

Lecture Notes in Networks and Systems 600

Rajendra Prasad Mahapatra

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Pritee Parwekar *Editors*

# Proceedings of International Conference on Recent Trends in Computing

ICRTC 2022

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# Lecture Notes in Networks and Systems

Volume 600

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Rajendra Prasad Mahapatra · Sateesh K. Peddoju ·  
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Editors

# Proceedings of International Conference on Recent Trends in Computing

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# Preface and About the Organization

This *Lecture Notes in Networks and Systems* (LNNS) volume contains the papers presented 10th International Conference on Intelligent Computing and Applications (ICRTC 2021) held during June 3–4, 2022, at SRM Institute of Science and Technology, Delhi-NCR Campus, Modinagar, Ghaziabad, India.

ICRTC 2022 is aiming at bringing together the researchers from academia and industry to report and review the latest progress in the cutting-edge research on various research areas of image processing, computer vision and pattern recognition, machine learning, data mining, big data and analytics, soft computing, mobile computing and applications, cloud computing, green IT and finally to create awareness about these domains to a wider audience of practitioners.

ICRTC 2022 received 350 paper submissions including two submissions from foreign countries. All the papers were peer-reviewed by the experts in the area from India and abroad, and comments were sent to the authors of accepted papers. Finally, seventy papers were accepted for online Zoom presentation in the conference. This corresponds to an acceptance rate of 34% that is intended to maintain the high standards of the conference proceedings. The papers included in this *Lecture Notes in Networks and Systems* (LNNS) volume cover a wide range of topics in intelligent computing and algorithms and their real-time applications in problems from diverse domains of science and engineering.

The conference was inaugurated by Prof. Milan Tuba, Professor, Singidunum University, Serbia, on June 3, 2022. The conference featured distinguished keynote speakers as follows: Prof. Sheng-Lung Peng, National Tsing Hua University, Taiwan; Address by Chief Guest Prof. Mike Hinchey, University of Limerick, Ireland.

We take this opportunity to thank the authors of the submitted papers for their hard work, adherence to the deadlines, and patience with the review process. The quality of a referred volume depends mainly on the expertise and dedication of the reviewers. We are indebted to the technical committee members, who produced excellent reviews in short time frames. First, we are indebted to the Hon'ble Dr. T. R. Paari Vendhar, Member of Parliament (Lok Sabha), Founder-Chancellor, SRM Institute of Science and Technology; Shri. Ravi Pachamoothoo, Pro-Chancellor—Administration, SRM Institute of Science and Technology; Dr. P. Sathyanarayanan,

Pro-Chancellor—Academics, SRM Institute of Science and Technology; Dr. R. Shivakumar, Vice-President, SRM Institute of Science and Technology; Prof. C. Muthamizhchelvan, Vice-Chancellor i/c, SRM Institute of Science and Technology for supporting our cause and encouraging us to organize the conference there. In particular, we would like to express our heartfelt thanks for providing us with the necessary financial support and infrastructural assistance to hold the conference. Our sincere thanks to Dr. D. K. Sharma, Professor and Dean; Dr. S. Viswanathan, Director; Dr. Navin Ahalawat, Professor and Dean (Campus Life), SRM Institute of Science and Technology, Delhi-NCR Campus, Modinagar, Ghaziabad, for their continuous support and guidance. We specially thank Dr. Pritee Parwekar, Associate Professor, and Dr. Veena Khandelwal, Associate Professor, Co-conveners-ICRTC 2022, SRM Institute of Science and Technology, Delhi-NCR Campus, of this conference for their excellent support and arrangements. Without them, it is beyond imagination to conduct this conference. We thank the international advisory committee members for providing valuable guidelines and inspiration to overcome various difficulties in the process of organizing this conference. We would also like to thank the participants of this conference. The faculty members and students of SRM Institute of Science and Technology, Delhi-NCR Campus, Modinagar, Ghaziabad, deserve special thanks. Without their involvement, we would not have been able to face the challenges of our responsibilities. Finally, we thank all the volunteers who made great efforts in meeting the deadlines and arranging every detail to make sure that the conference could run smoothly. We hope the readers of these proceedings find the papers inspiring and enjoyable.

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**Dr. Pritee Parwekar** is an associate professor in the Department of Computer Science and Engineering, Faculty of Engineering and Technology. She has been an academician from last 21 years. She has been awarded Ph.D. in the area of wireless sensor networks. She holds a life membership of IEEE, ACM, CSI and ISTE. She has also contributed as Computer Society of India (CSI) State Student Coordinator for two years. Her research interests include Internet of things, cloud computing, machine learning, wireless sensor networks, software engineering, information retrieval systems, social media and data mining. She has published more than 60 research papers in peer-reviewed journals with SCI, SSCI Scopus Index, and in conferences. She has been a resource person for workshops, FDPs and international conferences. She has also been invited to many workshops and international conferences as speaker, organizer, session chair and member in advisory/program committees. She is associated with *IEEE Network Magazine* Springer, *IGI Global Inderscience*, *Evolutionary Intelligence (EVIN) Journals*, *Personal and Ubiquitous Computing* *Multimedia Tools and Applications* *Expert Systems* and many more international journals as peer reviewer.



