

EPC Accelerates Robotics Innovation with Integrated 3-Phase BLDC Motor Drive Inverter

Integrated GaN power stage with onboard control, sensing, and communication, delivering up to 20 ARMS in a 32 mm circular design for robotic applications.

EL SEGUNDO, CA, UNITED STATES, February 23, 2026 /EINPresswire.com/ -- Efficient Power Conversion (EPC), the world leader in enhancement-mode gallium nitride (eGaN®) power devices, today announced the release of the [EPC91122](#), a high-performance 3-phase BLDC motor drive inverter evaluation board specifically engineered for humanoid robot joint applications. Featuring EPC's highly integrated [EPC33110](#) 3-phase ePower™

Stage module, the EPC91122 delivers up to 20 ARMS (28 Apeak) phase current in an ultra-compact form factor optimized for space-constrained robotic joints, integrating all key functions of a complete motor drive inverter, including a microcontroller, motor shaft angular sensor, housekeeping power supplies, accurate voltage and current sense.

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Marco Palma, Director, Motor Drives Systems and Applications at EPC

The EPC91122 is mechanically optimized to fit directly inside humanoid joint motors. The complete GaN inverter occupies a 32 mm diameter inner circle, surrounded by a 55 mm external frame that supports mechanical mounting and lab connectivity. This design lets the inverter fit inside the motor chassis, which lowers loop inductance and makes the power density and dynamic performance higher.

The EPC33110 is the main part of the system. It is a three-phase co-packaged module with a



maximum voltage of 100 V. It has three monolithic GaN half-bridges with built-in gate drivers, bootstrap circuits, and level shifters. The device has an RDS(on) of 11.7 + 13 mΩ and can switch at frequencies of up to 150 kHz, which means it may use smaller passive components and respond quickly to changes.



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The board operates from a wide input range, making it well suited for battery-powered robotic systems. It integrates all critical subsystems required for a complete motor drive inverter, including:

- Onboard 5 V and 3.3 V housekeeping power supplies;
- Phase current sense gain: 44 mV/A;
- DC bus voltage sense gain: 44.89 mV/V;
- Encode default resolution: 1024 pulses per revolution with Z index;
- STM32G431 microcontroller for motor control;
- RS485 communication interface;
- JTAG/SWD programming connector for firmware development;

The EPC91122 comes preprogrammed to operate at 100 kHz PWM with 50 ns dead time, showcasing the high-speed switching capability enabled by GaN technology. Thermal testing under real-world operating conditions confirms the board's capability for continuous and pulsed operation.

“The EPC91122 highlights how GaN-based power stages enable unprecedented integration and power density in humanoid robotics,” said Marco Palma, Director, Motor Drives Systems and Applications at EPC. “By combining high-frequency switching, integrated drivers, sensing, and communication in a 32 mm circular inverter, designers can embed a complete 3-phase motor drive directly inside robotic joints while achieving up to 20 ARMS performance.”

The EPC91122 is ideal for humanoid robot joints, compact servo drives, robotics, drones, and eMobility platforms. Complete design support files, including schematic, bill of materials (BOM), and Gerber files, are available on the [EPC91122 product page](#).

Price and Availability

The EPC91122 reference design board is priced at \$ 470

Reference design boards and devices are available for immediate delivery from Digi-Key at <https://www.digikey.com/en/supplier-centers/epc>

Maurizio Di Paolo Emilio
Efficient Power Conversion
+39 3381426036
maurizio.dipaoloemilio@epc-co.com

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