

Free, Virtual ECCE 2021 Expo Presents Latest Tools, Instruments And Components

by David G. Morrison, Editor, How2Power.com

Each year, the IEEE Energy Conversion Congress & Expo hosts an exhibition that showcases the latest design tools (hardware and software), test instruments and components that are critical to the development of the various energy conversion applications discussed at ECCE. This year’s ECCE exhibition is being hosted virtually on the vFairs platform, which will make the exhibits accessible to a global audience of engineers, who can browse the booths and interact with exhibitors for free.

This article previews some of the products that companies will be showing in the virtual ECCE expo, including current sensors, magnetic cores and planar magnetics, GaN devices, LED drivers, and automotive power MOSFETs. Meanwhile in the design tools and instruments area, we highlight products for hardware-in-the-loop testing, simulation and design tools for power electronics and motor drives, an oscilloscope series, and programmable power supplies. Several of these products will be featured in interesting demos.

Attendees are encouraged to visit the exhibition during live exhibit hours on Monday, October 11 and Tuesday, October 12 as this will give them the most direct access to interact with exhibitors through the chat feature. See the table below for exhibit hours. However, beyond the live exhibit hours, registered attendees will be able to access the exhibition through November 2. (Click [here](#) to register for a free pass for the exhibition.)

In addition to the exhibit sessions, the ECCE schedule also includes dedicated Product Sessions during which select vendors will offer presentations on their products. Note that all times listed on the exhibition schedule are in Pacific Daylight Time (PDT, in deference to the intended conference destination—Vancouver, Canada). So please adjust the scheduled exhibit hours to match your time zone as needed.

This feature contains product information as available at the time of this writing. However, this article will be updated between now and the start of the conference, as additional details are supplied by exhibitors. See How2Power.com’s [ECCE section](#) for updates to this article.

ECCE 2021 Exhibition Schedule.

Monday, October 11, 2021	Tuesday, October 12, 2021	October 13 - November 2, 2021
Live Exhibits 10:30 AM – 12:00 Noon (PDT) 2:00 PM – 3:30 PM (PDT)	Product Session 8:30 – 9:30 AM (PDT)	Post-conference booth hosting period. Those who have registered for the exhibition can continue to access the exhibition during this period.
	Live Exhibits 9:30 – 11:00 AM (PDT)	
	Product Session 3:30 – 4:30 PM (PDT)	
	Live Exhibits 4:30 – 6:30 AM (PDT)	

Click [here](#) to register for a free pass to the ECCE 2021 exhibition.

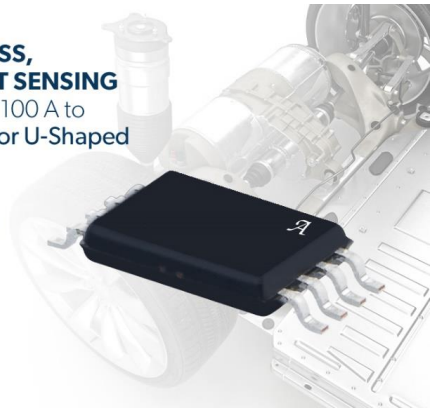
An Array of Current Transducers

Allegro MicroSystems, a provider of sensor and power integrated circuits (ICs) and photonics, will be showing its truly coreless current sensors and its large selection of 48-V automotive grade-0 gate drivers.

Allegro offers coreless current sensing IC solutions that are high-bandwidth efficient, user-programmable, and equipped with safety features such as self-checks and isolation capabilities that make them well suited for use in inverters for EV applications. The ACS3761X Hall-effect sensor IC solution family is a coreless and shield-free solution, reducing BOM and overall inverter size and weight. These differential sensors reject stray magnetic fields, reducing reliance on software. The family is optimized for a large range of currents, 100 A to >4000 A, making it well suited for automotive applications.

In support of vehicle electrification and emission controls, the company offers its innovative solutions for a 48-V bus. These include what Allegro describes as the most extensive portfolio of Grade-0 48-V solutions that reduce environmental impact in mild hybrid engines. Its robust and system-optimized family of 48-V products are designed for safety, including architectures for BLDC, dc motors and half-bridge with independent high-side and low-side outputs. And, Allegro has expanded what it describes as its industry-leading motor driver portfolio with a new family of 48-V-ready devices on an ISO26262-compliant design process.

