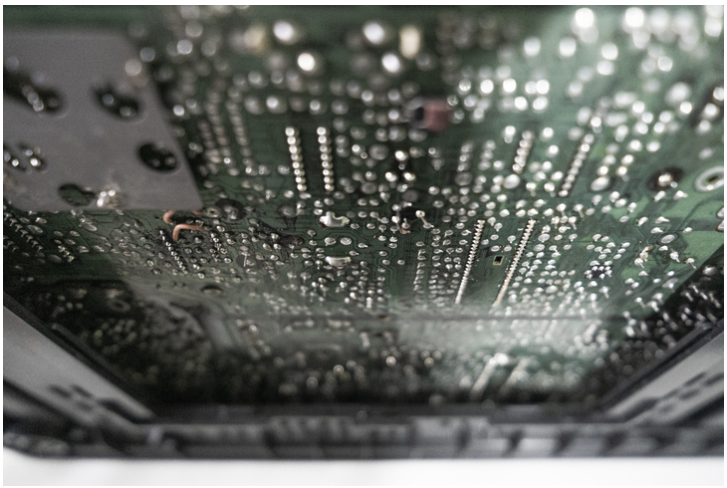
INNOVATION PARTNERSHIPS
UNIVERSITY OF MICHIGAN

Adaptive Power Steering and Matching Network for Rectifiers

TECHNOLOGY NUMBER: 6683



Technology ID
6683

Category
Hardware
Engineering & Physical Sciences
Semiconductor, MEMS, and Electronics

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OVERVIEW

Extend dynamic range of RF rectifiers using adaptive power distribution.

- Enhances rectification efficiency over fluctuating RF input power levels.
- Wireless power transfer, IoT devices, medical implants, and consumer electronics.

BACKGROUND

Wireless power harvesting (WPH) and wireless power transfer (WPT) are impactful areas in modern electronics, enabling the collection and transmission of energy without physical connections. Historically, these technologies have relied on rectifiers that convert received RF power into usable DC power. Traditional rectifiers, however, face efficiency constraints when operating across varying RF power levels, limiting the effectiveness of WPH and WPT systems. In many real-world environments, RF signal strength can significantly fluctuate, leading traditional rectifiers to exhibit poor performance and reduced energy conversion efficiency. This necessitates frequent battery replacements or the use of power cords, contrasting with the intended convenience and low maintenance goals of WPH and WPT systems. Consequently, there is a pressing need for advanced rectification methods that can sustain high efficiency over a broad dynamic range of input power levels, thereby enhancing the reliability and practicality of wireless power systems.

INNOVATION

Researchers at the University of Michigan have developed an extended resonance power divider that markedly improves the dynamic range of RF rectifiers. By employing multiple rectifier cells, each optimized for specific input power levels, the system can distribute RF input power adaptively. At lower power levels, the power divider channels input to a cell optimized for efficient low-power operation, while at higher power levels, it directs energy to a different cell suited for high-power efficiency. This adaptive distribution ensures that the most appropriate rectifier processes the input, maintaining optimal rectification efficiency across fluctuating power levels. The system achieves more than 50% efficiency over a substantial 35 dB dynamic range, improving energy conversion in varied conditions.

ADDITIONAL INFORMATION

REFERENCES

X. Wang and A. Mortazawi, "Dynamic range enhancement of RF rectifiers through adaptive power distribution employing an extended resonance network," 2015 European Microwave Conference (EuMC), Paris, France, 2015, pp. 135-138, doi: 10.1109/EuMC.2015.7345718

INTELLECTUAL PROPERTY

US9768708 "Wide dynamic range rectifier circuits"