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Eval Board For High-Efficiency, High-Frequency Wireless Power Transfer

Eggtronic's WaveEgg Low-Power (LP) evaluation board (EVB) allows engineers to quickly develop and prototype ultra-efficient, low-component count wireless power transfer designs for low-power applications. The EVB is built on the company's high-frequency WaveEgg architecture, which optimizes performance and efficiency and reduces component count and form factor in high-performance power converter and wireless power transmission systems (Fig. 1).

Well suited to wirelessly charging and powering small, smart devices and IoT products, WaveEgg delivers between 0.5 W and 30 W and can work at extremely high frequencies (up to tens of megahertz, including ISM band frequencies of 6.78, 13.56, and 27.12 MHz).

According to the vendor, WaveEgg offers end-to-end efficiency that is significantly higher than traditional systems, while allowing the overall bill of materials (BoM) to be reduced. Using WaveEgg LP EVB, engineers will be able to create systems with high low-load to full-load efficiency using fewer components than standard class D, class-E, class F, class Phi, and other resonant wireless power transfer solutions including Qi- and Airfuel-based technologies.

"Wireless power transfer technology based on conventional designs has limitations in relation to size, bill of materials and efficiency at reduced loads that limits its use for IoT and small smart devices," says Igor Spinella, Eggtronic's founder and CEO. "WaveEgg addresses the historical challenges of efficiency and component count for powers up to 30 W and the WaveEgg 6-W LP evaluation board provides a platform for engineers to quickly and easily realise practical and commercially viable low-power wireless designs."

WaveEgg is based on Eggtronic's EPIC (Eggtronic Power Integrated Controller) ICs. These ICs integrate a 32-bit RISC-V core and high-performance digital and analog peripherals and feature a flexible internal structure that supports control of both standard and proprietary power conversion architectures. High efficiency over the whole load range is achieved through a proprietary design that achieves zero-voltage-switching (ZVS) and quasi-zero-current-switching (quasi-ZCS) on the transmission side and ZVS+ZCS on the receiving side.

At an output of 6 W and a switching frequency of 2 MHz, WaveEgg achieves an efficiency of 85%. Its reduction in the number of required components versus conventional designs further contributes to efficiency by reducing losses from non-ideal component behavior (Figs. 2 and 3).

Additional component count reduction is possible for battery charging applications as the receiver is also capable of charging a battery through a stepdown converter implementing a CC/CV-mode algorithm, eliminating the need for a battery charge controller.

For more information, see the Technology page, the EPIC1AQW01 Resonant High Frequency Wireless Power Transmitter Controller page, and the EPIC1AQW02 Resonant High Frequency Wireless Power Receiver Controller page.

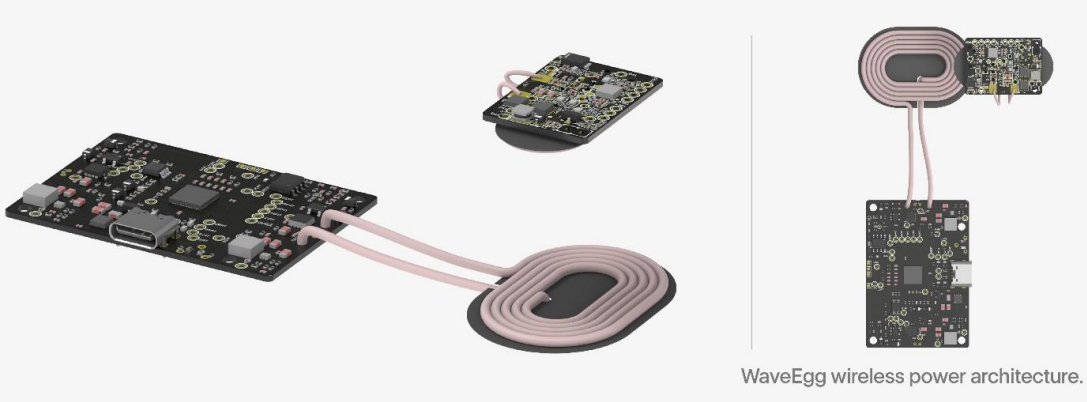

Fig. 1. WaveEgg LP EVB simplifies design and reduces component count for small form factor, cable-free charging of low-power devices up to 6 W.

