process is non-contact, has no consumables, offers instantaneous welding once positioned at the weld point location, provides sufficient control over the process to size the weld nugget according to requirements and provides a number of implementation methods that can be geared toward individual manufacturing requirements. Laser welding enables joining of many materials and material combinations, can weld thick parts and has no limitation on proximity of weld spots.

There are two types of laser that provide solutions for battery applications: pulsed Nd:YAG and fiber. Both of these lasers offer different joining characteristics that can be selected as appropriate.

### High speed seam and plug sealing

Laser welding is an excellent method for seam sealing, resulting in high speed, high quality seams in both steel and aluminum. Laser welding provides significant advantages over mechanical clinching and adhesive methods based on

joint reliability, joining speed, and ease of manufacturing. As laser welding is an extremely efficient joining process, the heat input into the battery is minimized. Figure 1 shows a few examples of seam welding of aluminum cans, including a weld cross section, and ball and plug sealing application examples.

### Welding tabs to terminals, buss bars

From a welding perspective, the important aspects of tab welding are the thickness and material of both the tab and the terminal. Resistance welding is extremely well suited to welding nickel tab material up to 0.015-inch thickness and nickel or steel clad copper tab material to around 0.012-inch thickness to a wide variety of terminal materials. Due to a different welding mechanism, laser welding is able to join both thin and thick tab materials, with a capability of welding copper or aluminum tab material above and beyond 0.04-inch thickness. Avoiding penetration of the can and overheating the battery are important aspects of tab to terminal welding.

Welding tabs or terminal connections to buss bars generally does not require as much penetration of heat input control as the tab to terminal welds. The materials, material thickness and combination of materials determine the best welding technique.

### Resistance welding

Resistance welding has been and continues to be, the most cost-effective method for joining tabs on a wide range of battery types and sizes, using both dc inverter closed loop and capacitor discharge power supplies. With fast rise times, closed loop feedback control, polarity switching and options for displacement and force sensing, the process can be finely tuned and monitored to ensure both high quality and yield.

For nickel tab thicknesses up to 0.0070-inch, the tab can be welded without modification. Beyond this thickness and to prevent electrical shunting and excessive electrode wear, a slot and projections are placed in the tab as part of the stamping process. The projections act not only as energy concentrators for the weld, but also greatly increase electrode lifetimes. Figure 2 shows several examples of the wide range of resistance tab welding applications.

### Micro-TIG

Micro-TIG offers excellent welding of copper and so presents a good solution

continued on page 19

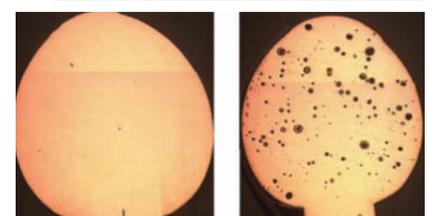


FIG. 3: Buss bar welds in 0.04" copper and the effect of pulsation on weld porosity



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# Energy efficiency level VI is coming

*Are you ready?*

Story submitted by Mega Electronics Inc.

In the early 1990s, it was estimated that there were more than 1-billion external power supplies active in the United States alone. The efficiency of these power supplies, mainly utilizing linear technology, could be as low as 50% and still draw power when the application was turned off or not even connected to the power supply (referred to as 'no-load' condition).

## Chronology efficiency standards

Experts calculated that without efforts to increase efficiencies and reduce 'no-load' power consumption, external power supplies would account for around 30% of total energy consumption in less than 20-years. As early as 1992, the U.S. Environmental Protection Agency started a voluntary program to promote energy efficiency and reduce pollution that eventually became the Energy Star program. However, the first mandatory regulation dictating efficiency and no-load power draw minimums wasn't put in place until 2004. The following section traces the path from the CEC's 2004 regulation up to the current standards that are in place today.

### April 2009

Europe enacted ErP Directive 2009/125/EC (Energy Related Products) with scheduled stages of implementation for efficiency and no-load requirements equivalent to Level IV and Level V stan-

dards. The schedule defined that the EU would harmonize with Level IV efficiency standards by April 2010 and Level V efficiency standards by April 2011.

### April 2011

EISA 2007, CEC Tier 3, and ErP Phase 2 took effect in full harmony of their standards leaving us with what is now simply known as the 'Level V Efficiency' standard, designated by the Roman numeral V surrounded by a circle.

Today, Level V will meet or exceed the requirements of any governing body around the globe. Power supply manufacturers indicate compliance by placing a Roman numeral V on the power supply label. Level V is enforced by the agencies all over the world except by UL in USA. However California requires also Level V.

### Moving forward

In what would effectively become the 'Level VI' efficiency standard, the proposal on the table would mandate no-load efficiencies down to 0.1W for external power supplies ranging from 1W to approximately 49W, boost mandatory average efficiency by about 1% and set standards for models with power ratings above 250W for the first time.

