









High Power Density Impedance Control Network DC-DC Converter **Utilizing Integrated Magnetic Structure**

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Prototype Design and Experimental Results

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Magnetics Integration Approach

- transformer
- high efficiency characteristic of ICN converter



Summary and Conclusions

- ICN-based resonant converter can achieve ZVS and near-ZCS operation and maintain high efficiency across wide operating ranges
- Magnetics integration enables increase in ICN converter power density by integrating three discrete inductors into a single magnetic structure using two coupled windings
- Integrated magnetics design optimized using 3D FEM simulations
- 550-W 1-MHz quarter-brick ICN converter prototype utilizing integrated magnetic structure achieves >450 W/in3 power density

Milwaukee, WI, September 2016.

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Converter size dominated by magnetic components with three inductors and a

Need an approach to increase power density while maintaining the wide-range





Model coupled inductor as a two-port network



References

• A. Kumar, J. Lu, S. Pervaiz, A. Sepahvand and K.K. Afridi, "High Power Density Impedance Control Network DC-DC Converter Utilizing an Integrated Magnetic Structure," Proceedings of the IEEE Energy Conversion Congress and Exposition (ECCE),