IMPLEMENTATION OF BUCK INVERTER WITH SINGLE INDUCTOR BY USING PWM TECHNIQUE

KONDA RAJU [1], KADASI SADANANDAM[2],
[1, 2] Department of EEE, JNTUH College of Engineering Manthani, INDIA
Email – [1] kondaraju999@gmail.com, [2]sadanandam4u@gmail.com

Abstract: *In Associate in nursing inversion system, high dependableness is one among the main targets following. Some issues can threaten the reliability of the system, like the shoot through the issue and the failure of reverse recovery. The twin buck inverters will solve the higher than issues while not adding dead time. A new topology of the twin buck electrical converter with series connected diodes and one electrical device is bestowed here. The system retains the advantage of no reverse recovery of the body diode. The electrical converter has only 1 filter electrical device, which may create the quantity and weight of the system attenuated unnoticeably and improve the integration. The full system is simulated in PSIM environment.*

Key Words: Body diode, MOSFET, PSIM, Reverse recovery, SPWM.

1. INTRODUCTION:

The quick development of the clean energy power generation needs the inversion system, particularly the inverters, to be a lot of reliable. Nonetheless, shoot through drawback of the power devices may be a major threat to the irresponsibleness. A traditional technique to resolve the shoot through the issue is by setting dead time. However, the dead time can cause a distortion of the output current. Also, throughout the dead time, the current might flow through the body diode of the switch which can cause the failure of the reverse recovery [1]. For the purpose of finding the higher than issues, the twin buck topologies square measure planned in a very ton of analysis. By combining two unofficial buck circuits, the twin buck electrical converters can not suffer threaten of shoot through drawback and also the freewheeling current can flow through the freelance diodes which may solve the reverse recovery drawback of the MOSFET's body diodes. However, the most important disadvantage of the dual buck topologies are that the magnetic utilization. Solely 1/2 the inductance is employed in each operating mode. And it'll obviously increase the load and volume of the system [4]. So as to boost the magnetic utilization of the twin buck inverter, a form of single electrical device twin buck topology was planned in [5]. Compared with the standard full bridge electrical converter, 2 further switches square measure applied within the proposed topology. The one electrical device topology will create full use of the inductance; however, the conducting loss is basically increased as a result of four switches square measure flown through throughout the power delivering modes. This paper presents a form of novel section leg topology with series connected diodes and single electrical device, to boost the irresponsibleness of the electrical converter, especially for the MOSFET electrical converter [6]. Applying the section leg to the one section electrical converter, associate improved single electrical device dual buck inverters square measure planned during this paper. The novel topology has the subsequent blessings. Firstly, retains the advantages of the standard twin buck inverters, secondly, makes full use of the inductance, thirdly, the planned inverter saves 2 switches compared to the standard single electrical device topology, that makes a lower conducting loss and a less complicated dominant strategy. The simulation and experimental results have verified victimization PSIM.

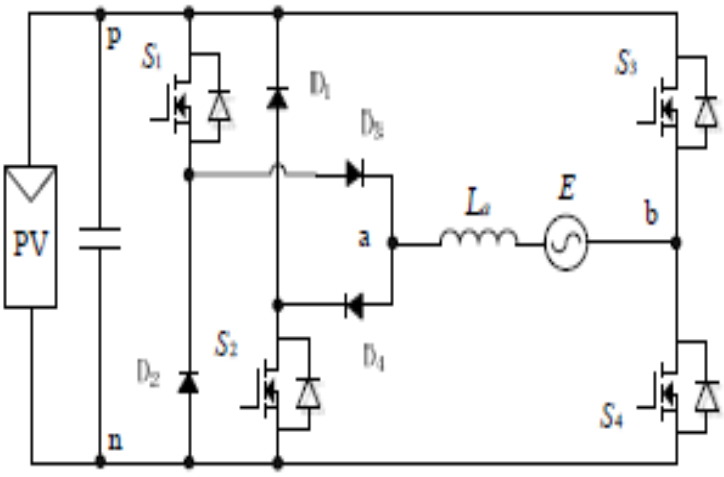

Fig.1.1.block diagram.

