

What is a bidirectional DC-DC converter?

Abstract: 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.

Why is bidirectional DC/DC converter important in battery-based hybrid ESS?

Due to the highly dynamic required battery output current, the battery's voltage variation is also highly dynamic. As a crucial interface between the lithium-ion battery and DC bus, the control of bidirectional DC/DC converters plays a critical role in the application of battery-based hybrid ESSs.

What is the optimal bidirectional DC/DC power converter control strategy?

The typical pulsed power load characteristic and the induced input side battery voltage change cannot be ignored. Therefore, an optimal bidirectional DC/DC power converter control strategy that considers these realistic disturbance is relevant.

What are the problems with bidirectional DC-DC conversion systems for NEV powertrain?

The main issues about bidirectional DC-DC conversion systems for NEV powertrain are as follows: With continuously improved bus voltage levels (400 V promoted to 800 V) of powertrain, a bidirectional DC-DC converter is required to continuously improve the voltage conversion ratio to match the SC (or power battery) and vehicle bus voltages.

What is a current-fed bidirectional DC-DC converter?

Typical current-fed bidirectional DC-DC converter include basic current-fed converters, current-fed DAB converters and interleaved isolated current-fed converters. Fig. 14. Classification of isolated bidirectional DC-DC converters. Voltage-fed bidirectional DC-DC converter consists of rectifier and inverter units.

Do DC-AC converters have bidirectional energy transfer capability?

As energy transfer in either direction is required for the system, each dc-ac converter must also have bidirectional energy transfer capability. With the same token, the dc buses in this structure must also be able to either generate or absorb energy.

STDES-DABBIDIR - 25 kW, dual active bridge bidirectional power converter for EV charging and battery energy storage systems, STDES-DABBIDIR, STMicroelectronics English ; ; ... The STDES-DABBIDIR provides a complete solution for a bidirectional DC-DC power converter. A dual active bridge topology based on ACEPACK 2 SiC power ...

Keywords-- Photovoltaic (PV) system, Battery energy storage system (BESS), Maximum power point tracker

(MPPT) controller, Bi-directional converter, Double loop PI controller, Permanent magnet dc ...

To improve the dynamic performance and durability of vehicle powertrain, the hybrid energy storage system of "fuel cell/power battery plus super capacitor" is more used in ...

International Journal for Modern Trends in Science and Technology, 2019. This study develops a newly designed, patented, bidirectional dc/dc converter (BDC) that interfaces a main energy storage (ES1), an auxiliary energy storage (ES2), and dc-bus of different voltage levels, for application in hybrid electric vehicle systems.

A double-paralleled bidirectional buck-boost DCDC converter (DBBC) is proposed in this paper to achieve bidirectional synchronous power conversion between battery energy storage(BES) ...

In addition to that use of energy storage devices and to support the battery a bidirectional DC-DC converter has been used in the paper. To managed the generated power across the renewable energy sources as well as to deals with the system uncertainty the requirement of energy storage systems also has been increased.

Bidirectional DC-DC converters (BDCs) are certainly an important power electronic converter for managing bidirectional power flow in various applications. It offers the ability to flow power in both directions, which is useful in systems with renewable energy sources and energy storage. ... employed in standalone PV system with battery energy ...

Bidirectional DC/DC converters, crucial interfaces linking batteries and DC buses, serve as critical actuators for tasks such as DC bus regulation, on-line battery diagnosis, ...

54.2.3 Bidirectional DC-DC Buck-Boost Converter The bidirectional DC-DC converter consists of two diodes; D1 and D2 connected in anti-parallel with two switches S1 and S2 respectively. It operates in two modes; buck and boost [10-12]. The circuit diagram of bidirectional DC-DC converter is shown in Fig. 54.4. The value of parameters of ...

The versatile bidirectional power supply is an integration of two systems: a DC-DC synchronous buck converter for charging a lead acid battery and a DC-DC synchronous boost converter for driving a CC-CV DC load from the lead acid battery. Control of the system is managed through an onboard MSP430F5132 microcontroller. The firmware

This paper describes the design and performance of a 6-kW, full-bridge, bidirectional isolated dc-dc converter using a 20-kHz transformer for a 53.2-V, 2-kWh lithium-ion (Li-ion) battery energy storage system. The dc voltage at the high-voltage side is controlled from 305 to 355 V, as the battery voltage at the low-voltage side (LVS) varies from 50 to 59 V. The maximal efficiency of ...

Keywords: bidirectional dc/dc converter (BDCC), bidirectional power flow, DSP flow chart, dual battery

storage, hybrid electric vehicle. Citation: Venkata Govardhan Rao K, Kumar MK, Goud BS, Bajaj M, Abou Houran M and Kamel S (2022) Design of a bidirectional DC/DC converter for a hybrid electric drive system with dual-battery storing energy. Front.