The EPA estimates that external power supply efficiency regulations implemented over the past decade have reduced energy consumption by 32-billion kW, saving \$2.5-billion annually and reducing CO2

Class ID	Product Class	Marking Requirement
B	Direct Operation, AC-DC, Basic-Voltage	Roman numeral VI
C	Direct Operation, AC-DC, Low-Voltage (except those with nameplate output voltage less than 3 volts and nameplate output current greater than or equal to 1,000 milliamps that charge the battery of a product that is fully or primarily motor operated)	Roman numeral VI
C-1	Direct Operation, AC-DC, Low-Voltage with nameplate output voltage less than 3 volts and nameplate output current greater than or equal to 1,000 milliamps and charges the battery of a product that is fully or primarily motor operated	No marking requirement
D	Direct Operation, AC-AC, Basic-Voltage	Roman numeral VI
E	Direct Operation, AC-AC, Low-Voltage	Roman numeral VI
X	Direct Operation, Multiple-Voltage	Roman numeral VI
H	Direct Operation, High-Power	Roman numeral VI
N	Indirect Operation	Class A: Roman numeral IV or higher Non-Class A: No marking requirement

External Power Supply Marking Requirements by Product Class

emissions by more than 24-million tons per year. Moving beyond the mandated government regulations, many OEMs are now starting to demand 'greener' power supplies as a way to differentiate their end products.

On 3 February 2014, the US Department of Energy (DOE) issued a pre-publication Federal Register final rule against the Notice of Proposed Rulemaking published in 2012. The new rule applies to all direct and indirect operation external power supplies (EPS), which are categorized into eight product classes. It not only increases the minimum energy efficiency

requirement of EPS from level IV to level VI, but also extends their scope to encompass lower voltage ac or dc output EPS, multiple-voltage EPS and EPS with nameplate output power exceeding 250 watts. The compliance date for the new requirements is 10 February 2016, which is two years after the rule's publication in the Federal Register.

For more information on Energy efficiency level VI from Mega Electronics Inc., go to <http://ept.hotims.com/51129-79>



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MVAB120	2 x 4	75W	120W		12/24/28/48V	91%
MVAD065		65W	-		12/24/48V	90%
MVAD040		40W	-			89%

For more information, visit [power.murata.com](http://power.murata.com)

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# electronic products and technology

## January

SUN	MON	TUES	WED	THURS	FRI	SAT	SUN
				1	2	3	
4	5	6	7	8	9	10	
		International CES Show January 6-9 Las Vegas, NV • <a href="http://www.cesweb.org">http://www.cesweb.org</a>			EP&T ElectroSource Ad Closing		
11	12	13	14	15	16	17	
18	19	20	21	22	23	24	
25	26	27	28	29	30	31	
	March/April EP&T Editorial Closing		Design Con January 27-30 Santa Clara, CA • <a href="http://www.designcon.com/santaclara/">http://www.designcon.com/santaclara/</a>		March/April EP&T Ad Closing		

## February

SUN	MON	TUES	WED	THURS	FRI	SAT	SUN
1	2	3	4	5	6	7	
						SPIE Photonics West February 7-12	
8	9	10	11	12	13	14	
SPIE Photonics West February 7-12 San Francisco, CA • <a href="http://spie.org/photonics-west.xml">http://spie.org/photonics-west.xml</a>		Medical Design & Manufacturing February 10-12 Anaheim, CA • <a href="http://mdmwest.mddionline.com/">http://mdmwest.mddionline.com/</a>					
15	16	17	18	19	20	21	
22	23	24	25	26	27	28	
		APEX February 24-26 San Diego, CA • <a href="http://www.apec-conf.org">http://www.apec-conf.org</a>					

## April

SUN	MON	TUES	WED	THURS	FRI	SAT	SUN
			1	2	3	4	
5	6	7	8	9	10	11	
		May EP&T Editorial Closing				NAB Show April 11-16 Las Vegas, NV <a href="http://www.nabshow.com">www.nabshow.com</a>	
12	13	14	15	16	17	18	
Hannover Fair, April 13-17 Germany <a href="http://www.hannovermesse.de/home">http://www.hannovermesse.de/home</a>		EPTECH Montreal <a href="http://www.ept.ca">www.ept.ca</a>		EPTECH Markham <a href="http://www.ept.ca">www.ept.ca</a>			
19	20	21	22	23	24	25	
				June/July EP&T Ad Closing			
26	27	28	29	30			
	June/July EP&T Editorial Closing		OCE Discovery, April 27-28 Toronto, ON <a href="http://www.oce-discovery.com">http://www.oce-discovery.com</a>				

## May

SUN	MON	TUES	WED	THURS	FRI	SAT	SUN
3	4	5	6	7	8	9	
10	11	12	13	14	15	16	
		EDS Show May 12-15 Las Vegas, NV • <a href="http://www.edsconnects.com">http://www.edsconnects.com</a>					
17	18	19	20	21	22	23	
IMS2015 May 17-22 Phoenix, AZ • <a href="http://www.ims2015.org">http://www.ims2015.org</a>							
24	25	26	27	28	29	30	
		ECTC May 26-29 San Diego, CA • <a href="http://ectc.net/">http://ectc.net/</a>		EPTECH Vancouver <a href="http://www.ept.ca">www.ept.ca</a>			
31							

