## ECCE 2025 Expo Will Highlight Latest Tools And Instruments For Designing Power Electronics

*by David G. Morrison, Editor, How2Power.com*

At the upcoming IEEE Energy Conversion Congress & Expo (ECCE 2025) in Philadelphia, approximately 60 companies will showcase their latest design tools, test instruments, components, and other wares useful in the development of power electronics, electric machines and the end applications for these technologies. Some typical end applications include EVs, motor drives, energy storage and renewable energy systems. In addition, 10 universities and one national laboratory will highlight their latest research in the expo. The conference will be further supported by 16 corporate sponsors, including GM which will also be featured in the expo.

While the conference runs from October 19-23, the exhibition hours are limited to Monday, October 20 from 4:30 to 7:00 pm and Tuesday, October 21 from 10:30 am to 5:00 pm. Exhibitors will also be participating in a Career Fair on Tuesday morning from 8:30 -11:30 am, which takes advantage of ECCE's large gathering of engineering students. The venue for both the conference and the exhibition is the Pennsylvania Convention Center at 1101 Arch Street.

As the conference enters its 17th year, ECCE looks to build on the success of last year's conference in Phoenix, which drew 2300 attendees. For those wanting to attend just the expo, there are free passes available, which includes a reception on Monday evening and lunch and snacks on Tuesday.



*The Pennsylvania Convention Center plays host to the 17th edition of the IEEE Energy Conversion Congress and Expo.*

This article presents a sampling of some of the products that exhibitors will be showing and demonstrating this year. A full list of exhibitors, as of this writing, is included at the end of this article. If you're attending the expo, please stop by the How2Power.com booth 325 and say hello!

### Design Tools

At this year's ECCE, **MathWorks** in booth 425 will showcase its latest simulation tools that are redefining how engineers design, test, and optimize power electronics and energy systems. A major highlight will be the Simscape Electrical environment, which supports fast, accurate, and scalable closed-loop simulations for converters, inverters, and motor control. Attendees will see how detailed models of switching devices—like IGBTs and MOSFETs—can be integrated with advanced control algorithms to simulate real-world performance under dynamic conditions, including faults, load variations, and thermal effects.

The booth will also feature workflows for thermal management, allowing engineers to model heat generation and dissipation in power components, improving system reliability and efficiency. In addition, new capabilities for battery management system (BMS) design will be demonstrated, including state-of-charge estimation, cell balancing, and thermal runaway mitigation—critical for EVs, renewable storage, and grid applications.

A key focus will be on hardware-in-the-loop (HIL) testing, where engineers can automatically generate C and HDL code from Simulink models to validate embedded controllers in real time. This is essential for supporting assessment against operational and safety standards in solar and grid-tied systems.
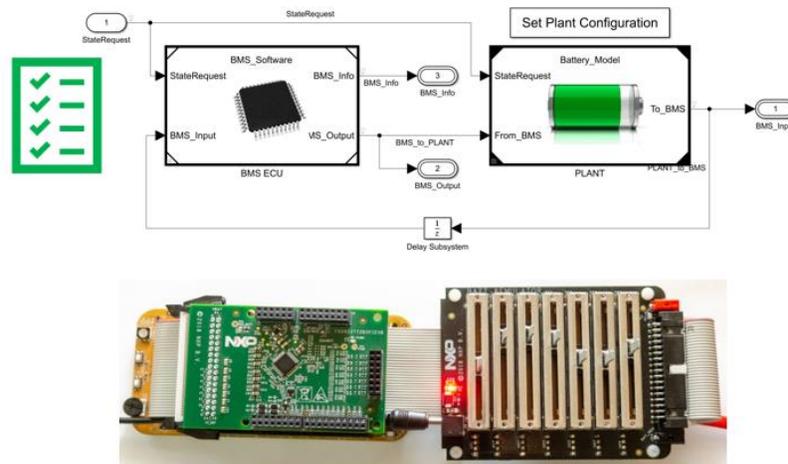
*Designing, deploying and testing a BMS Using MathWorks' Simulink and Simscape.*

