HOW2POWER TODAY
Your Power Design Newsletter

Special Report

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Record Crowd Pours Into PCIM Europe To See Latest Power Products

by Cliff Keys, Technology Journalist

The latest edition of PCIM Europe, which was held May 14-16 in Nuremberg, Germany, continued to expand the event's reach with a very positive outcome this year. Europe's premier power event saw a significant 15% increase in the number of visitors, drawing 7,883 in 2013 versus 6,874 in 2012. Meanwhile, the show also drew 395 exhibitors and 87 represented companies. Visitors to this event experienced displays and demonstrations of the latest developments and trends in power electronics, intelligent drive technology, renewable energy and energy management.

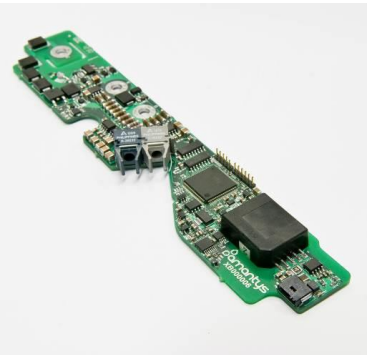
A record 7883 visitors attended PCIM Europe 2013 where they met with 395 exhibitors representing 87 companies, which showcased the latest developments and trends in power electronics, intelligent drive technology, renewable energy and energy management.

Meanwhile, many attendees also participated in PCIM's technical conference. A total of 726 delegates attended this year's conference, which was down slightly from the 744 delegates who attended the conference last year.

Visiting the show, I witnessed a broad variety of the industry's power offerings including many new products just being launched into the marketplace. In comparison to previous PCIM Europe events, this year's exhibition had more space, which gave a very easy route through, making it easier to navigate from booth to booth.

Among the many intriguing products I encountered in my tour of the exhibition were examples of the latest power modules, discrete power semiconductors, current sensors and dc-dc converters. In this snapshot of PCIM 2013, I describe these new products and how they are pushing power performance limits to enable greater performance in a variety of applications.

More-Intelligent Power Switching For IGBTs



Power Insight-enabled Amantys Power Drive.

Amantys is a company that develops power switching technology primarily aimed at the IGBT market. One of the key differentiators for Amantys is the use of more intelligence in the power switching process to improve optimizations and provide the ability to export condition-monitoring data from the heart of the power switching process, a software and hardware subsystem known as Amantys Power Insight. The Amantys Power Drive range of IGBT gate drivers incorporates the ability to monitor six key IGBT parameters and gate-drive parameters and export the information over the existing fiber optic links.

Historically it has been very challenging to export meaningful readings across the high-voltage isolation barrier, but the breakthrough at Amantys solves this problem. The use of Amantys Power Insight over the existing fiber optic links also minimizes cost and complexity associated with the technology.

Amantys worked with the Portuguese firm Empresa de Manutenção de Equipamento Ferroviário (EMEF) to export the condition monitoring data from the gate drives into the Lusogate interface and then into a train management system. In the 2300/2400 series EMU there are twenty four IGBTs in the upgrade all of which can be monitored by the system.

The Amantys Power Drive with Power Insight can monitor the gate-drive temperature, the collector-to-emitter voltage in both the on and the off state, the gate-emitter voltage in both the on and the off state and the power supply voltage on the gate drive. In addition to this, the Power Drive can log data about the driver, for example, the number of switching cycles, the type and number of short circuit events and the number of overvoltage clamp events. The data log information can also be exported to give an indication of the historical operating environment of the IGBT.

A SiC Six-Pack Power Module

Cree introduced the industry's first commercially available silicon carbide (SiC) six-pack power module in an industry-standard 45-mm package. When replacing a silicon module with equivalent ratings, Cree's six-pack module can reduce power losses by 75%, which leads to an immediate 70% reduction in the size of the heat sink or a 50% increase in power density.

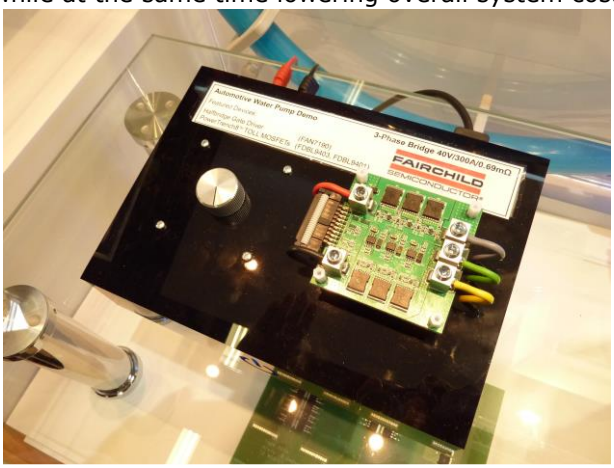
The new CCS050M12CM2 six-pack SiC module unlocks the traditional design constraints associated with power density, efficiency and cost, thereby enabling the designer to create high-performance, reliable and low-cost power conversion systems. When compared to state-of-the-art silicon modules, the SiC 1.2-kV, 50-A modules deliver performance equivalent to silicon modules rated at 150 A.