## July

SUN	MON	TUES	WED	THURS	FRI	SAT	SUN
			1	2	3	4	
5	6	7	8	9	10	11	
12	13	14	15	16	17	18	
		SemiCon West July 14-16 San Francisco, CA • <a href="http://www.semiconwest.org">http://www.semiconwest.org</a>					
19	20	21	22	23	24	25	
26	27	28	29	30	31		
	September EP&T Editorial Closing			September EP&T Ad Closing			

## August

SUN	MON	TUES	WED	THURS	FRI	SAT	SUN
2	3	4	5	6	7	8	
	NI Week August 3-6 Austin, TX • <a href="http://www.ni.com/niweek">http://www.ni.com/niweek</a>						
9	10	11	12	13	14	15	
16	17	18	19	20	21	22	
23	24	25	26	27	28	29	
	October EP&T Editorial Closing				October EP&T Ad Closing		
30	31						

## October

SUN	MON	TUES	WED	THURS	FRI	SAT	SUN
					1	2	3
4	5	6	7	8	9	10	
11	12	13	14	15	16	17	
18	19	20	21	22	23	24	
25	26	27	28	29	30	31	
		EPTECH Ottawa <a href="http://www.ept.ca">www.ept.ca</a>		EPTECH Mississauga <a href="http://www.ept.ca">www.ept.ca</a>			
					Nov/Dec EP&T Ad Closing		

## November

SUN	MON	TUES	WED	THURS	FRI	SAT	SUN
	1	2	3	4	5	6	7
8	9	10	11	12	13	14	
15	16	17	18	19	20	21	
22	23	24	25	26	27	28	
29	30						
					ElectroSource 2015 Ad Closing		





### Dc input EMC filter is rated at 50A

**RDEN-048050** EMC dc input filter complements existing R series of ac input EMC filters. Product can accept an input voltage of up to 76Vdc and is rated for currents up to 50A. Enclosed in a metal case, connections are made via rugged M5 studs for easy termination and the filter will operate at 50A in an ambient of -30 to 55C, derating to 20A at 85C. With frequencies between 0.2 to 10MHz, common mode attenuation is 30dB and with frequencies between 0.7 to 30MHz differential mode attenuation is 25dB.

**TDK-LAMBDA**

<http://ept.hotims.com/51129-80>



### Front-end ac-dc power supply delivers 1300W

**D1U3CS** 1300 series of 1300 Watt front-end ac-dc power supplies can deliver a wide 108 to 264Vac universal input, is hot pluggable, has no minimum load requirement and incorporates low-loss integral O-Ring Field Effect Transistors (FETs) on its main 12V output, for fault-tolerant and N+1 redundant applications. With a power density of 23 Watts per cubic inch, unit can achieve a high typical conversion efficiency of 92% at half full load. Product has a primary 12Vdc output and an optional auxiliary output of either 3.3Vdc, or 5.0Vdc for powering standby circuitry.

**MURATA POWER SOLUTIONS**

<http://ept.hotims.com/51129-81>

### Dc-dc power modules suit space-constrained apps

**MIC33163/MIC33164(1A)** and **MIC33263/MIC33264(2A)** family of low-profile step down power modules are capable of 100% duty cycle and operating with an input voltage range from 2.7V to 5.5V. The compact modules integrate a synchronous buck converter with an inductor into a 2.5mm x 3mm x 1.1mm (MIC33163/4) and 2.5mm x 3mm x 1.9mm (MIC33263/4) QFN package. Devices can operate up to 4MHz with improved light and full load efficiency (up to 88% at 10mA and over 93% peak efficiency). Architecture provides an ultra-fast load transient response that minimizes output capacitance thereby reducing total board space to just 4.6mm x 7mm. Devices provide an efficient alternative to linear regulators.

**MICREL**

<http://ept.hotims.com/51129-82>

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**TRACO**

<http://ept.hotims.com/51129-83>



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**P Series** micro-power high voltage power supplies provide fully regulated and programmable outputs of 0 to 1200V or 0 to 2000V in a lightweight, miniature PC-mount package. Products consume less than 4mA at full output and are housed in a case less than a quarter-inch tall. Devices provide an inductor/transformer-less design, low noise circuitry and shielded case, while ripple is less than 100 micro-volts peak-to-peak.

**EMCO**

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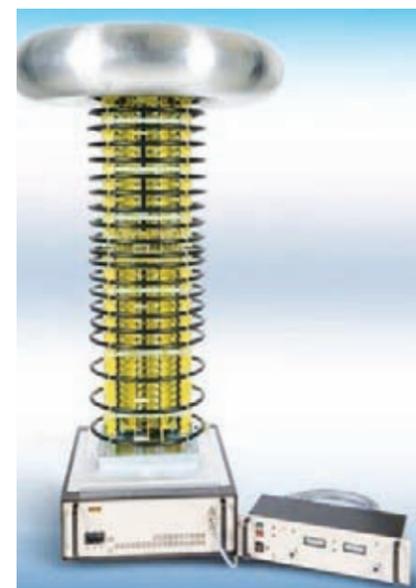


### Multi-range dc power supplies replace multiple units on bench

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### 4kW high voltage dc power supplies lower ripple, noise

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**GLASSMAN**

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# Battery welding

continued from page 14

for buss bar welding that would require a brazing material for resistance welding or a large power laser welder. Both butt, fillet and lap welds are possible up to and beyond thickness of 0.02" thick copper are routinely welded. When welding copper using micro-TIG it is extremely important to use a pulsation function that creates the weld without porosity, as shown in Figure 3.