STAND-ALONE CORELESS, DIFFERENTIAL CURRENT SENSING
Industry's First to Measure 100 A to >4000 A Without a Core or U-Shaped Magnetic Shield



GMW Associates, a distributor and integrator of sensors, transducers, instruments and systems based on magnetics, will be featuring voltage-isolated current measurement devices for test and measurement and OEM applications, dc-ac, from several amps to hundreds of kiloamps.

The company will be featuring clip-around Rogowski coil ac current probes from PEM (Power Electronic Measurements). These flexible "clip-around" current probes have very low insertion impedance compared to current transformers (CT), or Hall current transducers, are easy to insert in confined spaces and are not damaged by overcurrent surges. They can be used for measuring ac, pulse or transient current waveforms.



Since the PEM current probes have no magnetic core they can be used to measure ac current on a conductor with high dc current or in the presence of a high dc magnetic field. Measurement ranges are from ±60 A to 300 kA.

GMW will also show its own clip-on and clamp-on dc-ac current probes. GMW CPC and CPCO current probes enable electrically isolated monitoring of high electric currents (±250 A to 16 kA) without disconnection of the primary current conductor. The CPCO and CPC current probes have no magnetic core enabling very light weight, no magnetic hysteresis and no damage from unlimited overcurrent. Recovery from overcurrent to linear output operation is within a few microseconds.

Magnetic crosstalk from an external current return conductor touching the outer surface of the probes is less than ±1%. Amplitude accuracy is better than ±1% at dc and the phase shift at 60 Hz is less than 0.1°, enabling the CPC to



be used for electric power conversion measurements requiring modest accuracy. The current probes are moisture resistant and have operating temperature range of -40°C to $+100^{\circ}\text{C}$ making them useful as a current probe for in-vehicle current monitoring.

At the GMW booth, high-precision and high-stability dc-ac current transducers from Danisense will also be on display. Danisense DCCTs are based on a flux-gate zero flux detector with closed-loop operation to provide a signal output current accurately defined by the number of turns in the compensation winding. They provide higher accuracy for power analyzer measurements and improved performance for power amplifiers. Very high amplitude and phase accuracy from dc to over 1 kHz, and current ranges from ± 12.5 A to 10 kA.

Another product series that will be shown at GMW's booth is AKM Semiconductor's Currentier CQ/CZ series of isolated current sensors. The Currentier CQ/CZ devices are open-type current sensors using a Hall sensor, which outputs an analog voltage proportional to the ac-dc current. Very thin film is used as the Hall sensor, which enables the high-accuracy and high-speed current sensing.



Coreless ultra-small surface-mount package leads to space savings. The CQ/CZ sensors have linear sensing ranges from ± 8.5 A to ± 129 A (20 A to 60 A rms), depending on the specific part. Response times as low as 0.5 us, and bandwidth up to dc to 1.5 MHz. All the sensors are very low noise, <3 mV.

Cores For SMPS Design

In their booth, **Magnetics**, a supplier of precision soft magnetic components and materials to the electronics industry including high-quality powder cores, ferrite cores and tape wound cores, will be promoting several new series of cores that were introduced over the past one to two years. These include the Kool Mu HF, Edge, Nanocrystalline, and Amorphous product lines.



Magnetics' Kool M_{μ} Hf powder cores are made from distributed gap alloy powder optimized for frequencies from 200 to 500 kHz. Exhibiting approximately 35% lower losses when compared to Kool M_{μ} , Kool M_{μ} Hf is a cost-effective solution for minimizing power losses in high-frequency power supplies using GaN or SiC, high efficiency power supplies, and UPSs. This series is available in 26 μ , 40 μ , and 60 μ permeabilities.

company's Edge powder cores are said to offer the best dc bias of all alloy powder cores. When compared with the company's High Flux cores, Edge cores display approximately 40% lower losses and 30% improvement in dc bias performance. Applications include rack-mount power supplies, telecom servers, switching regulator inductors, inline noise filters, flyback transformers, power factor correction (PFC), and pulse transformers. The company recommends Edge for highest efficiency. These cores are currently available in permeabilities of 19 μ , 26 μ , 40 μ , 60 μ , and 125 μ .