Cree's CCS050M12CM2 SiC six-pack module.

The CCS050M12CM2 is available for immediate shipping through Digi-Key and Mouser Electronics. In addition, gate-driver ICs suitable for SiC MOSFETs are available from IXYS and Texas Instruments, while complete gate-driver boards (CRD-001) are available as samples from Cree upon request. For further information about the SiC six-pack module, visit www.cree.com/SiC-modules.

A Fuel-Saving Three-Phase VSD Power Module

Automotive engineers are constantly looking for ways to reduce fuel consumption and lower CO_2 emissions, while at the same time lowering overall system costs. To help designers meet these challenges, Fairchild Semiconductor developed the three-phase, variable-speed-drive (VSD) automotive power module, the FTCO3V455A1.



Fairchild Semiconductor's FTCO3V455A1 three-phase, variable-speed-drive automotive power module.

Intended for 3-phase motor-control applications under 2 kW, this device allows designers to reduce the overall system cost of higher-power applications. This includes electric power steering (column-mount and rack-mount), electro-hydraulic power steering, electric water pumps, electric oil pumps and engine cooling fans.

The FTCO3V455A1 allows these applications to deliver higher torque outputs. Additionally, power modules are more cost-effective than traditional solutions when all aspects of the power stage design (interconnections, mechanical, electrical and thermal) are considered.

The FTCO3V455A1 automotive power module, through increased electronics integration, uses fewer components than discrete solutions and provides a compact system design that delivers better EMI performance. An integrated

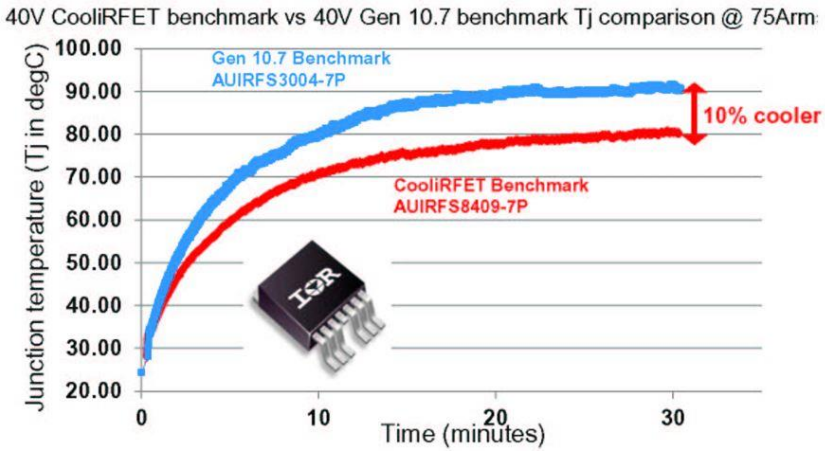
dc bus high-accuracy current-sense resistor enables full control of the electric motor, while an NTC thermistor provides thermal protection.

The module enables an extremely low electrical resistance path between the battery and motor, in addition to a complete separation of the control board from the high-power stage. This provides high current handling capability at a reduced system cost. The module, measuring 44.00 x 29.00 x 5.00 mm, offers designers better EMC, greater than 1.5 kV in electrical isolation and lower motor ripple. Additionally, the module provides better system reliability and easier installation.

MOSFETs For Heavy-Load Automotive Applications

International Rectifier introduced a family of automotive-qualified COOLiRFET MOSFETs delivering benchmark on-state resistance ($R_{DS(ON)}$) for heavy load applications including electric power steering (EPS), braking systems and other loads on internal combustion engine (ICE) and micro hybrid vehicle platforms.

The family of 22 AEC-Q101-qualified 40-V n-channel MOSFETs feature IR's proven Gen 12.7 trench technology that delivers ultra-low $R_{DS(ON)}$ in D^2Pak-7P, D^2Pak, DPak, TO-262, IPAK and TO-220 packages. The benchmark D^2Pak-7P AUIRFS8409-7P delivers $R_{DS(ON)}$ max as low as 0.75 mΩ at 10-V V_{gs} with a current rating up to 240 A. The new devices offer low conduction losses and robust avalanche performance to deliver higher efficiency, power density and reliability. With this performance, many applications using these new COOLiRFET devices run significantly cooler than with state-of-the-art MOSFETs.



