iJRASET
International Journal For Research in
Applied Science and Engineering Technology

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 7 **Issue:** III **Month of publication:** March 2019

DOI: http://doi.org/10.22214/ijraset.2019.3381

International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 6.887
Volume 7 Issue III, Mar 2019- Available at www.ijraset.com

Dual Output Isolated Converter for E-Vehicle

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Abstract: In this project a unique integrated and isolated dual-output dc–dc resonant converter is created , which can interface both HV traction batteries and LV loads. The proposed topology is bidirectional, capable of delivering power from HV traction batteries to the LV load . This is achieved by increase the power density of the converter, the dual-output dc–dc resonant converter combines magnetic components of resonant networks into a single three-winding electromagnetically integrated transformer. This project improves economics and environmental incentives, as well as advances in technology, are reshaping the traditional view of industrial systems. Currently existing system, Batteries cannot be charged from grid and in down times no back up facilities. In comparison to two stand-alone dc-dc converters and other integrated converters, the proposed integrated topology has less number of components, smaller size, wide input/output voltage range, and potentially lower cost. The overall efficiency is enhanced by utilizing variable dc-link strategy.
Keywords: Dual output converter, Isolated converter, Bidirectional converter, E-vehicle converter

I. INTRODUCTION

Conventional Internal Combustion (IC) engine vehicles use petroleum products (i.e. petrol, diesel, or LPG) as the source of energy for driving purpose. The shortage of fossil fuel is the most critical issue over worldwide and the immediate solution is to minimize the use of fossil fuel as much as possible. Moreover, conventional IC engine vehicles emit carbon dioxide and various greenhouse gasses by making it harder to satisfy environmental regulations. The solution leads to adopting alternate fuel vehicles such as Electric Vehicles (EV) and Hybrid Electric Vehicle (HEV). EV does not emit tailpipe pollutant like particulates, ozone, volatile organic compounds, carbon monoxide, hydrocarbons, lead and oxides of nitrogen which plays a vital role in air pollution and greenhouse gas Moreover the fossil fuel issue can be minimized.

A. Components

PIC16F877A
Crystal Oscillator (10 MHz)
Rectifier-W10
IR211O; IRF840; Regulator (7805)
Diode IN4001
Resistor-100E, 1k, 470k ; Inductor-2mH; Capacitor- 470uf, 100uf, 22pf
Power supply (12v)

B. Existing System

Prior efforts to develop integrated EV onboard chargers include integration of non-isolated single-stage chargers that combine an ac-dc PFC converter and a dc-dc bidirectional converter, which interfaces an HV battery pack and the propulsion inverter**.** These topologies require more transistors and diodes, and integrating a high-power dc-dc converter with a low power onboard charger might reduce the charging efficiency. Some PEVs might not be equipped with a bidirectional converter between HV battery pack and propulsion inverter.

C. Proposed System

In this project a highly integrated dual-output isolated topology capable of G2V and HV-to-LV charging has been proposed. This work focuses on design and development of the bidirectional isolated resonant dc-dc stage. A unidirectional LLC resonant converter is used as the isolated stage of onboard charger to regulate the voltage/current of the HV traction battery. Another LLC resonant converter is used to deliver power from HV traction battery pack to LV dc loads. The proposed integrated topology has less number of components, smaller size, wide input/output voltage range, and potentially lower cost. The overall efficiency is enhanced by utilizing variable dc-link strategy. The leakage inductance and magnetizing inductance at both primary side and secondary side of integrated transformer without a need for additional individual resonant inductors.