Designed for cutting-edge performance, the



Magnetics' line of Nanocrystalline cores are made from annealed amorphous metal with a uniform nanocrystalline microstructure. This line is currently available in toroids and split cores from 5 mm to 145 mm with durable cases



available in polyester ($<130^{\circ}\text{C}$) and rynite polyester ($<155^{\circ}\text{C}$). Nanocrystalline cores are said to be a choice solution for applications such as common-mode chokes and current transformers as they exhibit high permeability, low power loss, and high saturation.

Finally, the vendor's line of Amorphous cut cores are considered a choice solution for high-frequency, low-loss applications such as UPSs, SMPS PFC chokes,

magnetic amplifiers (magamps), and high-frequency power transformers and inductors. This line is currently available in cut (C shape) core, but toroids and split cores may be available upon request.

Custom Planar Magnetics

As a global provider of both conventional and planar transformers, **Payton Planar** has more than 25 years of research and development experience. Payton offers a wide range of custom designed products that meet all the requirements and standards for a variety of specific product applications. Visit their booth at ECCE to learn more about their expertise in planar magnetics and see many examples of planar transformers that they have developed as well as to chat with their magnetics design experts.

GaN Power Device Demos

At its booth, **Efficient Power Conversion (EPC)** a provider of gallium nitride (GaN)-based power management technology, the company will be showcasing its latest demonstration systems that highlight the advantages of GaN for motor drives, automotive 48-V systems, and 48-V high-density computing.

The EPC9146 demo offers an example of GaN's advantages in a 400-W motor drive. In this design example, GaN provides the fast switching, small size, and low cost needed to further reduce the size and weight of BLDC motors, reduce audible noise, improve torque for faster reaction times, and increase efficiency.

Another demo, which was previously displayed at PCIM, is the EPC9137, a GaN-based 3-kW 48-V to 12-V dc-dc converter. Here, the higher switching frequency of GaN results in a solution that is 35% smaller, results in 10-W lower inductor DCR losses, and reduces cost of the system by about 20% over the MOSFET solution, according to EPC.

Finally, EPC's EPC9149 illustrates the high power density that can be achieved with GaN in small, brick-style dc-dc converters. The EPC9149 is a 1-kW eGaN FET-based LLC resonant converter in the eighth-brick size for 48-V server applications. To put this performance in perspective, silicon-based solutions typically need to be in the quarter brick format to reach 1 kW. This 1-kW LLC resonant converter also achieves 97.6% peak efficiency and 96.5% full-load efficiency.

SiC And GaN Products

Richardson RFPD, an Arrow Company, is a specialized electronic component distributor providing design engineers with deep technical expertise and localized global design support for the latest new products from the world's leading suppliers of RF, Wireless, IoT and Power Technologies.

At their booth, they will be presenting information on a Supercapacitor microsite, a white paper on Wolfspeed's WolfPACK SiC power modules, a brochure providing an overview of RichardsonRFPD's GaN & SiC Technologies for Power Electronics and information on Microchip's 1700-V, 750-mΩ SiC MOSFETs, which are in stock. Visitors can also learn about RichardsonRFPD's Tech Chat, which provides a selection of technical videos highlighting key design topics for GaN & SiC.

Automotive LED Drivers, Power MOSFETs And TVSs

Taiwan Semiconductor, a supplier of discrete power electronics devices, LED drivers, analog ICs and ESD protection devices, will be showcasing its new automotive LED drivers, 40-V to 60-V automotive MOSFETs and its 1K5SMPC series of TVS devices.

The TS19501 is a single-channel, dimmable LED driver targeting high-brightness automotive applications. Due to the device's highly integrated design, this single IC is well suited for virtually every automotive LED application: high- and low-beam headlights; daytime running lights; turn indicators; position indicator lights; fog lights; ATV and four-wheel drive high-brightness lamps. The IC is also offered in a version ideal for a wide range of non-automotive dc-input LED lighting applications.

