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## Active voltage balancing circuit using single switched-capacitor and series LC resonant energy carrier

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### ELECTRONICS LETTERS

Volume: 56 Issue: 20 Pages: 1036-+

DOI: 10.1049/el.2020.1417

Published: SEP 30 2020

Document Type: Article

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### Abstract

Single switched-capacitor and series LC resonant converter-based active voltage balancing circuit are presented in this Letter. This converter is proposed to balance the cell voltage in series-connected electrochemical energy storage devices namely battery or super-capacitor. This balancing circuit directly transfers the energy from higher capacitive energy storage cells to lower energy storage cells in the string. It realises the maximum energy recovery and zero voltage gap between the cells and overcomes the drawback of switching loss, conduction loss, balancing time duration, and the voltage difference between the cells of conventional switched-capacitor as well as single LC converter. The details of the balancing circuit operation, theoretical, and mathematical analysis are presented. The experimental result demonstrated that the balancing circuit result where the voltage difference is 451-0 mV in 124 min for two 12 V, 4.5 Ah lead-acid batteries.

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### Funding

Funding Agency	Grant Number
North Garth Institute of Technology Fundamental Research grant	
National University of Malaysia (UKM)	GOP P72086

[View funding text](#)

### Publisher

INST ENGINEERING TECHNOLOGY-IET, MICHAEL FARADAY HOUSE SIX HILLS WAY STEVENAGE, HERTFORD SG1 2AY, ENGLAND

### Journal Information

**Impact Factor:** [Journal Citation Reports](#)

### Categories / Classification

**Research Areas:** Engineering

**Web of Science Categories:** Engineering, Electrical & Electronic

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