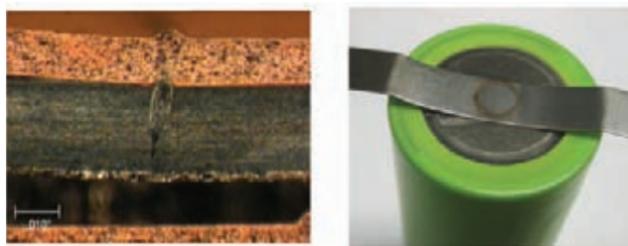
### Laser welding

For tab and buss bar joining, laser welding offers a high degree of flexibility, welding both thin and thick tab materials and materials such as copper, aluminum, steel and nickel, as well as dissimilar material combinations. Two example welds are shown in Figure 4.

When welding a tab to a terminal, the general rule of thumb is that the tab should be thinner than the can terminal

thickness. As the can thickness decreases the tab usually must be 50% of the can thickness for a safe processing window that provides the weld strength and conductivity whilst not penetrating the can.

As laser welding has no limitation on the proximity of the welds, the laser can place any pattern of weld spots on the tab according to strength requirements. It is worth noting that, in nearly all cases, if the joint's weld strength is achieved, conductivity follows. For more conductive materials, the weld area required for strength can be as much as 10 times that required for conduction.



Cross section and top view of a fiber laser weld of 0.012" thick copper tab to steel battery can

FIG. 4: Examples of laser welding conductive tabs

As shown in Figure 5, the placement of the weld spots on the tab is completely flexible and can be tuned to the strength requirements of the pack or tab. For example, peel strength is often used as a metric for weld quality. Therefore the welds can be positioned accordingly. The peel strength of (a) is 15 lbs. and (b) is 60lbs.

The time needed to add additional weld spots is very short; sufficient tab strength can be achieved with very little impact on cycle time.

Although peel strength remains an important weld test, vibration is also important. As vibration strength places an emphasis on having good weld strength in any direction, the circle of weld spots shown in (c) provides the solution.

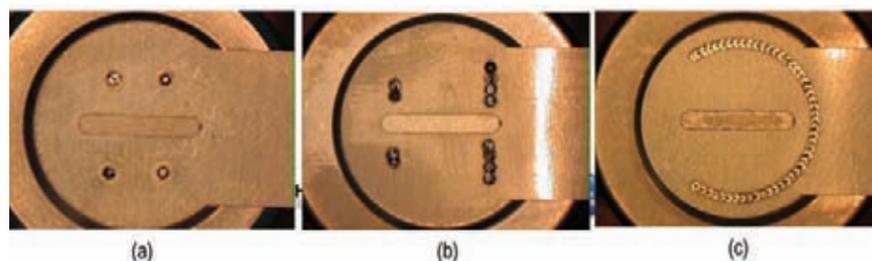


FIG. 5: Examples of flexible weld placement for tailoring weld strength and weld

Technology	Key Benefits
Resistance welding	Closed loop feedback welding, cost effective, self-tooling
MicroTIG	Large process window, cost effective for copper welding
Laser	Non-contact, high speed welding, tailored weld patterns, weld any joint geometry

Joining Application	Technology	Details
Can and plug sealing	Laser	Barrier sealing of aluminum, nickel and cold rolled steel with minimal heat input
Tab to electrode/case	Resistance	< 0.015" thick nickel/steel straps < 0.007" thick copper straps
	Laser	Up to 0.04"+ thick tab material Electrode/case thickness > 1.5x tab thickness
Tab to busbar	Laser	Multiple materials and layers can be welded Up to 0.04"+ weld penetration in any material
	Micro-TIG	Thick copper welding, single spot nugget dimensions up to 0.15" x 0.15" Seam welding capability
	Resistance	Material thickness range as for tab welding. Thicker materials can be brazed.

### Battery pack manufacturing systems

The two main production options available are continuous flow in-line or offline systems. It should be noted that the manufacturing flow can have an impact on the welding technology selected and this should be factored in at the technology selection stage. A consideration of materials, joint geometry, weld access, cycle time and budget will normally point in the direction of the required joining technology.

### Production volume driven by consumer demand

The production volume of batteries continues to be driven by the demands of consumer electronics and electric vehicles. Likewise, the manufacturing and joining needs of these batteries are also pushed by capacity, size, materials and usage. Resistance, microTIG and laser technologies each have specific features that align well to these joining needs. A clear understanding of the technolo-

# CORPORATE OVERVIEW



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Profiles of leading electronic suppliers follows on next pages

gies and application is needed to implement an efficient and reliable production welding system. The tables below offer some guidelines on the available methods and a few parameters including suitability for a variety of applications.



