



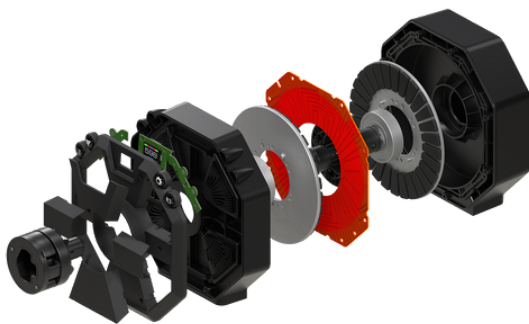
ECM and Thrustmaster Partner to Offer an Innovative Direct Drive Race Simulation Wheel with PCB Stator Technology.



OVERVIEW

ECM and **Thrustmaster** partnered to design and launch a novel simulated racing wheel for use across computer and gaming consoles. The project's aim was to create an ultra-realistic driver experience leveraging zero-cogging technology.

The result is Thrustmaster's new T598 gaming console with ECM's integrated PCB Stator motor technology.



Internal View of Thrustmaster T598 featuring PCB Stator Technology

CHALLENGES

Simulated racing steering wheels must accurately replicate the forces experienced in real-world driving, such as feedback from the road, tire grip, and engine vibrations. The motor used in the steering wheel plays a central role in generating the necessary forces, while maintaining responsiveness and realism. To fully achieve these aims for a sim racing wheel the following challenges must be overcome in the motor:

Cogging

Cogging refers to the non-smooth behavior that occurs when a motor's magnetic rotor is attracted to magnetic material in the poles of the stator. This results in noticeable "jerks" or uneven motion during rotation, particularly at low speeds or when the motor is not under load. In the context of a simulated racing steering wheel, cogging can significantly disrupt the feel of the steering wheel, leading to a less realistic user experience.

Torque

Torque is one of the most important specifications for a racing steering wheel motor. The motor must be capable of generating sufficient torque to simulate the forces a driver would experience in a real car. A motor with insufficient torque will fail to generate the necessary forces, resulting in weak feedback, while a motor that is over-specified can make the wheel feel unwieldy or overly heavy.

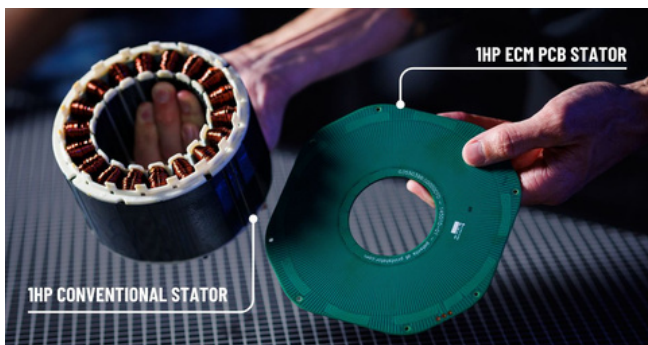
Heat Dissipation

High torque motors tend to consume a lot of power, which can lead to excessive heat buildup, potentially damaging the motor or reducing performance over time. Ensuring adequate cooling solutions is crucial in high-performance applications.

SOLUTION

To solve for these challenges, Thrustmaster leveraged ECM's PrintStator CAD platform. Using PrintStator, ECM optimized a custom PCB Stator electric motor for Thrustmaster's new T598 – the company's next generation, direct drive sim racing wheel.

The T598 was released in October 2024 following a successful prototyping project. Thrustmaster and ECM worked closely together to define the desired specifications and design the optimal solution for the user experience.



ECM Coils are Fully Enclosed Within a Composite Structure

RESULTS

The PCB Stator motor integrated in Thrustmaster's T598 offers a novel motor solution for the sim racing industry with unique advantages including:

High Quality of Motion

- ECM-designed motors deliver smooth torque and zero cogging, resulting in a higher quality of motion compared to traditional machines. Cogging is avoided in ECM motors because they are air-core machines with PCB Stators that lack iron.
- Thrustmaster's HARMONY technology generates high-frequency vibrations to feel all the physics of the game, down to the smallest details.

5 Nm of Torque

- The ECM-designed motor delivers a constant torque of 5Nm, while also offering the opportunity of overshoot during high-torque demands within the game.

- The T598 has an overshoot capability of +100% to vastly increase its power and deliver super-boosted effects with ultra-low latency of 5ms.

Efficient Heat Dissipation

PrintStator incorporates patented thermal features into each motor design, including the T598, ensuring safe continuous operation. ECM PCB Stators use a continuous copper path that transfers heat from the stator's loss generating components to the motor case, where the heat can be dissipated into the surrounding environment. These thermal features enable the T598 to operate without added active cooling.

CONCLUSION

The T598 is the first product developed through ECM and Thrustmaster's continuing collaboration to leverage PrintStator Motor CAD with integrated PCB Stator technology. By pairing Thrustmaster's gaming hardware expertise to ECM's expertise in electric motor design, the partnership produced a first of its kind, axial drive sim racing wheel with unmatched performance, at this price range.

ECM's patented PCB Stator technology and advanced Motor CAD SaaS enable engineers to optimize electric motors that are smaller, quieter, and more energy efficient. ECM has collaborated with multiple organizations to create optimized motor solutions across a variety of verticals.

Those span HVAC, E-Mobility, Medical, Robotics, Aerospace, Haptics, Simulated Inertia, Renewable Energy, Aerospace, and Consumer Electronics.

Those wishing to leverage ECM's innovation can do so by obtaining a PrintStator SaaS licence or utilizing our advanced prototyping services. To explore integrating ECM's PCB Stator technology into your product line, please email info@pcbstator.com and visit our [Design Your Own](#) page to learn more about our five-step integration process.