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USB-C Power Delivery Reference Design Leverages GaN FET For High-Efficiency

Eggtronic's 140-W USB-C power delivery ac-dc reference platform for next-generation premium laptops and high-performance devices combines Eggtronic's EPIC combo controller with Renesas' high-voltage GaN device, the TP70H150G4LSG (700 V, 150-mΩ $R_{DS(ON)}$). According to the vendor, it delivers an unprecedented combination of extreme efficiency, outstanding cost-effectiveness, and simplified system architecture.

Unlike conventional high-power USB-C adapters that rely on costly LLC, asymmetrical half-bridge (AHB), or active clamp flyback (ACF) topologies, the reference design achieves efficiencies approaching 96% while maintaining the bill of materials cost of a traditional QR flyback converter.

The platform also delivers excellent efficiency across the entire operating range, including 94.5% efficiency at 90-Vac input and outstanding light-load performance, enabling compliance with the latest DOE Level VII energy efficiency requirements.

At the heart of the solution is Eggtronic's EPIC combo controller, which integrates every major control function into a single device, including totem pole power factor correction (PFC), isolated primary-side regulation, synchronous rectification, proprietary ultra-low-latency isolated communication and USB power delivery protocol management.

The platform's totem pole PFC overcomes two of the most common limitations of conventional implementations—EMI performance and light-load efficiency—while maintaining industry-leading conversion efficiency, says Eggtronic (see the figure).

The 140-W USB-C power delivery reference board is available now. For more information, see the product page.

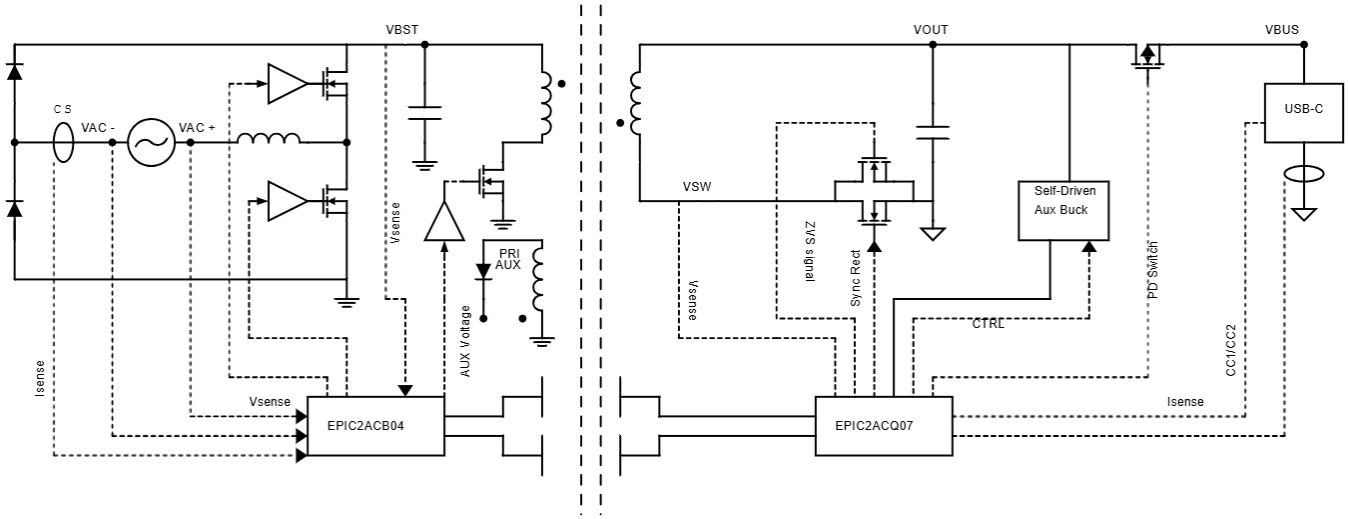

Figure. The PFC stage feeds Eggtronic's proprietary QuarEgg regenerative flyback architecture, which utilizes a single primary-side switch to achieve higher efficiency and lower system cost than LLC, AHB, and ACF converters, says the vendor, while maintaining the simplicity and economics of a QR flyback design.

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