According to the vendor, the TS19501 offers designers a number of benefits and improvements over competing devices including a 4.2-V to 42-V input voltage, a wide operating temperature of -40°C to +125°C, low-side current sensing, and a spread spectrum clock to



reduce EMI and ease regulatory compliance for EMC. Other features include support for multiple topologies and multiple operating modes, PWM and analog dimming, a 70-kHz to 700-kHz adjustable frequency and a small MSOP-10EP package.

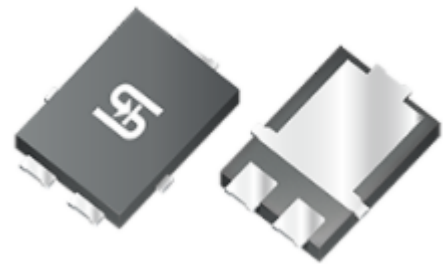
Taiwan Semiconductor's follow-up to the TS19501, the TS19503 is a continuous conduction-mode inductive converter for driving single or multiple LEDs by stepdown topology. It operates under a wide input supply from 4.5 V to 75 V with a high accuracy output current of up to 2 A, which is externally adjustable. The TS19503 LED driver can deliver more than 25 W of output power, depending on the supply voltage and external components.

The TS19503 will be followed by a three-channel version of this driver with linear control up to 150-mA.



Another product that will be on display is the TQM... family of single and dual N-channel automotive-grade power MOSFETs. Offered with drain-to-source breakdown voltage (BV_{DSS}) of either 40 V or 60 V, all of the 14 parts in this AEC-Q101 family feature a maximum operating temperature (T_j) of 175° C. And unlike many other products in this class, all are 100% tested for compliance with published maximum on-resistance and UIS/avalanche rating. The devices are all packaged in a wettable flank, 5-mm x 6-mm PDFN package.

The 1K5SMPC series of TVS devices provide series breakdown voltage support from 12 V to 51 V and non-repetitive peak power dissipation capability up to 1500 W in a SMPC4.6U package that stands just 1-mm tall. The devices' 175°C junction temperature rating is another notable feature. The 1K5SMPC series is AEC-Q101 qualified, and meets ISO 7637-2 (Pulse 1/2a/2b/3a/3b) and IEC 61000-4-2 (Level: 4) / ISO 10605 (Level: L4). Targeted applications include automotive head lights, switched mode power supplies, dc-dc converters and battery management systems.



Real-Time Simulation And Hardware-In The Loop Testing

In the **OPAL-RT Technologies** booth, the company will be presenting information on their microgrid solutions and Microgrid PHIL Test Bench as well as a demo of Hybrid Powertrain Multi-ECU HIL Testing and news about the XG Simulator series.



The company's Microgrid solutions brochure discusses how the company's products can help with real-time simulation of microgrid projects: While microgrids and their distributed energy resources (DERs) offer operational and economic benefits, they differ substantially from traditional power grids bringing challenges currently being addressed by utilities, equipment providers, system integrators and academics. As with other electrical systems, field testing of microgrid products and integrated systems on live grids can be risky.

For these reasons, many microgrid applications are well suited to Hardware-in-the-Loop (HIL) and Power Hardware-in-the-Loop (PHIL) testing. OPAL-RT Technologies has recognized the power of HIL and PHIL, and over the last decade, they have strived to help engineers employ these types of real-time simulation for their microgrid projects.

With regard to the Microgrid PHIL Test Bench, the company comments that building a quality PHIL setup requires components to be carefully selected not just for their technical capability but also for their inter-compatibility. With the Microgrid PHIL Test Bench, OPAL-RT says they have taken the guesswork and risk out of PHIL with a turnkey product that offers one of the highest performance and versatile setups in the market.

OPAL-RT's hybrid Powertrain Multi-ECU HIL Testing demo is meant to help users learn how to quickly implement model-based simulation on FPGAs and deploy an integrated power electronics HIL system that addresses the need for high performance paired with flexibility for rapid test system changes. This "multi-ECU" demonstration features power electronics and an electric machine (motor) in NI I/O connected FPGAs and VeriStand with OPAL-RT's VeriStand Add-On for Power Electronics.

