

This article presents a 10-kW novel gallium-nitride (GaN)-based three-phase grid to 48-V battery energy storage system (BESS). The BESS utilizes a single-stage ac-dc dual-active-bridge (DAB) converter with dual-phase-shift (DPS) and variable-frequency (VF) control. 600- and 80-V GaN power transistors, as well as planar magnetics, are used to achieve 96.6% ...

property of the synchronous buck power stage allows the designer to implement the bidirectional power flow controller. The following Figure 2 and Figure 3 show the power flow when the power stage is working as a synchronous buck and synchronous boost converter. Figure 2. Power Stage When Working as Synchronous Buck Converter High Efficiency ...

In this paper, we deal with the design problems of bidirectional AC-DC converters for charge/ discharge control and grid connection of energy storage system. The bidirectional DC-DC converter will be designed and implemented as a noninverting buck-boost type topology. The buck mode will be operated in the charge mode and the boost mode will also be operated in ...

energy storage device (ESD) such as supercapacitors are very low. Series connection of many cells reduces reliability [4, 5]. ESDs need to be charged and discharged [6]. A desirable charger is preferred to control the charging current tightly. To exchange energy between the ESD and ac grid, a bidirectional dc-ac converter is needed.

This paper presents a new modulation and control strategies for the high-frequency link matrix converter (HFLMC). The proposed method aims to achieve controllable power factor in the grid interface as well as voltage and current regulation for a battery energy storage device. The matrix converter (MC) is a key element of the system, since it performs a ...

4 · 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. This paper presents a novel dual-active-bridge (DAB) bidirectional DC-DC converter power management system for hybrid electric vehicles (HEVs).

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 ...

AC/DC, DC-DC bi-directional converters for energy storage and EV applications Ramkumar S, Jayanth Rangaraju Grid Infrastructure Systems . Detailed Agenda 2 1. Applications of bi-directional converters 1.1.

Power storage applications 1.2. EV charger applications 2. Bi-directional topologies and associated reference designs

The efficiency measurements of the bidirectional DC-AC converter, performed in grid-connected inverter mode, show that we exceeded the efficiency target of 95% over the entire output power range studied, i.e., from 100 W to 1.5 kW. ... arrays and/or wind turbines and energy storage systems, such as flywheels, supercapacitors or batteries ...

In Section 4, stability control strategies for bidirectional energy storage converters are obtained depending on AC CPLs, energy storage systems, and micro power sources. Finally, Section 5 shows simulations and experimental findings to validate the suggested control techniques for the DCDC converter and DC-AC converter used for energy storage ...

Fig. 1 shows an energy storage system which composes of a Li-ion battery bank, a bidirectional isolated DC-DC converter and a three-phase bidirectional AC-DC converter [5]. The three-phase bidirectional AC-DC converter is an essential part of the energy storage system due to its bidirectional-power-flow and synchronization capabilities [6].

This paper presents a three-phase single-stage bidirectional isolated matrix based AC-DC converter for energy storage. The matrix (3×1) topology directly converts the three-phase line voltages into high-frequency AC voltage which is subsequently, processed using a high-frequency transformer followed by a controlled rectifier. A modified Space Vector Modulation (SVM) ...

This study presents a high-efficiency three-phase bidirectional dc-ac converter for use in energy storage systems (ESSs). The proposed converter comprises a modified three-level T-type converter (M3LT 2 C) and a three-level bidirectional dc-dc converter. The M3LT 2 C comprises two T-type cells to interface with a three-phase grid. By directly connecting the S ...

This article proposes a bidirectional single-phase dc-ac converter with triple port converter (T-PC) for application of energy storage. This proposed converter provides three ports such as ac port, dc port, and dc bus port to achieve three power interfacing ports. For the direct conversion process, dc port is directly connected to T-PC, and direct power will be exchanged between energy ...

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Grid-tied energy storage devices are usually necessary for intermittent renewable-fed electric grids to provide a steady power supply. ... Wu, H.; Mu, T.; Yang, F.; Ma, X. An asymmetrical three-level dual-input bidirectional DC/AC converter with improved conversion efficiency for vehicle-to-grid application. In

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This paper presents a novel bidirectional series resonant converter for energy storage systems (ESS). Conversion between a dc energy storage device and an ac grid has grown in importance because of the renewable energy generators and ESS used in microgrids, which usually use batteries or supercapacitors as storage devices in order to provide different ...

In this paper, a single-stage high-frequency isolated battery charging and discharging converter is proposed. The circuit topology and control strategy of this DC-AC converter are deeply studied, and the secondary ripple current of the system is decoupled by Buck active power decoupling circuit to suppress the secondary ripple current of the DC side. The control strategy uses a ...

A current-fed bidirectional three-phase HF ac link dc-ac converter is proposed for energy storage applications. The charging/discharging current can be controlled tightly. The proposed power circuit is given and analysed in Section 2.

Energy storage system has been widely applied in power distribution sectors as well as in renewable energy sources to ensure uninterruptible power supply. This paper presents a model predictive algorithm to control a bidirectional AC-DC converter, which is used in an energy storage system for power transferring between the three-phase AC voltage supply and ...

The H bridge bidirectional DC-DC impedance network use four switches to form a pair of bridge arms, and energy storage elements are arranged between the two bridge arms to realize the bidirectional flow of energy, as shown in Fig. 12. H bridge impedance network is suitable as high voltage side structure of bidirectional DC-DC converter for ...

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