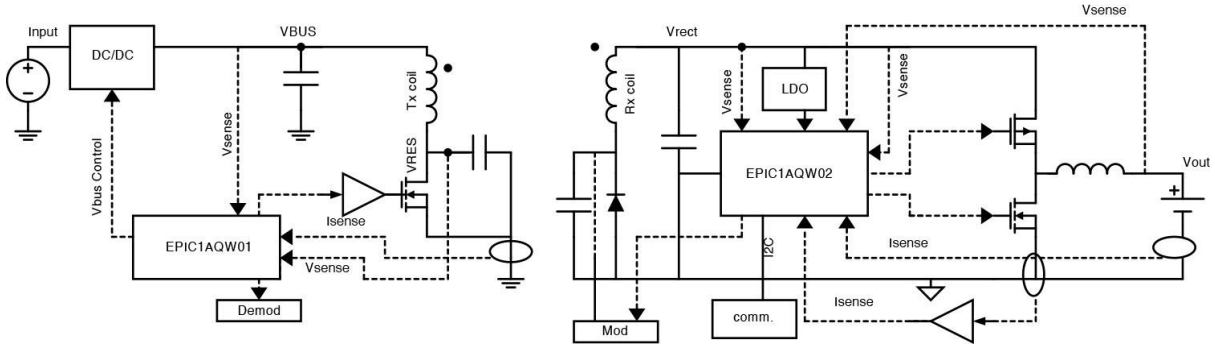

Fig. 2. A dc-input 6-W WaveEgg LP transmitter based on the EPIC1AQW01 coupled to a 6-W WaveEgg receiver based on the EPIC1AQW02. WaveEgg proprietary architecture is an evolution of Class-E amplifiers/rectifiers. In comparison to Class-E architectures, BOM is significantly reduced (no choke inductor, no matching network) both for cost optimization and light load efficiency. In addition, high efficiency over the whole load range at very high frequency is ensured thanks to load-independent zero-voltage-switching (ZVS) and quasi-zero-current-switching (quasi-ZCS) on the transmission side, and ZVS+ZCS on the receiving side.

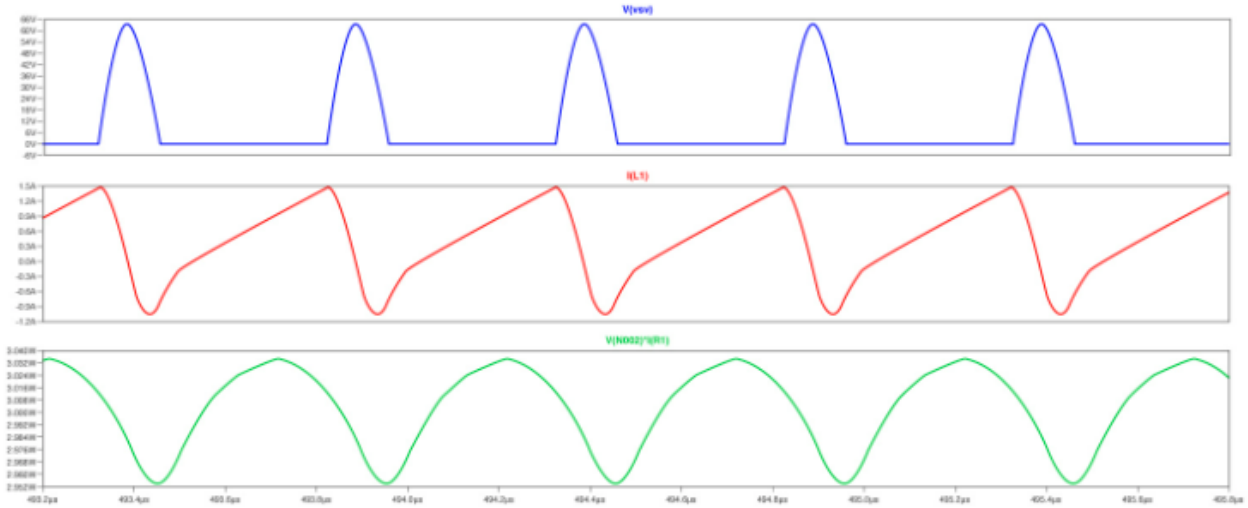

Fig. 3. Waveforms of WaveEgg show a similar shape in pattern to those of a Class-E amplifier.