

This article presents a review and comparison of high-voltage-step-down ratio dc/dc converters based on the modular multilevel converter (MMC) or quasi-MMC, specifically designed for medium-voltage direct current (MVDC) grid-tied energy storage systems (ESS). This article discusses various topology configurations and their operational features. The surveyed ...

This research introduces a unique bidirectional dc-dc converter specifically developed for energy storage applications. The proposed circuit topology exhibits a high ...

This study proposes a bidirectional DC-DC converter with low voltage stress on its semiconductor elements and high voltage gain. Bidirectional DC-DC converters play a crucial role in DC microgrid systems, and they have been used for many applications such as power flow management, battery storage systems, voltage regulation, and electric vehicle (EV) ...

FCs, electric cars, battery energy storage, and continuous power sources demand high-gain DC/DC converters. Interleaving and connecting two inductor boost cells so that the input is parallel to the output series results in significant voltage gain while reducing the amount of input current ripple [11]. Solar photovoltaic (PV) systems are ...

High-current, high-voltage DC switching Dr. Shun Yu, Claas Rosenkoetter, Robert Hoffmann, Dr. Frank Werner (all TDK Piezo & Protection Devices Business Group) An increasing number of DC applications, such as battery charge and discharge systems, renewable energy storage etc. require adequate and powerful DC switches.

In this paper, a novel non-isolated interleaved bidirectional soft-switching dc-dc converter (NIBC) with a novel auxiliary zero-voltage-transition (ZVT) cell is proposed for connecting the energy storage system to the DC bus. The proposed converter achieves high performance in terms of efficiency because main switches can realize zero-current-switching (ZCS) turn-on through the ...

In this article, an interleaved soft-switching bidirectional dc-dc converter (BDC) with high voltage conversion ratio (VCR) and low voltage stress is proposed for battery charging/discharging applications. A built-in transformer (BT) is integrated into conventional half-bridge BDC and three-level structure to achieve high VCR and reduced voltage stresses ...

A nonisolated soft-switching bidirectional dc-dc converter (BDC) with interleaved technique and built-in transformer (BT) is proposed for the interface between the energy storage system and dc microgrid bus in this article. A T-type neutral-point-clamped circuit is integrated into an interleaved conventional buck-boost BDC to obtain a high voltage-gain ratio and decrease ...

- In this mode power transfer from high voltage DC Bus to battery. - Power stage work as "LC Converter" - The High voltage mosfet achieve ZVS turn-on. - The body diode of the low voltage mosfet have high  $di/dt$  at turn-off. Some have some Qrr ...

An increasing number of DC applications, such as battery charge and discharge systems, renewable energy storage etc. require adequate and powerful DC switches. In contrast to AC switching, where zero-crossing of voltage and current facilitates quenching ... igh-current, high-voltage DC switching 3. Methods of arc quenching There are several ...

1 INTRODUCTION. Bidirectional DC/DC converters are used to manage the battery for several electric power applications such as small energy storage systems, mini electric vehicles, and uninterruptible power supplies [1-5]. Generally, low-voltage batteries are used in small-scale energy storage system or devices because it is easy to handle and relatively ...

Shown in Fig. 1, these energy storage systems are DC systems and require the use of a high voltage conversion ratio (VCR) converter to connect to the DC bus [[8], [9]]. Moreover, compared with many distributed DC/DC converters, a multi-ports DC-DC converter can achieve less components, higher compactness, higher efficiency and higher power density.

Das, M. & Agarwal, V. Design and analysis of a high-efficiency DC-DC converter with soft switching capability for renewable energy applications requiring high voltage gain. IEEE Trans. Ind ...

The paper proposes a novel multi-port high-gain (NMPHG) bidirectional DC-DC converter that supports DC microgrid (DC-MG) applications. The main contributions of the proposed converter are high step-up/step-down conversion gain, multiple input ports, lower switch voltage stress, and lower component count owing to the single converter with ...

A new design of compact circuit that converts a low-level dc voltage to a high-level dc voltage has been proposed in this paper. It has a single switch and fewer passive ...

The study introduces a bidirectional dc-dc converter with current- and voltage-fed (VF) ports that features soft switching in both buck and boost operating modes. The converter can be used for integration of low-voltage DC sources, such as batteries into a dc bus of considerably higher voltage or a dc link of a grid side inverter.