MathWorks will also introduce the Power Electronics Curriculum Module, a hands-on learning toolkit with live scripts and Simulink examples covering PWM control, converter efficiency, and thermal modeling. Combined with MATLAB Copilot, a new AI assistant for writing and debugging code, and expanded GPU support for over 60 functions, the simulation environment is now more powerful and accessible than ever.
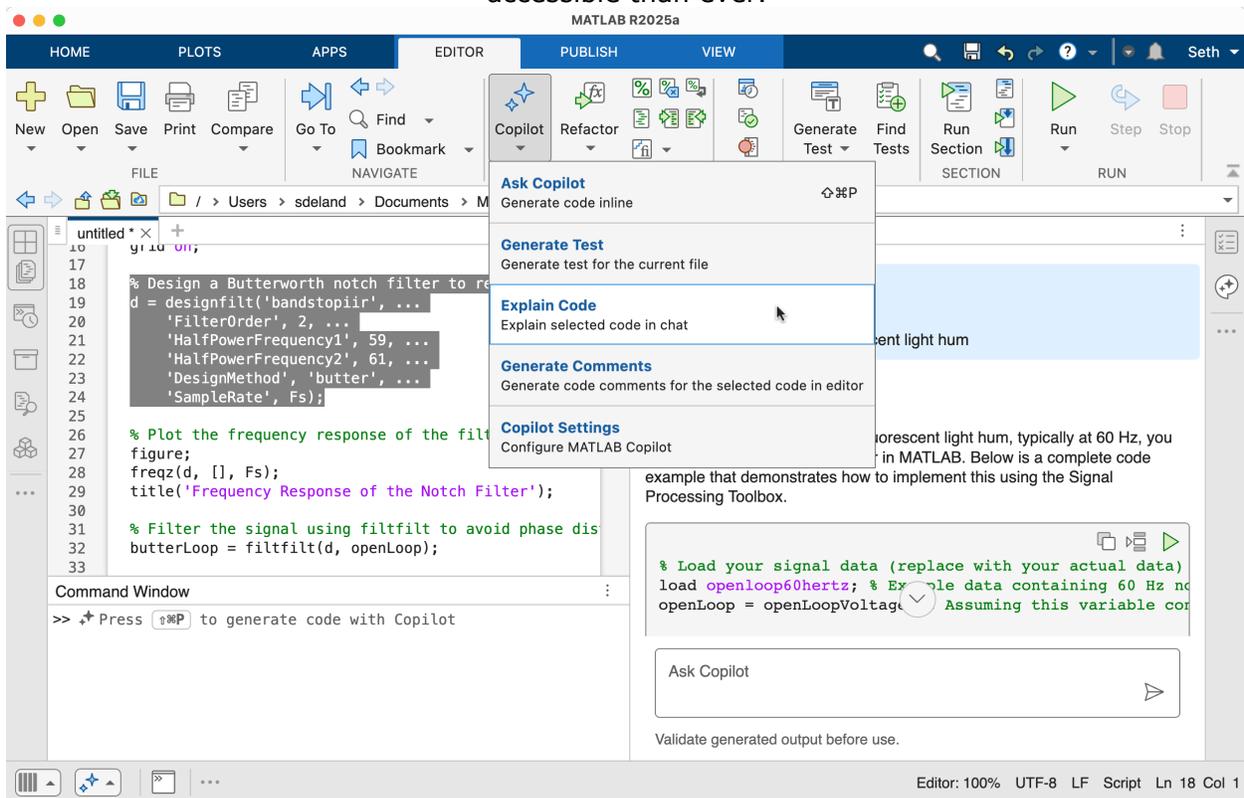


*A view of MATLAB Copilot from MathWorks.*

Whether you're working on EV drivetrains, smart grids, or renewable energy systems, these tools offer a scalable, integrated platform for innovation. Visit the MathWorks booth at ECCE to explore live demos, real-world case studies, and the future of energy systems engineering.

In booth 208, the **Plexim** team will provide demonstrations for all of the latest capabilities of PLECS, the RT Box, and PLECS Coder. Real-time controller HIL examples for several applications will showcase the workflow to easily transition from an offline PLECS model of a closed-loop circuit, to a real-time simulation of the power stage on the RT Box, that is interfaced to a PLECS-programmed microcontroller.