For more information on selecting and using laser, micro-TIG and resistance technologies from Miyachi America Corp., go to <http://ept.hotims.com/51129-87>



### High power diodes lower clamping voltage under surge

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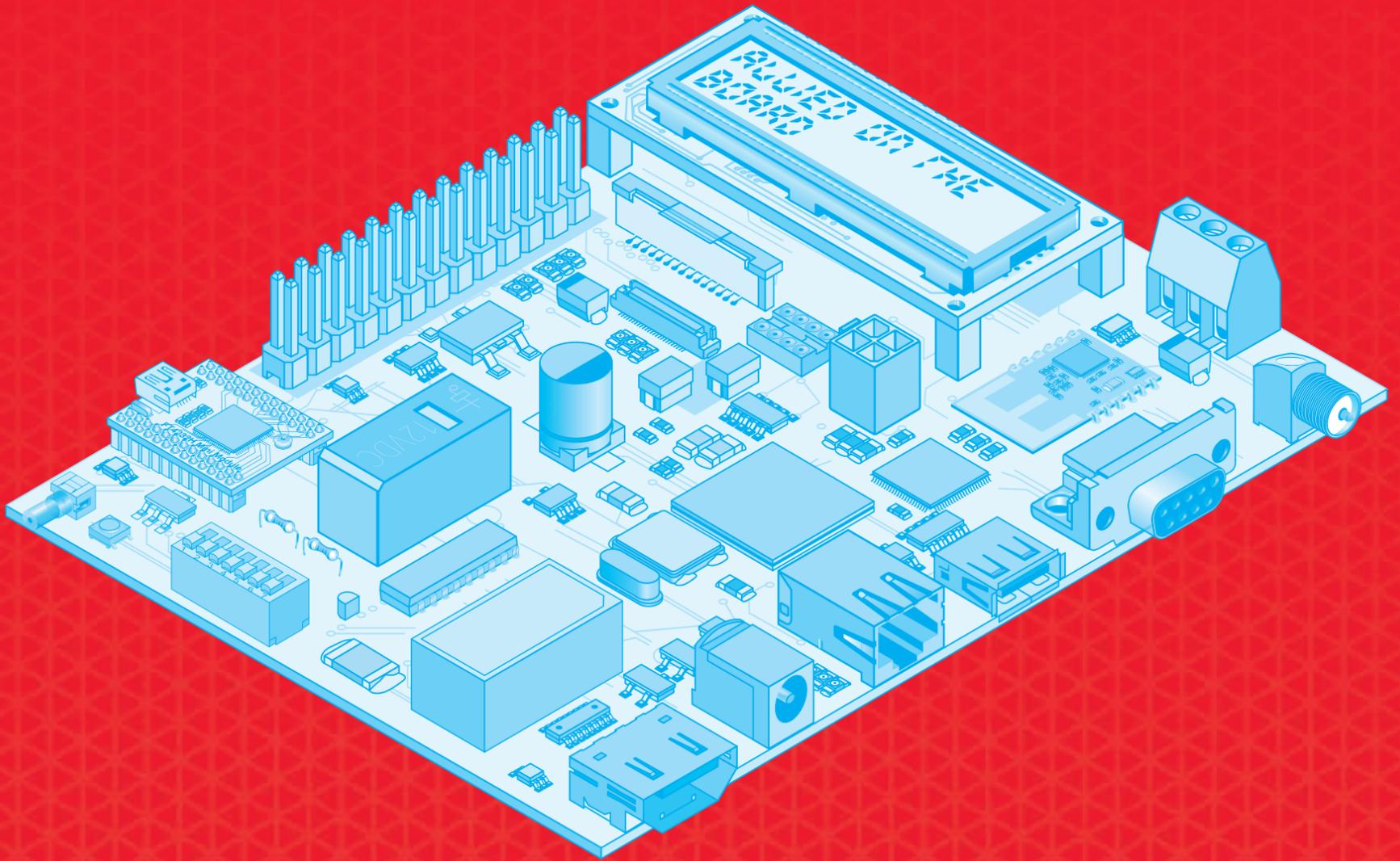
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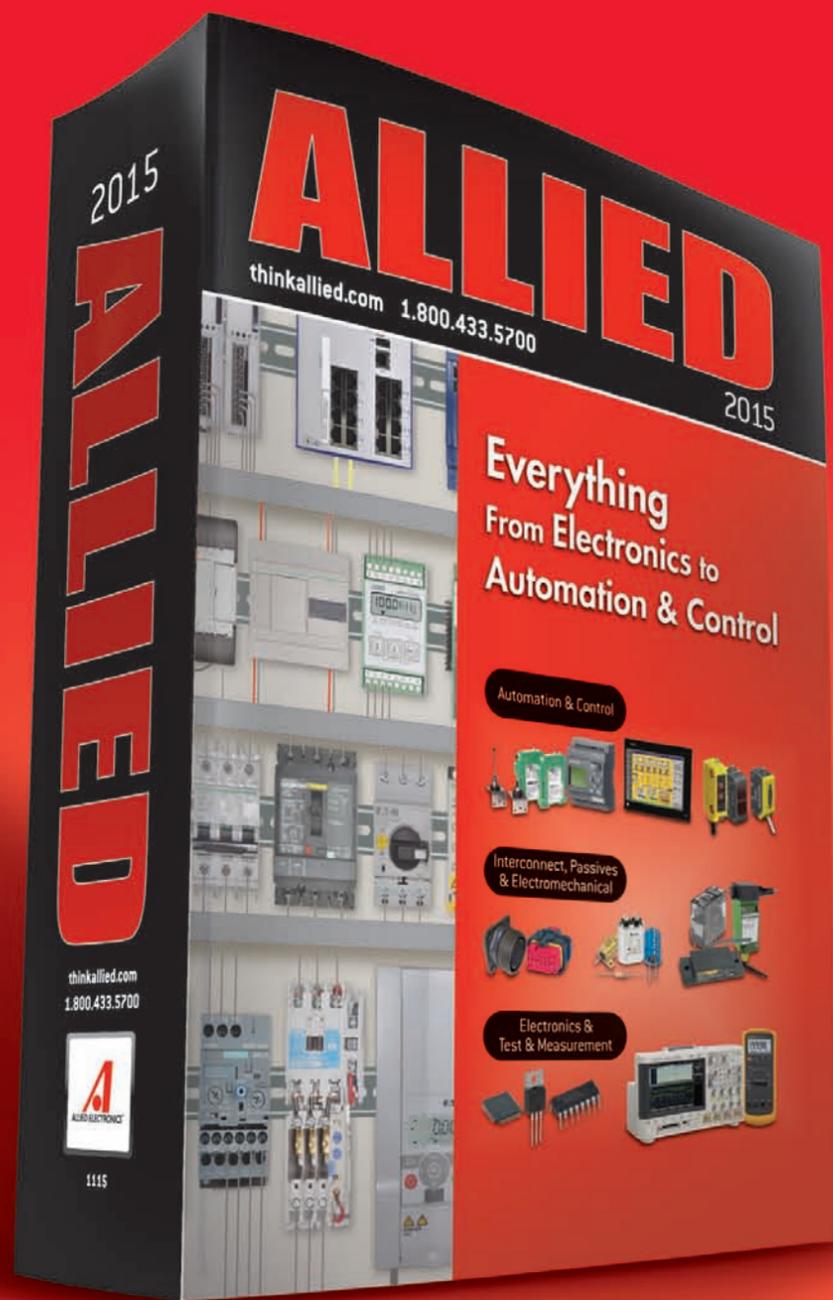