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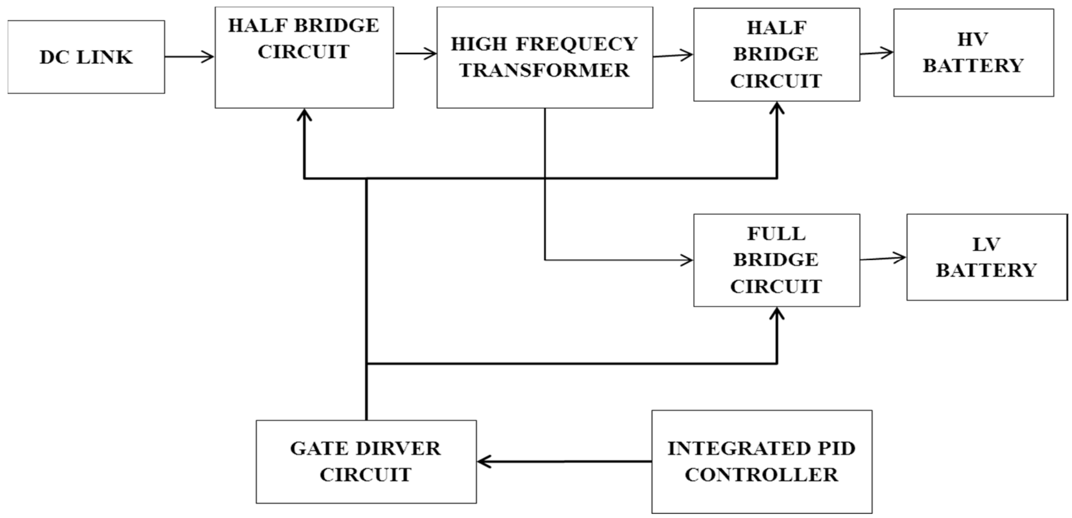
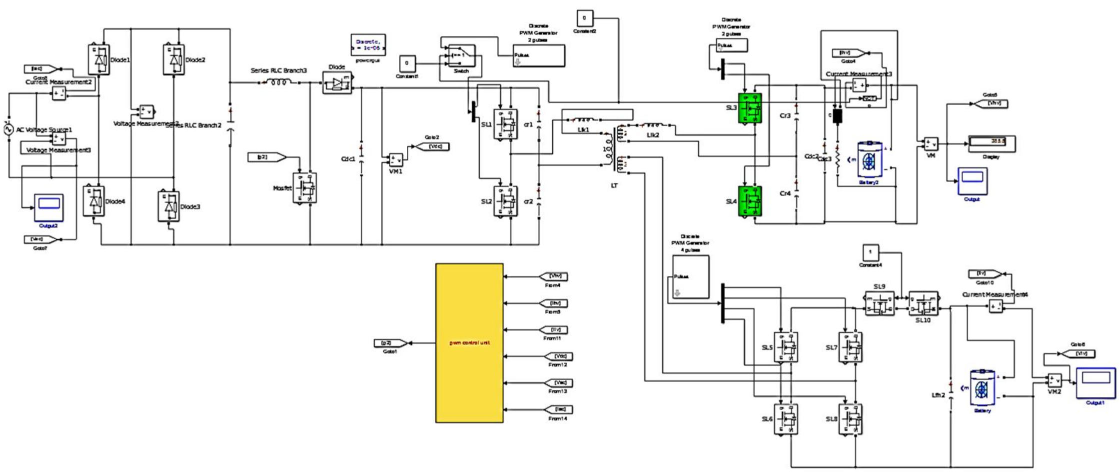
D. Block Diagram