With the addition of Comemso battery cell emulators, the company integrates models from Mathworks' Simulink and LabVIEW in VeriStand to simulate and test the other components around the vehicle control unit, such as

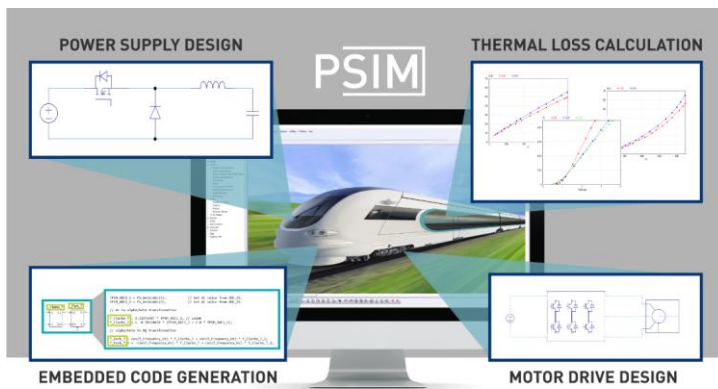
physical ECUs from Pi-Innovo and ORION BMS. Designers can use this test solution to connect design and test workflows and to streamline the transition from desktop design to model-in-the-loop (MIL) to hardware-in-the-loop (HIL) testing.

Describing the XG Simulator Series, the company comments that this product takes real-time simulation to another level. The new OPAL-RT operating system, OPAL-RT Linux 3, combined with Intel's latest technologies and OPAL-RT's unique toolboxes, allow engineers to benefit from an unmatched performance to develop, test, integrate and validate innovative products and solutions, according to the vendor.

Power Electronics Simulation

Powersim, a provider of simulation and design tools for power electronics and motor drives, will be promoting all of its main products including PSIM, DSIM, PE-Expert4 and SmartCtrl. In doing so, they will show new design suites in PSIM (EMI DS and Power Supply DS) and new functionality in DSIM.

Powersim's flagship product PSIM has evolved into a powerful simulation platform that offers comprehensive simulation and design capabilities for various power electronic applications. PSIM simulates power electronics, renewable energy devices, motor drives, digital and analog controls, thermal losses and more. It covers both device or circuit simulation; as well as system or control simulation. The company describes PSIM as the most versatile and accurate power electronics offline simulation software.



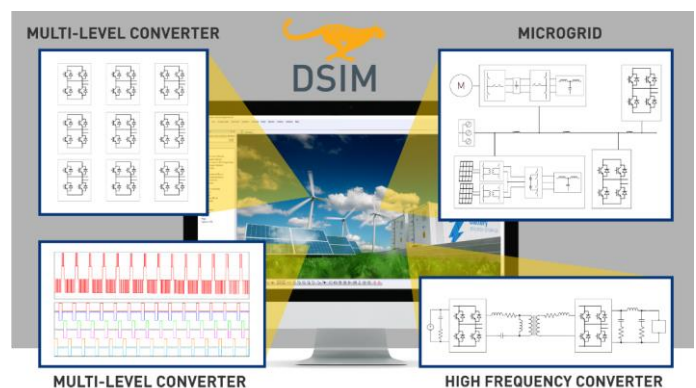
Furthermore, the PSIM ecosystem covers the user's entire development cycle by linking to and partnering with an array of tools. Users can design with either PSIM internal design suites (Motor Control, EMI, Power Supply and HEV) or with the company's partner tools from RidleyWorks or SmartCtrl.

Other features include automated code gen with PSIM's SimCoder embedded code generation capabilities and the ability to implement control with C2000 hardware from Texas Instruments and mixed DSP/FPGA PE-Expert4 system from Myway Plus Corp. Or users can test their control with real-time HIL simulation from Typhoon HIL.

DSIM is the brand-new simulation solver that can be purchased as an add on to the PSIM software, or as a stand-alone tool. This solver is capable of simulating simple topologies or large and complex systems with astounding speed and accuracy, says the vendor. The company also describes it as the world's fastest offline simulator specialized for large-scale power converters and microgrids.