A Swiss software company, Plexim has been developing its popular PLECS simulation software for over 20 years. In recent years, Plexim introduced the RT Box family of real-time simulators for hardware-in-the-loop testing of control systems and rapid prototyping for algorithms.

In early 2025 the company unveiled its Nanostep FPGA-based solver for the RT Box, providing what's described as an industry-leading step size of 4 nanoseconds to simulate many common power electronics topologies with extremely high fidelity. This performance level offers a ~1000x improvement for time-critical applications compared to Plexim's existing solver technologies, completely extending what's possible. Along with FPGA- and CPU-based solvers optimized for unique challenges of their own, the RT Box lineup provides a diverse set of computational tools for a variety of applications.

The Nanostep solver excels in the simulation of dc-dc converters with an inductive ac link, such as isolated active bridges, LLC converter variants, and phase-shifted full-bridges, all of which are relevant for key topics in industry today, such as data center and A.I. power, electric vehicle charging, and energy storage. Further, Nanostep also supports classic buck and boost converters, PFCs, and three-phase, two- and three-level voltage source converters with switching frequencies up to 1 MHz.

This fall, Plexim will be introducing the RT Box 4, which extends the current platform to include additional high-speed analog outputs with a resolution of 8 ns, specifically to provide access to internal signals from within the Nanostep-supported power stages for high-bandwidth control requirements. Further, users will be able to observe electrical signals with full nanosecond-level fidelity using the PLECS Scope, allowing real-time waveform visualization and validation.

Plexim also offers embedded code generation for various Texas Instruments C2000 and STM32 devices. From a PLECS model of the control logic, one can easily program an MCU without requiring any hand-coding or deep knowledge of the particular device. Dedicated blocks in the schematic and intuitive configuration menus for on-chip peripherals such as ADCs, PWMs, and GPIOs make embedded software development accessible and efficient. Recent updates for PLECS Coder and its targets include support for newer chips, advanced PWM capabilities, and additional peripherals and protocol interfaces.

**Typhoon HIL**, in booth 510, will showcase its industry-proven hardware-in-the-Loop (HIL) solutions, alongside a comprehensive suite of model-based engineering tools tailored to meet the needs of academia and bridge the gap between engineering education and real-world industrial practice in power electronics and control.

The offering includes the HIL101 real-time simulator, TyphoonSim, an offline simulator available free for academia, and affordable teaching kits and lab bundles, now featuring the TI C2000 Toolbox for seamless automatic code generation and deployment on TI microcontrollers. Together, these tools streamline learning and research—from simulation to real-time HIL testing, through hands-on experience.
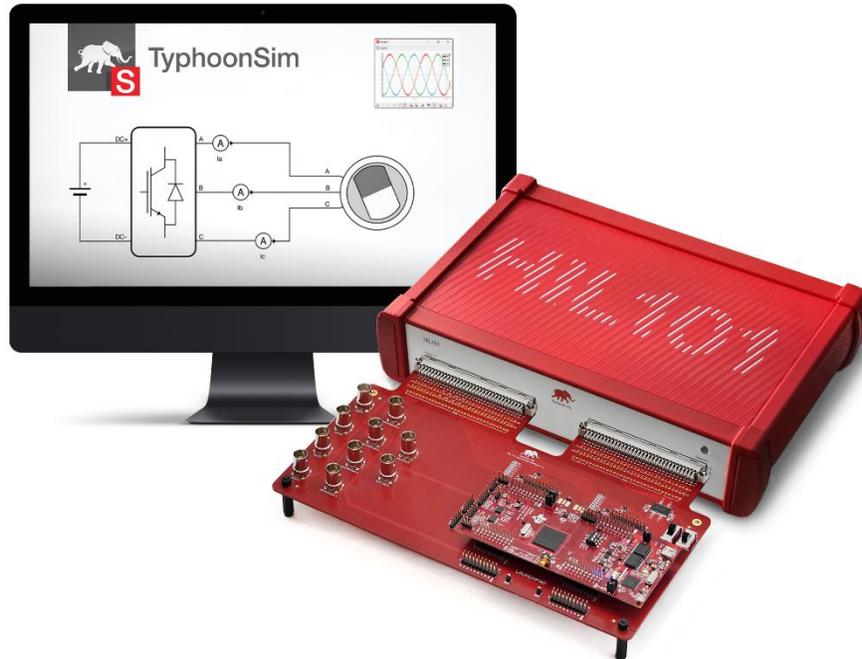
*The HIL101 is Typhoon's most compact and accessible HIL device, delivering sub-microsecond real-time simulation in a portable form factor. Tailored for academic labs and project-based learning, it combines industry-grade FPGA performance with exceptional ease of use.*