E. Simulation Of Proposed System In Matlab



F. Simulation Output

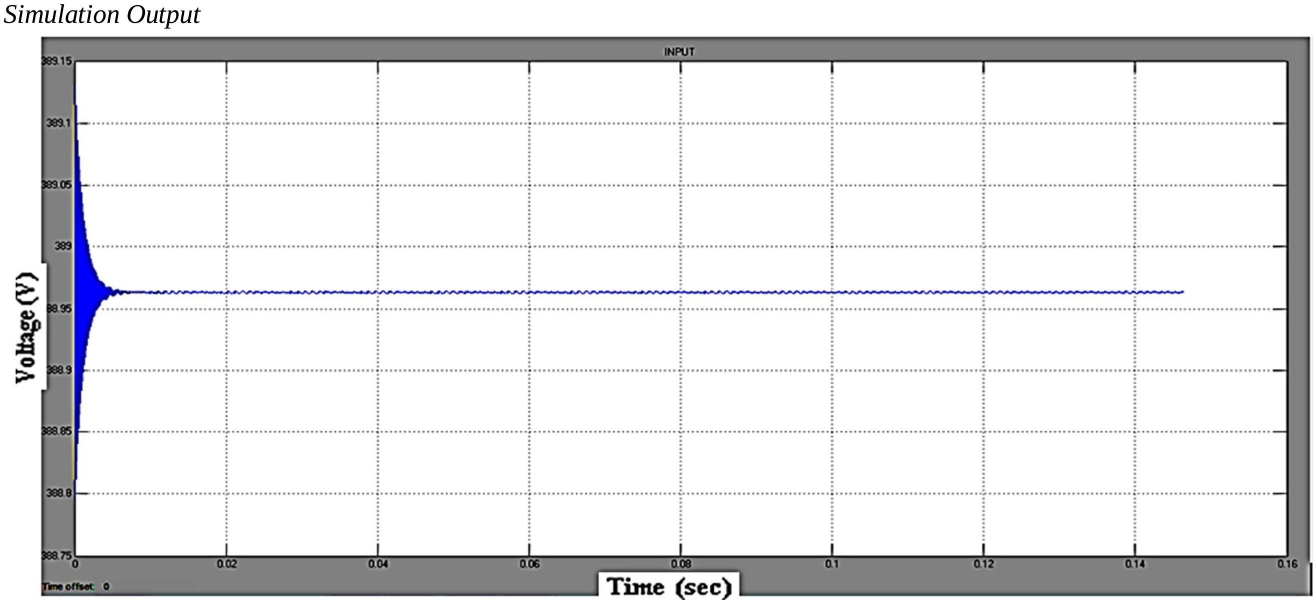


Figure. High voltage Battery voltage charge

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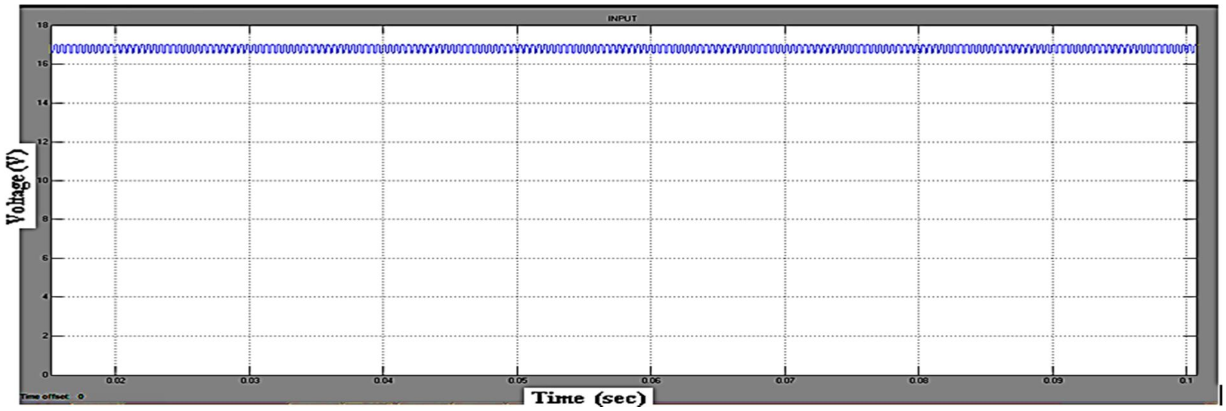