International Rectifier's AEC-Q101-qualified MOSFETs.

"IR's new family of COOLiRFET 40-V automotive-qualified MOSFETs achieves benchmark $R_{DS(ON)}$ in all package variations to deliver a highly efficient solution for high current automotive applications requiring high performance while reducing overall system cost," said Jifeng Qin, product manager, automotive MOSFETs, IR's Automotive Products Business Unit.

Extended Performance Capabilities For Current Sensors

The "Cores and Components" division of VACUUMSCHMELZE (VAC) presented at the show as an expert partner for current sensors in the fields of future technologies and clean energy. The Hanau, Germany-based company demonstrated its materials expertise and presented products including a range of current sensors from its comprehensive portfolio. In addition, Dr. Stefan Lehmann gave a presentation entitled "New IGBT-Drive Transformers" at the exhibition forum.

VAC current sensors, unlike conventional Hall-effect sensors, use a VAC-developed magnetic field probe of cobalt-based amorphous alloy as a zero-field detector, which offers distinct benefits such as minimal offset current and negligible long-term drift. Since offset current is practically temperature-independent, the current sensors deliver reliable and ultra-precise readings in a wide variety of operating conditions.

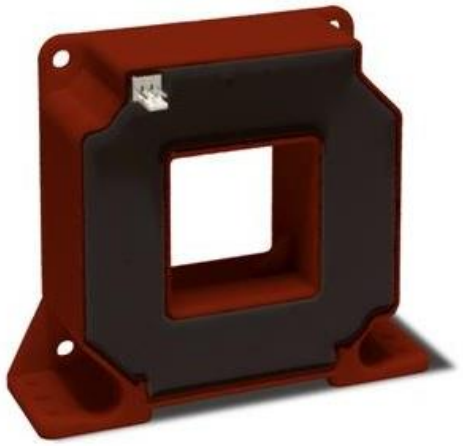
Among the products showcased by VAC was a new range of current sensors for print assembly with model numbers 4646-X7xx. These sensors are largely identical to VAC's highly successful ultra-compact 4646-X6xx range. Their extended clearance and creepage distances enable system voltage to be increased up to 600 V rms and operating voltage up to 1020 V rms (as per EN 61800). They also have four current bars instead of three, reducing current density in parallel circuits and allowing users more options for parallel and series connection to tailor measurement ranges to their specific application.

Ac- and dc-sensitive differential current sensors**,** or DI sensors, form the core of residual current monitoring units (RCMUs) compliant with the EN 62109 standard for transformerless solar inverters. The sensors measure residual current to a precision level of 1.5% of the nominal residual current of 300 mA and generate an output voltage proportional to the differential current. These differential current sensors offer a range of additional functions including sensor core demagnetization, which can be triggered by the supply voltage or as required. The new 4646-X975 sensor with integrated primary conductors is designed for single-phase systems and features test current integrated into the sensor housing.

This feature is also offered by the new model 4646-X976, which is designed for three-phase systems and has four integrated primary conductors.

As current trends continue to move towards increasingly high-power applications in central inverters for photovoltaic systems, wind power inverters or large-scale drive systems, demand for devices capable of detecting increasingly high current levels is growing. In response to this need, VAC has advanced the superior functional principle of its current sensor and developed high-current sensors for currents of 1000 A eff with a measurement range of up to 2500 A.

Compared to existing devices, VAC's solution offers the hallmark advantages of VAC sensors such as high measurement precision and stability, broad measurement range and outstanding dynamic properties, as well as low sensor power consumption thanks to a PWM driver for compensation current. The wide opening enhances flexibility for the user when connecting the primary conductor.



VAC's high-current (up to 1000 A effective) current sensors.

Extreme Power Density For DC-DC Conversion

Vicor announced the expansion of its ultra-high density Picor Cool-Power PI31xx series of isolated, zero voltage switching (ZVS) based dc-dc converters optimized for 24-V industrial, 28-V aerospace/defense and/or demanding wide-temperature applications. The new Cool-Power PI31xx converters retain the product series' signature 0.87- x 0.65- x 0.265-in. surface-mount package profile to provide up to 334 W/in^3 power density and 2250-V input-to-output isolation. At less than 50% the size of a conventional isolated sixteenth brick, Cool-Power PI31xx converters provide exceptional performance in an IC package for use in high-density system designs.

Picor Cool-Power PI31xx series of isolated, ZVS-based dc-dc converters from Vicor.

Cool-Power PI31xx series converters utilize an advanced ZVS architecture and high-performance planar magnetics to enable IC-like density and greater PCB layout flexibility in space-constrained environments. The high-switching frequency (900 kHz) of the PI31xx converters reduces input filter and output capacitance requirements, further reducing space constraints.