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Effective bidirectional energy transfer between the battery and the SC using a DC-DC converter enables each storage device to function independently and maximize its specific capabilities. This active connectivity implies the SC can swiftly handle high-power requirements, while the battery handles longer-term power demands due to its higher ...

In this article, a novel bidirectional dc-dc converter (BDC) consisting of an active switched-inductor (A-SL) cell, a zero current ripple cell and an auxiliary capacitor cell is proposed for the ...

This paper presents modeling and analysis of bidirectional DC-DC buck-boost converter for battery energy storage system and PV panel. PV panel works in accordance with irradiance available.

Battery energy storage systems (BESSs) can control the power balance in DC microgrids through power injection or absorption. A BESS uses a bidirectional DC-DC converter to control the power flow to/from the grid. On the other hand, any fault occurrence in the power switches of the bidirectional converter may disturb the power balance and stability of the DC ...

The steady and transient performance of a bidirectional DC-DC converter (BDC) is the key to regulating bus voltage and maintaining power balance in a hybrid energy storage system. In this study, the state of charge of the energy storage element (ESE) is used to calculate the converter current control coefficient (CCCC) via Hermite interpolation. Moreover, ...

The battery energy storage system is required to maintain the direct current (DC) bus voltage of the hybrid aircraft through a bidirectional isolated DC-DC convert. ...

A double-paralleled bidirectional buck-boost DCDC converter (DBBC) is proposed in this paper to achieve bidirectional synchronous power conversion between battery energy storage(BES) system and aircraft high voltage DC (HVDC) buses. The double-paralleled topology is firstly proposed to regulate bidirectional power flow from battery to charging-bus and 270V-bus, ...

Abstract: With the increase in demand for generating power using renewable energy sources, energy storage and interfacing the energy storage device with the grid has become a major challenge. Energy storage using batteries is most suitable for the renewable energy sources like solar, wind etc. A bi-directional DC-DC converter provides the required bidirectional power flow ...

Battery energy storage bidirectional dc/dc

with Dual-Battery Energy Storage for Hybrid Electric Vehicle System Ramesh Romala¹ | T Suman²
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Dual-Battery Energy Storage for

The present trends in the aircraft industry is a shift towards a "More Electric" architecture, in which electrical power drives aircraft flight surfaces. With the increase in electrical power requirement, a high energy density battery energy storage system (BESS) is required in a More Electric Aircraft (MEA). This paper describes the design and operation of a 50 kW, 6.4 ...

Bidirectional dc-dc converters (BDC) have recently received a lot of attention due to the increasing need to systems with the capability of bidirectional energy transfer between two dc buses. ... A full-bridge bidirectional DC-DC Converter with Fuzzy Logic Control is designed and implemented for battery energy storage application and shows the ...

increasing need to systems with the capability of bidirectional energy transfer between two dc buses. Apart from traditional application in dc motor drives, new applications of BDC include ...

The bidirectional DC-DC converters are widely used in the energy storage system (ESS) and DC distribution system. The power capacity is limited when the converter is operated with smooth power transfer. In addition, the directions of the inductor current and the capacitor voltage cannot change instantaneously. In this study, a rapid energy conversion ...

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) ...

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 ...

In this paper, a PV system with battery storage using bidirectional DC-DC converter has been designed and simulated on MATLAB Simulink. The simulation outcomes verify the PV system's performance ...

Bidirectional dc-dc converters are integrated with the hybrid energy storage system to control the charge and discharge operations of the energy storage system. A model and simulation of the ...

Bi-directional DC-DC converters are the key elements in BESS, which interface batteries and DC bus for power transfer. In this lecture, a comprehensive review for isolated bi-directional DC-DC converters is presented. The requirements of BESS on isolated bidirectional DC-DC converters with high efficiency and

high power density are introduced.

1 Introduction. Massive introduction of dispersed energy generation systems imposes new challenges of grid stability due to the intermittent nature of the renewable energy sources, which is especially challenging in remote locations [1, 2]. Fuel cell or battery-based energy storage systems (BESSs) is an attractive solution for both residential and commercial ...

This study develops a newly designed, patented, bidirectional dc/dc converter (BDC) that interfaces a main energy storage (ES1), an auxiliary energy storage (ES2), and dc-bus of different voltage levels, for application in hybrid electric vehicle systems. The proposed converter can operate in a step-up mode (i.e., low-voltage dual-source-powering mode) and a ...

An equivalent circuit based small signal model for a bi-directional dual half bridge (DHB) DC/DC converter and a power management control method is proposed to realize cold start and load leveling for fuel cell vehicle propulsion system. ... This converter is applied in a fuel cell vehicle that uses battery as an energy storage element to ...

This paper presents a control scheme for the charge and discharge operations of a hybrid energy storage system comprised of batteries and supercapacitors. The benefits of high-power density of supercapacitors and high-energy density of batteries have a potential to improve the dynamic performance of a power system and improve the battery life when combined. Bidirectional dc ...

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