Figure. Low Voltage Battery Voltage charge

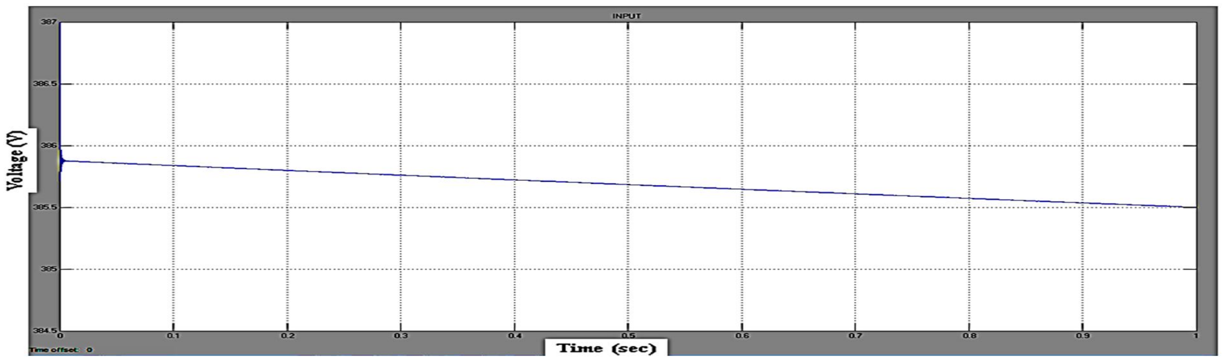

Figure. High voltage Battery Discharge mode

II. CONCLUSION

The proposed topology presents the integration of a half-bridge CLLLC converter intertwined with a half-bridge LLC converter with minimum number of passive and active components. The magnetic components are integrated into a single three-winding electromagnetically integrated transformer, which leads to an ultra-compact design with less size/weight, less saturation effect, less magnetizing losses, and higher voltage isolation. The half-bridge CLLLC converter operates during G2V operation while the half-bridge LLC converter operates during H2L operation. In comparison to conventional stand-alone converters, the integrated topology with less number of components reduces the size, weight and cost of the onboard PEIs. The proposed system is simulated in the MATLAB/Simulink simulation software and the output generated is represented graphically and experimental verification are made.

REFERENCES

[1] W. Su, H. Rahimi-Eichi, W. Zeng, and M.-Y. Chow, "A survey on the electrification of transportation in a smart grid environment," IEEE Trans. Ind. Informat., vol. 8, no. 1, pp. 1–10, Feb. 2012.
[2] C. C. Chan, A. Bouscayrol, and K. Chen, "Electric, hybrid, and fuel-cell vehicles: Architectures and modeling," IEEE Trans. Veh. Technol., vol. 59, no. 2, pp. 589–598, Feb. 2010.
[3] H.Chen, X.Wang, andA.Khaligh, "A single stage integrated bidirectional ac/dc and dc/dc converter for plug-in hybrid electric vehicles," in Proc. IEEE Veh. Power Propul. Conf., Sep. 6–9, 2011, pp. 1–6.
[4] J. A. P. Lopes, F. Soares, and P. M. R. Almeida, "Integration of electric vehicles in the electric power systems," Proc. IEEE, vol. 99, no. 1, pp. 168– 183, Jan. 2011.
[5] Y. Hu, W. Xiao, W. Cao, B. Ji, and D. John Morrow, "Three-port dc-dc converter for stand-alone photovoltaic systems," IEEE Trans. Power Electron., vol. 30, no. 6, pp. 3068–3076, Jun. 2015.
[6] J. G. Pinto, V. Monteiro, H. Goncalves, and J. L. Afonso, "On-board reconfigurable battery charger for electric vehicles with traction-to-auxiliary mode," IEEE Trans. Veh. Technol., vol. 63, no. 3, pp. 1104–1116, Mar. 2014.
[7] H.Wang, S. Dusmez, andA.Khaligh, "Maximum efficiency point tracking technique for LLC based PEV chargers through variable DC link control," IEEE Trans. Ind. Electron., vol. 61, no. 11, pp. 6041–6049, Nov. 2014.
[8] Electric Vehicle Conductive Charging System—Part 1: General Requirements, TC 69, ICS 43.120, IEC 61851-1:2010, 2010.
[9] J. Jung, H. Kim, M. Ryu, and J. Baek, "Design methodology of bidirectional CLLC resonant converter for high-frequency isolation of dc distribution systems," IEEE Trans. Ind. Electron., vol. 28, no. 4, pp. 1741–1755, Apr. 2013.