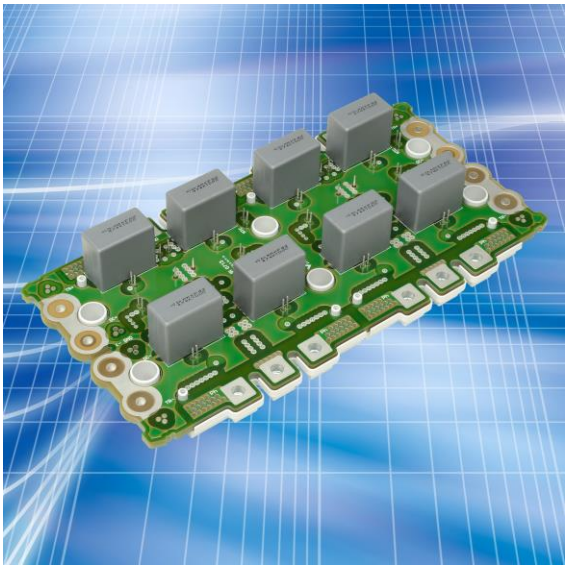
Fully equipped with a variety of programmable features, the PI31xx include output-voltage trimming, programmable soft-start capability, and remote on/off enable. Within these converters, there is also a temperature monitoring function, providing an analog output voltage proportional to the internal module temperature.

The PI31xx is self-protected against fault conditions including input overvoltage, undervoltage lockout, over-temperature, and output overvoltage. A constant current limit threshold is employed to protect against short circuit and overload conditions. All fault conditions have an auto-restart function.

When paired with 0.98- x 0.49- x 0.18-in. Picor QuietPower EMI filters—described as the smallest filters in this product category at less than 25% the size of competing offerings—designers are afforded an end-to-end isolated dc-dc conversion and EMI filtering solution that's said to be unrivaled in density optimization. QuietPower filters provide up to 99.5% efficiency and are designed for universal compatibility with high frequency switching dc-dc converters from any manufacturer. Example products include the QuietPower QPI-12 filter with high common-mode (>40 dB) and high differential-mode (>70 dB) attenuation for industrial applications. For aerospace/defense applications, the MQPI-18 offers >45 dB and >75 dB common-mode and differential-mode attenuation respectively.

Ultra-low Inductance High-Voltage Power Module

Vincotech, a supplier of module-based solutions for power electronics, has launched a new low-inductance power module designed for applications ranging up to 400 kW such as three-phase solar inverters. This high-voltage 2x*flow*NPC 4w module features a higher power rating in the new wide-body housing. Its Neutral Point Clamped (NPC) topology provides maximum efficiency for higher switching frequencies.



Vincotech's 2xflowNPC 4w low-inductance power modules.

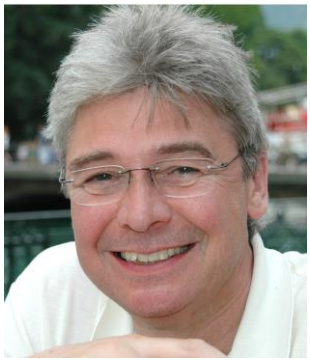
This remarkably efficient power module integrates all three phases of the NPC inverter topology into a new low-inductance package with a high-power screw interface. The NPC topology cuts output filter effort and filter losses by more than 50%, as well as switching losses by 50%.

Equipped with extremely fast 1200-V components to achieve a 2400-V/800-A rating, the 2x*flow*NPC 4w module is destined for solar and UPS applications with ratings up to 400 kW and a dc link of 1500 V. Its ultra low-inductance (5-nH) technology and onboard dc capacitors extend maximum PWM frequencies up to 20 kHz, which is unique in this power range. The 2x*flow*NPC 4w module is available in the 2x*flow*SCREW 4w housing. Samples may be ordered via standard sales channels.

To learn more about Vincotech's power module products, please visit http://www.vincotech.com/products/by-topologies.html.

If reading about some of the exciting products displayed at PCIM 2013 has piqued your interest, consider attending next year's event. PCIM Europe 2014 will take place from May 20–22 at the Exhibition Centre Nuremberg.

About The Author



Cliff Keys is a freelance writer and editor with more than 25 years of media and editorial experience covering semiconductors and power electronics. He has written, both for print and the web, for leading electronics trade publications in the U.S and Europe. He operates out of the U.K. and Germany and takes on writing and consulting projects for different trade publications and vendors. Prior to becoming an editor, Cliff worked in industry as an electronics engineer and became marketing communications director for National Semiconductor in Europe.