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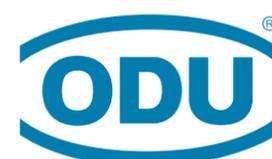
Over 70 years ago, the founder of ODU, Otto Dunkel developed the SpringTac™ connector system. A pioneer of his time, Mr. Dunkel's new connector system revolutionized the connector industry by allowing over 100,000 connection cycles over the lifetime of the connector.

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# Solving Thermal Management Challenges in a Minimum Space

Heat is a killer for electronic systems. As applications get thinner and lighter, this statement has never been more true, yet space and weight restrictions – especially in portable mobile devices – mean that conventional solutions may not be feasible. But it's not just consumer products such as smartphones, tablets and cameras that are at risk. Communications infrastructure equipment cram more and more complex electronics systems into a small space; electric (Eco) and hybrid cars require long-lasting, lightweight batteries; the advent of the smart factory (Industry 4.0) calls for greater levels of monitoring and control; solar panels (ironically) need to be able to cope with constant exposure to the sun; modern medical devices must be able to be worn comfortably.

All these examples require heat to be transferred or dispersed effectively, using a minimum amount of space. Pyrolytic Graphite Sheet (PGS) is a new, ultra-light graphite interface film material, developed by Panasonic, which has a thermal conductivity up to five times greater than copper. It is pliable enough to be cut and folded into complex three dimensional shapes then simply stuck onto the heat source to diffuse the heat or provide a path for heat to flow to a cold wall.

## WHAT IS PGS?

Pyrolytic Highly Oriented Graphite Sheet is made of graphite with a structure that is close to a single crystal. It is produced from polymeric film using a heat de-composition process. The hexagonal crystal structure of graphite is arranged uniformly in a horizontal 2D structure.



## FEATURES

PGS has a number of features which make it highly suitable as an easy-to-use, space-saving, thermal management solution:

- **Super Thin** – PGS is available in a range of thicknesses from 100µm down to 10µm – and has excellent thermal conductivity from 700 to 1950W/m.K which is two to five times higher than copper and up to seven times better than aluminium;
- **Flexible and Pliable** – PGS can be easily cut and folded into a complex shape. With a bend radius of 2mm, sheets can be bent through 180 degrees more than 3000 times, and its thermal conductivity is unaffected if sharp folds are avoided;
- **High Stability** – The material is very stable so it is resistant to environmental effects and shows no deterioration with age;
- **EMI Shielding** – PGS can provide some shielding to electromagnetic noise, providing a simultaneous EMI and thermal solution.

PGS film is used to transfer heat away from a heat source, or to diffuse or spread heat away from a hot spot – even around corners (See Figure 1). It can also be used as a highly-efficient thermal interface material (See Figure 2).

PGS is available as sheet only, or in combination with a number of standard and high heat resistance adhesive options. Additionally, for higher isolation requirements PET tape is available.

## ALTERNATIVE SOLUTIONS

PGS has a lower thermal resistance than silicon sheet material and graphite products from other manufacturers. Silicone grease has a lower thermal resistance, but it has the disadvantage of drying up over time and losing effectiveness. Also it is less easy to apply uniformly so results can be variable.