Its novel technique of solving power electronics simulation was specifically designed to address schematics with large numbers of switches, high switching speeds, the need for small time constants for switch transitions and the need for large time constants for system simulations including nanosecond timing with switch transitions.

According to Powersim, these simulations are solved at speeds that exceed those of currently available simulation tools by hundreds or thousands of times. At these speeds it solves not only ideal switches but also physical switch models (non-ideal).



PE-Expert4 is a high performance, expandable DSP/FPGA digital control development system created for advanced power electronics applications. Its main code and algorithm executes on a 1.25-GHz DSP while the peripherals like PWM and ADC are handled by dedicated FPGAs.

The system, depending on configuration, supports up to 144 PWMs, 60 analog inputs, 400-kHz switching and 200-kHz vector control execution. PE-Expert4 can be used to control hardware like motor drives, microgrids, or even multi-level inverters. Also, it can be interfaced with a high-fidelity real-time hardware simulation platform like Typhoon HIL. In combination with the PSIM simulation of the power stage and the embedded code-generation function, the PE-Expert4 system allows a seamless digital control development workflow.

SmartCtrl enables users to design the control for analog and digital power converters and controllers. Its capabilities include design of digital controllers in the analog s-domain, verification of the control loop stability, definition of the digital delay, and calculation of the z-domain coefficients of digital compensators to be implemented on digital devices

SmartCtrl and PSIM seamlessly work together to create a stable simulation environment. SmartCtrl automatically generates a ready-to-simulate schematic, containing the complete circuit, including power stage and control circuit. With only one click on the PSIM icon, one can export the entire circuit and simulate it.

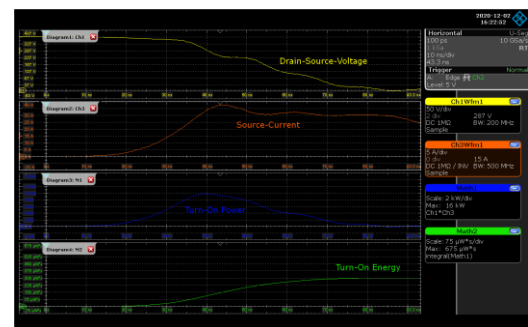
Versatile Oscilloscope, Double Pulse Test Application Software



Rohde and Schwarz, a manufacturer of test and measurement and other products, will showcase its R&S RTO6 oscilloscope. This new instrument has digital trigger and advanced fast Fourier transformation (FFT), opening up new areas for EMI debugging. The R&S RTO6 oscilloscope offers a fast update rate and the FFT frame overlay processing and persistence display offer insights into the structure of unwanted emissions. Along with strong FFT capabilities, this oscilloscope offers the performance, low noise and high input sensitivity to ensure even weak emissions can be detected and analyzed, says the vendor.

R&S will also highlight how to use the R&SRTO6 oscilloscope to tackle varying complexities from rail measurements to advanced signal analysis and a new method to accomplish impedance measurements with a two-port-shunt-through with integrated analysis software. With the push of a button, the RTO6 oscilloscope unlocks much needed time domain capabilities required for PDN testing which includes the ability to observe effects during impulse response, step response and resonance response testing.

In addition, this exhibitor will use the R&S RTO6 oscilloscope to demonstrate the R&S Double Pulse Test Application software, the basics of double pulse testing and the necessary measurement set up for determining the switching times and switching losses as well as to ensure proper switching behavior.



Programmable Power Supplies

Another exhibitor, **Magna-Power** designs and manufactures robust programmable power products in the USA that set industry standards for quality, size, and control, according to the vendor. The company's experience in power electronics is reflected in its 1.25-kW to 2000-kW+ product line, quality service, and reputation for excellence.

Magna-Power's standard products are used worldwide to aid in the manufacture of electric vehicles, simulating solar arrays for development of inverters, steering magnets for particle accelerators, powering radar systems, driving traction controllers for locomotive development, and at a wide range of universities for cutting-edge energy research.

For a full list of this year's exhibitors see the ECCE 2021 [website](#). To register for a free pass to the ECCE 2021 exhibition, click [here](#).