In this paper, a novel high-efficiency bidirectional isolated DC-DC converter that can be applied to an energy storage system for battery charging and discharging is proposed. By integrating a coupled inductor and switched-capacitor voltage doubler, the proposed converter can achieve isolation and bidirectional power flow. The proposed topology comprises five ...

This paper presents an isolated high voltage gain soft-switching dc-dc converter suitable for DC microgrid

applications. The converter comprises a dual-switch quasi-z-source network, ...

4 &#0183; A bidirectional DC-DC converter is presented as a means of achieving extremely high voltage energy storage systems (ESSs) for a DC bus or supply of electricity in power applications. ... are an interleaved buck/boost converter on the battery and a three-phase wye-wye series resonating converter on the DC bus. Each switch's current stress is ...

The Nuvation Energy High-Voltage BMS is a utility-grade battery management system for commercial, industrial and grid-attached energy storage systems. ... 25% reduction in the cost per kilowatt-hour footprint of the BMS (over the Nuvation Energy G4 BMS, based on a 1500 V DC energy storage system).

This paper presents a high efficiency, low-cost bidirectional isolated dc-dc converter for distributed energy storage device (DESD). Derived from dual active bridge (DAB), the proposed converter consists of a half-bridge circuit at high voltage side and a push-pull circuit with active clamp at low voltage side.

The circuit diagram of the proposed high step-up/step-down BDC is shown in Fig. 1. The voltage sources,  $V_L$  and  $V_H$  are the LV battery bank and the HV DC bus symbols, respectively. The proposed topology consists of four power MOSFET switches  $S_1$  - $S_4$ , a clamp capacitor  $C_c$ , two HV side stacked capacitors  $C_{H1}$  and  $C_{H2}$ , and the coupled inductors with ...

Interfacing multiple low voltage energy storage devices with a high voltage DC bus efficiently has always been a challenge. In this paper, a high gain multiport DC-DC converter is proposed for low ...

A switched inductor based bidirectional DC-DC converter (BDC) for high voltage gain is designed for electric vehicle (EV) and solar PV installation applications. The global ...

Power electronics play a crucial role in optimizing energy extraction from renewable sources. Illustrated in Fig. 1, a DC microgrid relies on high-gain DC-DC circuits to bridge between loads and ...

In this paper, a bidirectional non-isolated DC/DC converter for hybrid energy storage systems has been proposed. The converter is constituted by the integration of two conventional two-level topologies, with a parallel connection on their low-voltage sides (LVSS) and a series connection on their high-voltage sides (HVSs). Thus, a high-voltage gain can be ...

Non-isolated bidirectional dc-dc converters (NBDCs) are widely used in energy storage systems. However, the zero-voltage switching (ZVS) for NBDCs is hard to realize by adding auxiliary circuits. The auxiliary current should be larger than the filtering inductor current. Then the auxiliary current causes high conduction losses, which have adverse effects on ...

In this article, an interleaved soft-switching bidirectional dc-dc converter (BDC) with high voltage conversion ratio (VCR) and low voltage stress is proposed for battery ...

renewable energy storage etc. require adequate and powerful DC switches. In contrast to AC switching, where zero-crossing of voltage and current facilitates quenching and in some cases prevents arcing, only the high power switch can extinguish the arc generated by a DC source.

This study proposes a bidirectional DC-DC converter with low voltage stress on its semiconductor elements and high voltage gain. Bidirectional DC-DC converters play a ...

One of the major challenges with EV and PV installation are the interface between the energy storage unit and the DC link. The proposed BDC can solve this problem and achieves a high step-up/step-down conversion ratio. This converter operates at a switching frequency of 100 kHz and obtain a high voltage gain without having extreme duty ratio ...

In this paper, a novel non-isolated interleaved bidirectional soft-switching dc-dc converter (NIBC) with a novel auxiliary zero-voltage-transition (ZVT) cell is proposed for connecting the energy storage system to the DC bus. The proposed converter achieves high performance in terms of efficiency because main switches can realize zero-current-switching ...

Power electronic conversion plays an important role in flexible AC or DC transmission and distribution systems, integration of renewable energy resources, and energy storage systems to enhance efficiency, controllability, stability, and reliability of the grid. The efficiency and reliability of power electronic conversion are critical to power system ...

Regarding the scientific literature, a huge number of RES-based microgrids present a connection scheme similar to Fig. 1. That is, there is a high voltage-DC bus supported by the battery bank as ESS, and additional renewable sources (photovoltaic panels, wind turbines or fuel cells) are connected to DC-bus by means of DC/DC power converters.

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