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# A Novel High Gain Single Switch Flyback DC–DC Converter for Small-Scale Lighting



R. Sathiya, M. Arun Noyal Doss, S. Avinash, and R. R. Hitesh

**Abstract** Day by day the population is increasing in our country. Increasing population leads to increase demand for power. In order to work out this growing demand, a simple and reliable model of combination of flyback and Luo converters are put forward in this paper. The source for the proposed converter is taken as photovoltaic energy obtained directly from the sun and the load is an outdoor lighting device, a well lamp. In this research, a hybrid converter is proposed that produces high gain with less ripples and also less stress across connected components. The operating modes also justify the working of the proposed converter. Furthermore, the proposed converter is backed with MATLAB Simulation waveforms and is verified with mathematical calculations to prove its efficiency. A 100 W prototype model is proposed to verify the effectiveness of the software model.

**Keywords** Flyback converter · High gain · Single switch · High efficiency · Increased voltage gain

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## 1 Introduction

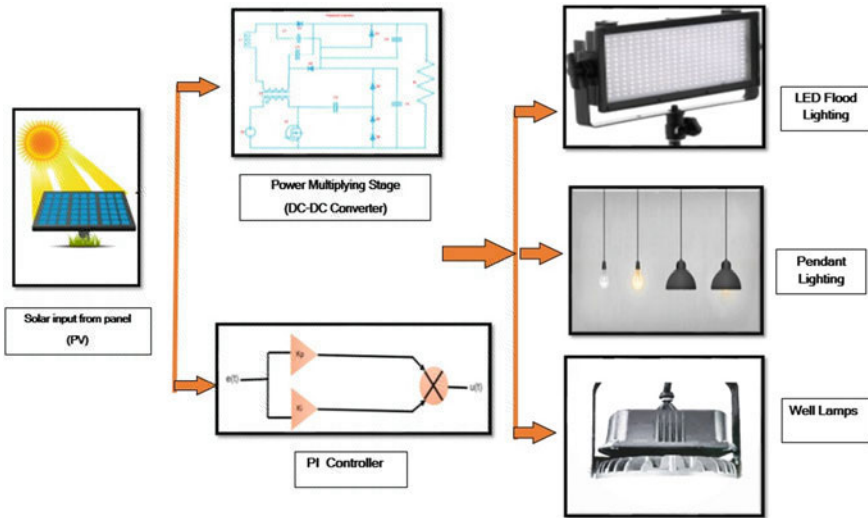
Most preferred DC–DC converter, flyback converter is the converter that draws attention of young budding researchers when it comes to its simplicity and effectiveness. Usually, the other topologies are seemingly quite hard to design and to practically formidable to implement, whereas in the case of flyback converter, where we have minimalistic design, increased efficiency, multiple differentiated input–output, increased voltage gain and reduced cost so it is quite easy to call it an ‘Efficient converter’. Two mutually coupled inductors are integrated into flyback converters for separation between input–output energy storage and increased output power transformation [1]. There are many differentiated types of DC-DC converters available in the industry available for various purposes but we are only concerned about isolated converters. These are mostly preferred as it supplies the required differentiation between input and output side which delivers a wide range of functions including agreement with noise immunity, safety requirements and other possible ground references. Also, it formulates a considerable amount of change in the voltage levels, energy ratings, etc. [2]. Flyback converters usually find its applications in cell phones, LCD TVs and personal computers as a power supply circuit [3].

Renewable energy became a major requirement due to its wide range of application sets, because of which it has become an essential part in our day-to-day activities. Among the various available energies, solar energy is predominantly selected because of its superabundance and versatility [4]. The proposed converter uses solar energy in the form of photovoltaic energy from the photovoltaic array of cells. It can generate up to 20 V of energy. A battery is considered as a secondary source of energy in case of any complications or breakdown of the primary source. The proposed converter uses two boost converters, a flyback converter and a Luo converter which elevates the efficiency of the proposed converter and decreases the stress among the connected constituents [5]. The proposed converter can be best explained with the help of the functional diagram given in Fig. 1.

The proposed converter uses MOSFET as a switch to drive the input pulse, and thus, it provides improved voltage gain making decreased stress across the constituents possible and producing less ripples in the waveform [5].

## 2 Proposed Topology

The ideology behind the proposed converter is best understood with the help of the given flowchart (Fig. 2) [6]. The DC-DC converter which can increase or decrease voltage according to the user needs is called a flyback converter. It can act both like a boost or buck converter. In this paper, we are currently interested in the boost mode of the flyback converter. The main advantage of flyback converter instilled in this designed converter is that even when there is no primary current flowing through



**Fig. 1** Functional diagram of the proposed converter

the coil, still some amount of secondary voltage is induced on the mutually coupled inductors and consequently power is delivered to the load.

The presented converter is given in the diagram given in Fig. 3. There are minimalistic amount of components used. With limited components, there is no compromise on the efficiency or the performance of the converter which separates the proposed converter from its previous competitors. In the presented converter, direct current (DC) is taken as input considering the fact that alternating current cannot be stored because of its alternating nature. But in order for the components to run smoothly, alternating current (AC) is required. Therefore, the DC is supplied with the help of input pulse generator so that the pulse generator converts the DC to AC in such a way that the components are not damaged considering that continuous AC damages the components [7–11]. Also, the MOSFET is used as a switch that is used to drive the input pulse generator and the resistor is used as load [5]. The inductors are used as storage elements.

The capacitors are used to store energy in the off state, and they discharge the same stored energy along with the applied input energy and hence making the voltage to increase.

This paper consists of flyback converter combined with Luo to boost the load voltage of the proposed module. This will produce a boosted voltage which will in turn power the load. The converter can be used to power all the three applications as specified in Fig. 1. One of the major issues of our country is the improperly developed construction sites. These poorly developed construction sites often lead to accident of innocent people usually children. So by developing a proper lighting system, these accidents can be reduced and their effects can be neutralized. Out of the proposed applications well lamp is finalized as a load considering its necessity and also its