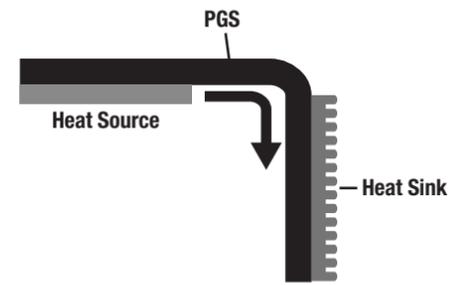


Figure 1

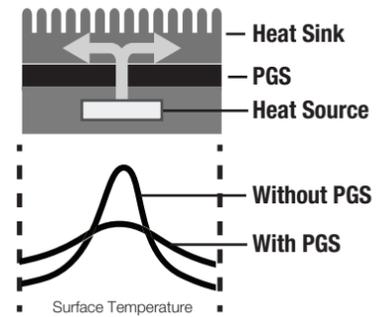


Figure 2

Want to see PGS in action? Visit our Circuit and Thermal Protection webpage to request a demonstration tool and try it out for yourself!



[na.industrial.panasonic.com/products/circuit-thermal-protection](http://na.industrial.panasonic.com/products/circuit-thermal-protection)

# Understanding Polymer Capacitor Varieties



Capacitors may seem simple enough, but specifying them has actually grown more complex in recent years. The reason why comes down to freedom of choice. The universe of capacitors has expanded greatly over the past few years, in large part because of capacitor designs that take advantage of advances in conductive polymers.

These advanced capacitors sometimes use conductive polymers to form the entire electrolyte. Or the conductive polymers can be used in conjunction with a liquid electrolyte in a design known as a *hybrid capacitor*. Either way, these polymer-based capacitors offer a performance edge over conventional electrolytic and ceramic capacitors when it comes to:

- Electrical characteristics.
- Stability.
- Longevity.
- Reliability.
- Safety.
- Life cycle cost.

The various polymer and hybrid capacitors have distinct sweet spots in terms of their ideal voltages, frequency characteristics, environmental conditions and other application requirements. In this paper, we'll show you how to identify the best uses for each type of advanced capacitor. We'll also highlight specific applications in which a polymer or hybrid capacitor will outperform traditional electrolytic or even ceramic capacitors.

## POLYMER CAPACITOR VARIETIES

Polymer capacitors come in four main varieties, including the hybrid. Each type has different electrolytic and electrode materials, packaging and application targets:

- **Layered polymer aluminum capacitors** use conductive polymer as the electrolyte and have an aluminum cathode (see Figure 1). Depending on the specific model, these capacitors cover a voltage range from 2-35V and offer capacitances between 2.2-560µF. The distinguishing electrical characteristic of these polymer capacitors is their extremely low equivalent series resistance (ESR). For example, some of our SP-Cap™ polymer capacitors have ESR values as low as 3mΩ, which is among the lowest in the industry. Packaged in a molded resin as compact surface mount devices, these layered polymer capacitors have a low profile. As a result of the electrical and form factor characteristics, they have applications in a variety of handheld electronic devices or other applications that require a low-profile capacitor that will not interfere with a nearby heat sink.
- **Wound polymer aluminum capacitors** are also based on conductive polymers and aluminum, but they have a wound foil structure. The wound polymer capacitors cover a wider range of voltages and capacitance values than other types of polymer capacitors. Voltages extend from 2.5 to 100V, while capacitances run from 3.3 to 2700µF. Like the layered polymer capacitors, the wound style has extremely low ESR values. Some of our OS-CON™ capacitors, for instance, have ESR values below 5mΩ. The wound style can also be surface mounted, though they are not quite as compact as the layered capacitors.
- **Polymer tantalum capacitors** employ a conductive polymer as the electrolyte and have a tantalum cathode (see Figure 2). They span voltages from 2 to 35V and capacitances from 3.9 to 1500µF. They, too, have low ESR values. They, too, have low ESR, with some of our POSCAP™ capacitors exhibiting ESR values as low as 5mΩ. Packaged in a molded resin case, the tantalum polymer capacitors are among the most compact on the market. Our POSCAP M size, for example,

measures just 2.0 by 1.25 mm. Though compact, a wide range of sizes is available for this capacitor type.

- **Polymer hybrid aluminum capacitors.** As their name suggests, these capacitors use a combination of a liquid and conductive polymer to serve as the electrolyte and aluminum as the cathode. Think of this technical approach as the best of both worlds: The polymer offers high conductivity— and a correspondingly low ESR. The liquid portion of the electrolyte, meanwhile, can withstand high voltages and provide higher capacitance ratings due to its large effective surface area. The hybrid capacitors offer a voltage range from 25 to 80V and capacitances between 10 and 330µF. At 20 to 120mΩ, ESR values for hybrids are higher than other types of polymer capacitors, but still very low considering the higher power applications they address.