2. PREVIOUS STUDY:

The quick development of the clean energy power generation requires the inversion system, particularly the inverters, to be more and a lot of reliable. However, shoot through the downside of the power devices may be a major threat to the irresponsibleness. As is known, a standard methodology to resolve the shoot through the issue is by setting dead time. However, the dead time can cause a distortion of the output current. Also, throughout the dead time, the current could flow through the body diode of the switch that can cause the failure of the reverse recovery [1]. For the aim of resolving the higher than issues, the dual buck topologies are projected during a ton of analysis. By combining 2 unidirectional buck circuits, the twin buck inverters won't suffer the threaten of shoot through downside and the freewheeling current can flow through the freelance diodes which may solve the reverse recovery downside of the MOSFET's body diodes. However, the key downside of the dual buck topologies is that the magnetic utilization. Solely 1/2 the inductance is employed in each operating mode. And it'll obviously increase the burden and volume of the system [2]-[4].

3. DESIGN OF EXTERNA INDUCTOR:

This section proposes a sort of novel MOSFET section leg which maintains the high responsibility of the twin buck topology and additionally makes full use of the twin buck's inductance. Fig. shows the standard twin buck section leg and also the projected novel MOSFET section leg. The 2 inductors in Fig. are replaced by 2 diodes and one electrical device even as shown in Fig. Applying the projected section leg to the total bridge inverter, a unique twin buck MOSFET electrical converter with series connected diodes and the single electrical device is projected then. The novel twin buck electrical converter is shown in Fig. Compared to the traditional single electrical device twin buck electrical converter in Fig., the proposed topologies save 2 switches which suggest a less complicated control strategy. Meanwhile, within the power delivering mode, the current of the novel topology solely flows through one switch and 2 diodes that are a smaller amount than the standard one in Fig. So, the projected single electrical device twin buck topologies have the advantages within the facet of potency, management quality, and system price and size. The operational principle of the projected single electrical device twin buck electrical converter is illustrated with four operation modes. Fig. Shows the particular current flow methods during the energy transferring modes and also the freewheeling modes. A unipolar SPWM strategy is applied to manage the four switches of the novel electrical converter.

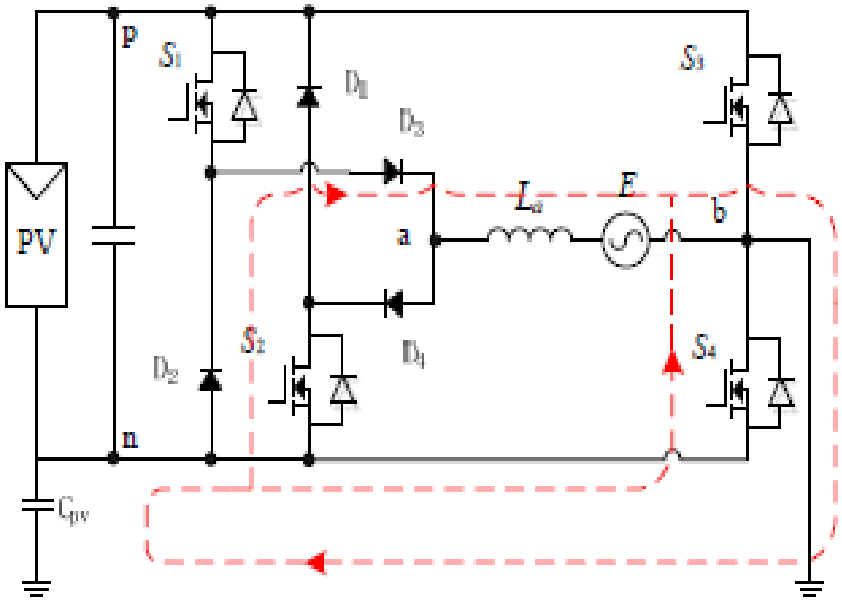

Fig.3.1.Equivalant circuit.

