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Multiple output wireless power transfer (WPT) system has a great potential to be used in applications where multiple receivers need to be powered simultaneously, including wireless office table, logistic sorting robots, and magnetic resonant imaging (MRI) equipment. For the sake of reducing no-load losses and avoiding leakage magnetic fields, it is desirable to only switch on those transmitter coils that are covered by receivers and switch off the rests. To realize this, however, bidirectional power switches, sensors and control logic are needed, which are expensive, bloated, and lossy. This paper proposed a novel receiver-controlled coupler (RC-Coupler) that can realize switching on/off of transmitter coils without using bidirectional switches, sensors, and control. The structure, design considerations, and leakage fields of the proposed RC-coupler are researched, and its feasibility has been confirmed with a GaN-based 120 W, 6.78 MHz prototype. A power density of 2.78 W/cm³ is reached benefiting from the receiver-controlled characteristics.

General information
Publication status: Accepted/In press
Organisations: Department of Electrical Engineering, Electronics, Jilin University
Contributors: Chen, X., Yu, S., Zhang, Z.
Pages: 1 - 11
Publication date: 2019
Peer-reviewed: Yes

Publication information
Journal: IEEE Transactions on Circuits and Systems Part 1: Regular Papers
ISSN (Print): 1549-8328
Ratings:
BFI (2019): BFI-level 1
Web of Science (2019): Indexed yes
Original language: English
Keywords: Wireless power transfer (WPT), Multiple output, Leakage magnetic field, Efficiency
Electronic versions:
FINAL_VERSION_5_.pdf
DOIs:
10.1109/TCSI.2019.2924949
Source: PublicationPreSubmission
Source-ID: 185535098
Research output: Contribution to journal › Journal article – Annual report year: 2019 › Research › peer-review