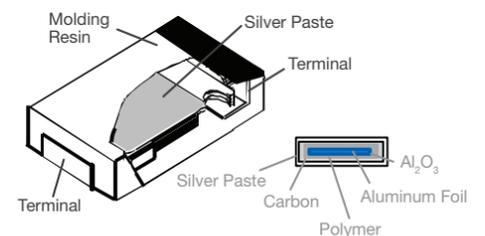


Figure 1

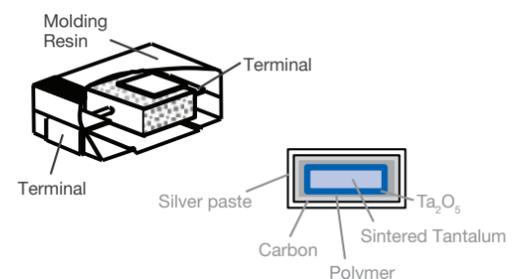
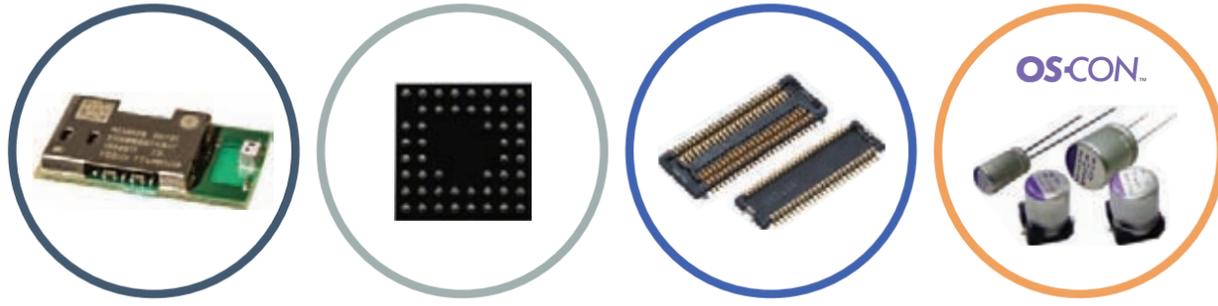


Figure 2

Learn More about Panasonic Polymer Capacitors by visiting our website and downloading our full white paper entitled, "Understanding Polymer and Hybrid Capacitors":

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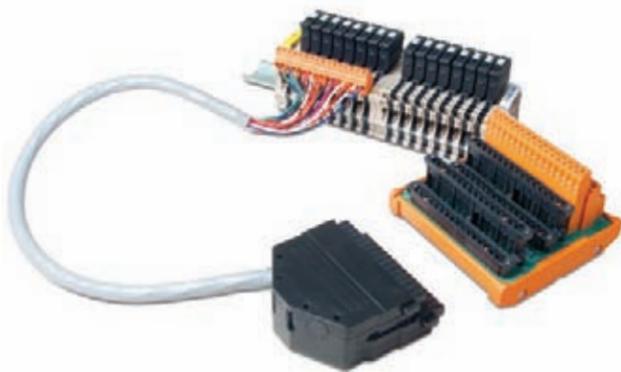
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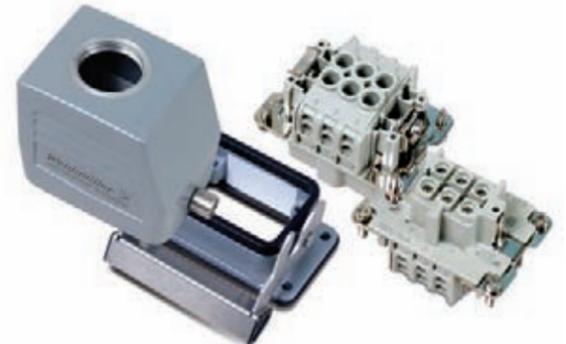


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## products on review

### Touch-safe fuse cover serves as inserter, extractor

ESO 10.3x38 fuse inserter, extractor and cover in one is a multi-functional fuse cover for use on printed circuit boards. Product can be used simultaneously as an inserter, extractor and cover for fuses. Designed for use with firm's CSO fuse clips and the ASO 10.3x38 fuse, the combination provides touch-safe circuit protection up to 1500Vdc. Upon inserting the product with captive fuse into the fuse clips, the installation provides a touch-safe cover according to IP20 specifications. If the fuse is triggered, then the device can also be used as a fuse removal aid. Additional tools are not required.

SCHURTER

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### Bus System connection unites electronic appliances

**ItalTronic Bus System** connects several electronic appliances by means of a bus with a limited number of wires. Product is widely used in all industrial sectors. Firm has developed and renewed its solution for the Railbox line and will also extend this solution to the Modulbox line. Firm will eliminate the Jump-bus connection it previously proposed, along with its respective accessories: terminal covers for Jump-bus.

CONNECTOR SOLUTIONS

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### Smart card socket permits two-sided card insertion

**Model 116F-DBC0** smart card socket two-sided card product withstands 10,000 mechanical cycles and is rated to 1.0A. Product simplifies use, as smart card can be inserted without remembering which side should go in first, as each side is the correct side. Device provides a recommended IR reflow temperature of 260C for soldering, operating range of -40C to 85C and dielectric withstanding voltage of 500Vac. Product's voltage rating is 100Vac-dc, contact resistance is 50MΩ and insulation resistance is 1000MΩ.

DB LECTRO

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