TyphoonSim is a high-speed offline simulator that can be used standalone, allowing students and researchers to develop and test models on their laptops without hardware. Fully compatible with Typhoon's real-time platforms, it enables a seamless transition from offline simulation to HIL testing—supporting a continuous and agile workflow from design to validation.

Alongside booth demonstrations of its flagship solutions, Typhoon HIL will host a tutorial titled "Integrated HIL Simulation Environment: Streamlining the Development Cycle from Offline to Real-Time." This session will highlight how Typhoon's tools maintain model continuity throughout development—from design through real controller implementation and testing— supporting a cohesive workflow from start to finish.

Visit the Typhoon HIL booth to explore how this unified academic ecosystem supports teaching, research, and innovation in digital power systems.

## Test Equipment

In booth 519, **OMICRON Lab** will demonstrate the Bode 100 and Bode 500, which are vector network analyzers that also function as frequency response analyzers, along with most of the available accessories. These include injection transformers, common-mode choke, impedance test fixtures, passive and active differential probes, and Picotest signal injectors.

There are two new products being shown this year. One is the B-TCA test card adapter, a test fixture designed to simplify the frequency response analysis of surface-mount components using Bode 500 or Bode 100. It enables simple impedance and S-Parameter measurements over a very wide frequency range up to 450 MHz.

*OMICRON Lab's B-TCA test card adapter.*

Capabilities include Impedance or S11 reflection via the one-port measurement setup; two-port impedance measurements (shunt-thru, series-thru, shunt-thru with Rs); and S21 transmission via a two-port measurement setup. The B-TCA enables users to analyze impedance of surface-mount components from dc to 450 MHz; easily measure impedance from milliohms to megaohms; and simplify connection of SMD components to your Bode 100 or Bode 500 vector network analyzer.

Another new product that will be shown is the Circuit Fit feature in the Bode Analyzer Suite. This feature allows users to easily create equivalent circuit models of measured impedance (or admittance) curves.
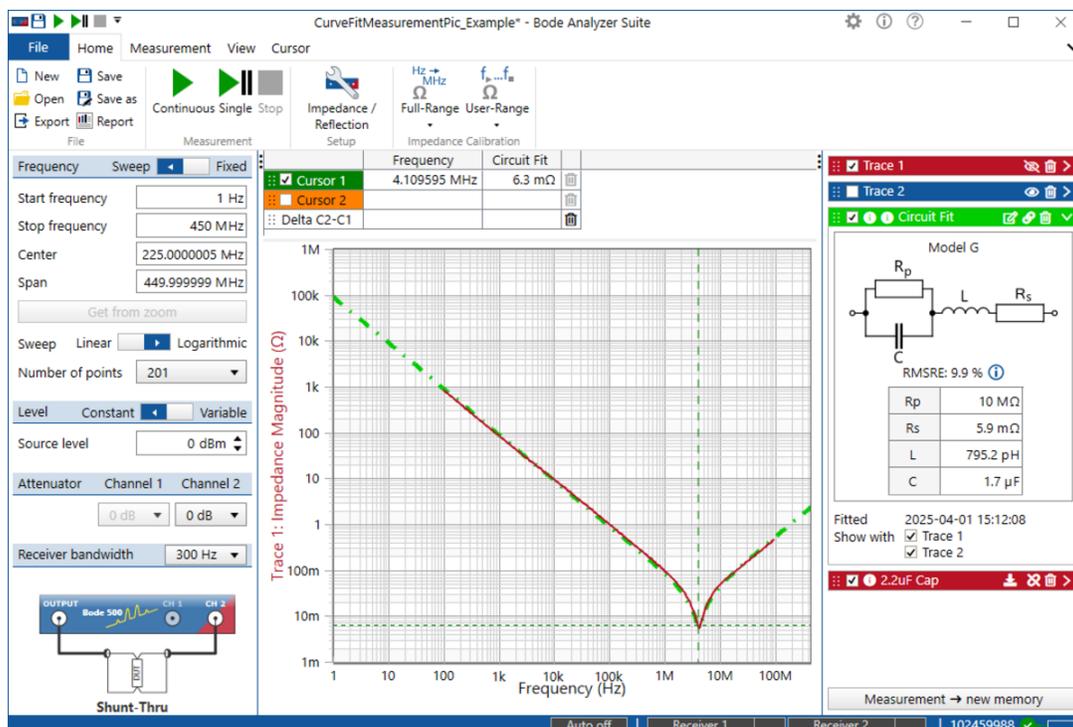