4. SIMULATION RESULTS:

The simulation and experimental results area unit shown during this section. The projected inverters in Fig. four were simulated in Mat lab/Semolina. The DC voltage is 400V, and also the grid voltage is 220V/50Hz. The shift frequency is 10 kHz. The output electrical device is 2mH. The grid current is controlled by a conventional PR controller. Fig. nine shows the simulated switching signals of the projected electrical converter. Fig. ten shows the filtering current and shift current of the projected electrical converter. The current waveforms of the switches area unit all simplex which indicate that no freewheeling current is flowing through the body diodes of the MOSFET. That the projected electrical converter cannot be vulnerable by the reverse recovery issue, thus the reliability of the inversion system is basically improved.

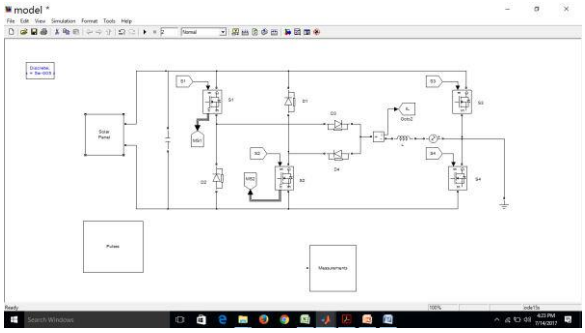

Fig.4.1.Simulation circuit.

Fig.4.2.Output Waveforms.

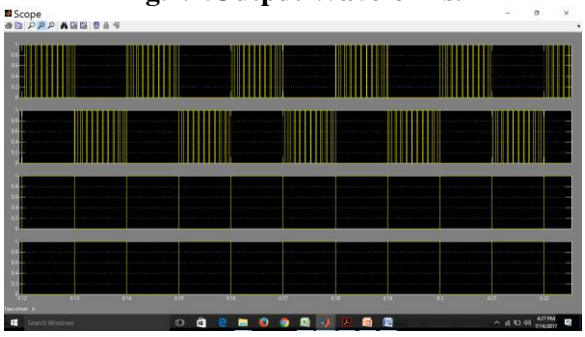

Fig.4.3.Output Waveforms at MOSFETS.

5. CONCLUSION:

From the theoretical analysis and experimental results of the example, it's obtained that the electrical converter has high conversion potency and no reverse recovery of the body diode. Compared with alternative twin buck inverters, the electrical converter has only one filter inductor; therefore, the quantity and weight of the system square measure unnoticeably shriveled, and also the integration is more improved. Since the diodes forestall this flow through the body diodes of switches S1 and S2 the reverse recovery loss is well reduced. So as to unravel the most drawback of low magnetic utilization, a form of part leg topology is conferred. By applying the novel part leg to the full bridge electrical converter, the new topology maintains the high reliability of the standard twin buck electrical converter and also the magnetic utilization is essentially improved. Also, compared to the traditional single inductance twin buck electrical converter, the novel topology has the benefits in conducting loss and controlling quality.

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AUTHOR'S BIO-GRAPHY:

Konda Raju is currently working as a lecturer in EEE department in Jawaharlal Nehru Technological University Hyderabad College of Engineering Manthani. He received M.Tech in Power Electronics from PRRM Engineering College, Shabad in 2013 and received his B.Tech in Electrical & Electronics Engineering from Jyothishmathi Institute of Technology and Science Karimnagar affiliated to JNTU , Hyderabad, India in 2011.

Kadasi Sadanandam is currently working as a lecturer in EEE department in Jawaharlal Nehru Technological University Hyderabad College of Engineering Manthani. He received M.Tech in Power Electronics from CMR CET (Autonomous), Hyderabad in 2014 and received his B.Tech in Electrical & Electronics Engineering from Sindhura College of Engineering & Technology affiliated to JNTUH, NTPC, Ramagundam, India in 2010.