*Circuit Fit feature in the Bode Analyzer Suite.*

This capability in turn allows users to easily create data-driven component models, perform measurement-

based component analysis and to measure and model in the same software. This makes it possible to easily integrate measured components into SPICE models

**Teledyne LeCroy**, in booth 300, will present live demos featuring its oscilloscopes and probes performing double pulse testing on power semiconductors and power analysis for motors and drives system testing.

Engineers rely on the double pulse test to evaluate the dynamic switching behavior of power semiconductors– and when precision matters most, Teledyne LeCroy delivers, says the vendor. Visit the booth to explore oscilloscopes and probes designed for ultra-accurate measurements, along with complimentary software tools that provide expert insights to minimizing switching and conduction losses. These products are designed to give engineers an edge, whether they're designing or debugging power semiconductor devices.

Meanwhile, Teledyne LeCroy's high voltage probes are said to set the industry standard with exceptional common-mode rejection ratio (CMRR) and outstanding signal integrity–ensuring your measurements are as clean and accurate as your designs demand. Discover the company's complete range of solutions, including high-voltage probes for precise differential measurements, current probes and sensor adapters for accurate ac and dc analysis, all seamlessly integrated with Teledyne LeCroy oscilloscopes for a streamlined testing experience.

Also see how Teledyne LeCroy delivers more power analysis capability than two separate instruments at a lower cost, according to the vendor. With advanced dynamic views that reveal per-cycle behaviors, the high-bandwidth, 12-bit resolution oscilloscopes offer complete visibility into control, inverter, and motor performance. From static measurements to long-duration waveform captures, Teledyne LeCroy is said to provide everything you need in one instrument, on one display.

In booth 324, **Yokogawa** will show its WT5000 Power Analyzer, DLM5000HD oscilloscope and DL950 ScopeCorder.

The WT5000 is said to offer industry-leading accuracy for power and efficiency measurements in converters, inverters, and drives. It provides multi-channel measurements, advanced harmonic analysis, and intuitive operation through its user-friendly software and responsive touchscreen. With seven swappable input elements, four motor channels, and approval for SPEC Power and IEC standards, the WT5000 is described as the ultimate tool for high-accuracy power measurements.
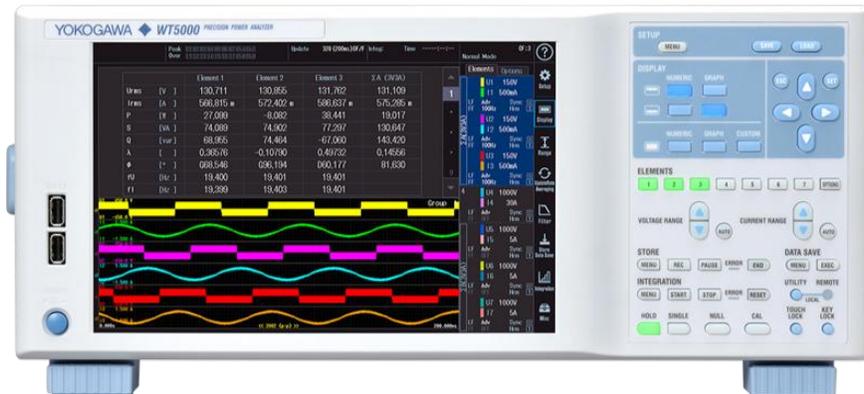


*Yokogawa's WT5000 Power Analyzer.*

Meanwhile, the DLM5000HD oscilloscope is touted as a cost-effective solution for SiC device testing with 12-bit resolution and switching loss analysis.

*Yokogawa's DLM5000HD oscilloscope.*

The third product to be shown, the DL950 ScopeCorder is said to offer a unique combination of a mixed-signal oscilloscope and portable data acquisition recorder that can be used to capture both high-speed transient events and long run trends. It features up to 32 isolated channels, 16-bit resolution, and 200 MS/s sampling for capturing fast transients and system behavior.

In booth 421, **TDK-Lambda Americas**, a manufacturer of programmable dc power supplies and ac sources, will show its general-purpose Genesys series and its advanced GENESYS+ series of programmable dc power sources as well as its Genesys series programmable ac sources.

The Genesys series (750 W to 15 kW), offers reliable, accurate and easy-to-use programmable dc power for every-day technology applications, while the GENESYS+ series (1 kW to 22.5 kW, and 30 kW to 90 kW), showcases advanced features, high efficiency and high power factor for leading-edge high-technology applications.



*The advanced GENESYS+ series of programmable dc power sources.*

The Genesys series programmable ac sources offer feature-rich high performance with single-phase 2 kVA/3 kVA (350 Vac) in 1U height and single/three-phase 6 kVA/9 kVA (350 V) in 3U height. They also have high power density, and provide built-in LAN, USB, RS-232/RS-485 and isolated analog interfaces.

## Components

**Payton Planar** in booth 219 will display the planar transformer it developed for Microchip Technology's recently released dsPIC33C 4-kW dc-dc [demonstration platform](#), which is a demonstrator for converting 800-V/400-V battery voltage down to the 12-V auxiliary battery used in electric vehicles (EVs).



*Microchip Technology's dsPIC33C 4-kW dc-dc demonstration application featuring Payton America's transformer.*

Payton Planar will also show a 6-kW three-phase planar transformer it announced last year. Designed for use in a half-bridge, three-phase LLC with four-diode rectifier, this transformer has specs which include a 350- to 450-V input; a 280-V at 7.5-A, three-phase output; a 250- to 350-kHz operating frequency; and 4250-Vdc isolation.



*Payton Planar's 6-kW three-phase planar transformer for an LLC converter.*

It delivers 98.7% efficiency with a 130°C hot spot when mounted to a 70°C cold plate. Ambient operating temperature range is -55°C to 70°C. The transformer measures 100 mm x 100 mm x 25 mm.

In booth 303, **Infineon** we will be showing several GaN applications and innovations, including a full-bridge single-stage on-board charger (OBC) featuring its new 650-V bi-directional switches (BDSs), a 400-W ultra-slim power supply featuring the company's new 650-V G5 power transistors, a 750-W class-D audio amplifier board featuring its new 100-V G3 power transistors and a 300-mm GaN production wafer.
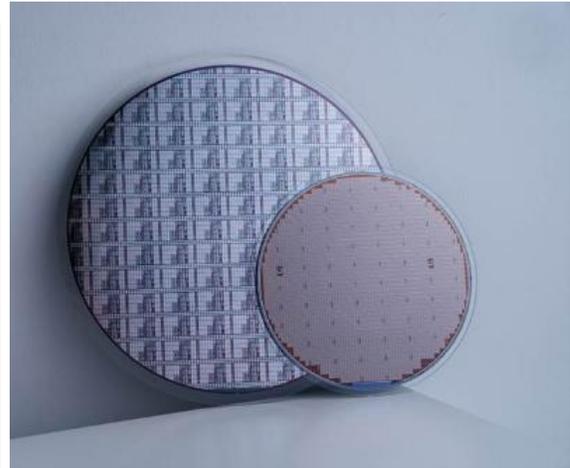


*Infineon's 750-W class-D audio amplifier board featuring its 100-V G3 GaN power transistors (left) and a 300-mm GaN wafer shown next to a 200-mm wafer.*

### ECCE 2025 Sponsors And Exhibitors

(As of 09-12-2025. For updates, see the Exhibitors page.)
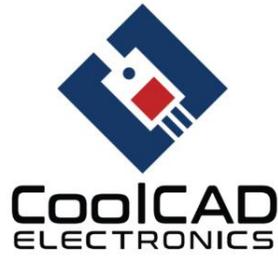
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For more information about the ECCE 2025 Exhibition, see the conference website or email me.