



IIT MADRAS

Indian Institute of Technology Madras

Technology Transfer Office
TTO - IPM Cell



Industrial Consultancy & Sponsored Research (IC&SR)

A Dc-Dc Voltage Converting Apparatus & a Method of Operation Thereof IITM Technology Available for Licensing

Problem Statement

- The problem statement discussed in the present invention is **how to provide a simple DC-DC power converting technique without any complexity or additional active components in the circuit.**
- Hence, present invention provides the solution efficiently.

Technology Category/ Market

Technology: a Dc-Dc Voltage Converting Apparatus

Industry & Application: Electronic System & Design Manufacturing (ESDM), Power Supply, Power Electronics, Telecommunication; consumer electronics, etc.

Market: The global **DC-DC converter** market is projected to grow at a **CAGR of 4.5%** during the forecast period **(2024-32)**.

Technology

- Present patent describes an **apparatus for converting a DC input voltage to a DC output voltage**, said apparatus comprising:
- a **power transformer** having a primary & secondary winding;
- a **full bridge switching circuit** comprising a lagging leg & a leading leg, the lagging leg comprising first (S1), & fourth switching devices (S4) configured to be switched ON complementarily to each other & the leading leg comprising second (S2) & third (S3) switching devices configured to be switched ON complementarily to each other, the power transformer connected at a Node "a" between the first (S1) & fourth (S4) switching devices on the lagging leg & at a Node "b" between the S2 & S3 switching devices on the leading leg;
- a **capacitor (Cb)** connected parallelly to the lagging leg & the leading leg at a Node "c" between the first & third switching devices & at a Node "d" between the S4 & S2 switching devices;

- an **input voltage source** having a positive terminal & a negative terminal connected via the Node "a" & the Node "d" respectively;
- an **inductor (Lb)** connected between the positive terminal of the input voltage source & the Node "a"; &
- a control unit (118) configured to switch ON & OFF the first, second, third & fourth switching devices & control an input alternating current across the primary winding to induce an output alternating voltage in the secondary winding.

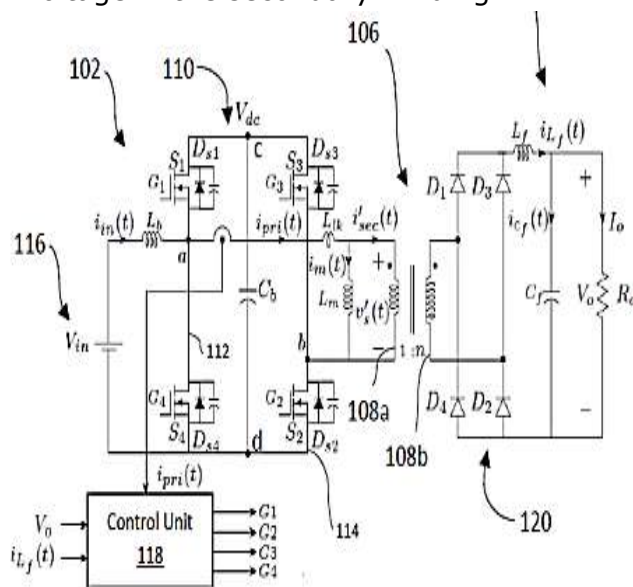


Fig.1 depicts an apparatus for converting a DC input voltage to a DC output voltage

Intellectual Property

IITM IDF Ref. 1866; Patent No. 385468

TRL (Technology Readiness Level)

TRL-4, Technology validated in Laboratory

Research Lab

Prof. Lakshminarasamma N
Dept. of Electrical Engineering,

CONTACT US

Dr. Dara Ajay, Head TTO
Technology Transfer Office,
IPM Cell- IC&SR, IIT Madras

IITM TTO Website:
<https://ipm.icsr.in/ipm/>

Email: smipm-icsr@icsrpis.iitm.ac.in
sm-marketing@imail.iitm.ac.in
Phone: +91-44-2257 9756/ 9719



IIT MADRAS

Indian Institute of Technology Madras

Technology Transfer Office
TTO - IPM Cell



Industrial Consultancy & Sponsored Research (IC&SR)

Images

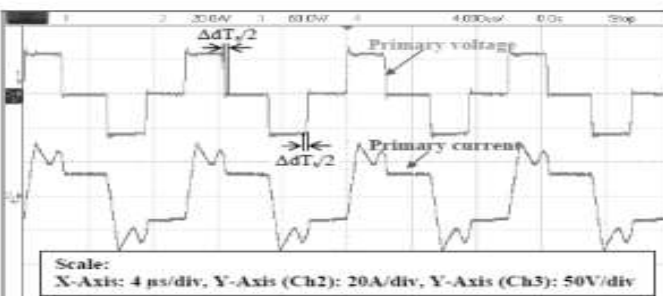
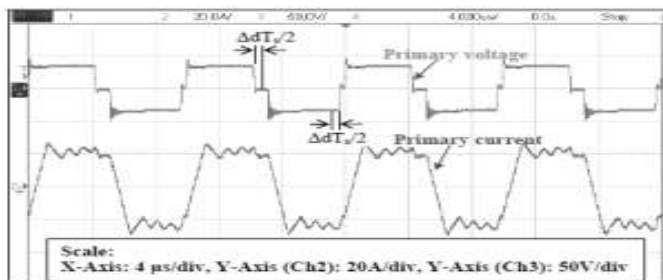


Fig. 2a & 2b depict **experimental results of primary current and voltage of an apparatus** for converting a DC input voltage to a DC output voltage

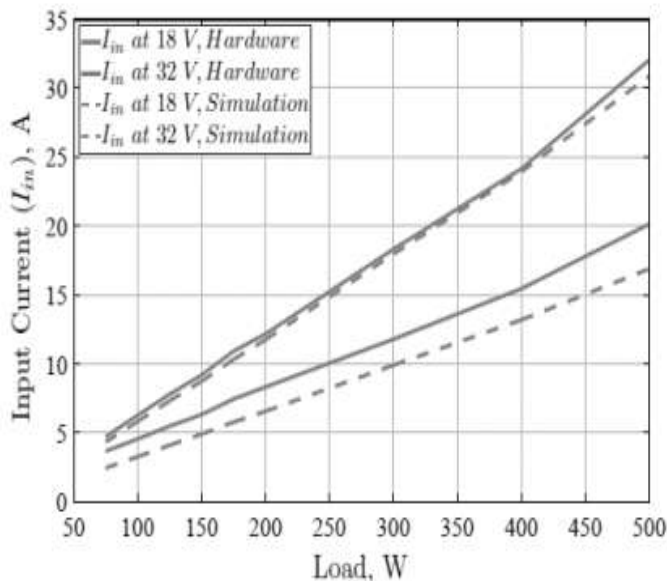


Fig.3 depicts **the different waveforms** of an input current of an apparatus for converting a DC input voltage to a DC output voltage

Key Features / Value Proposition

❖ Technical & Industrial Perspective:

- ❖ Provide a **DC-DC power converting device** which has **high DC voltage gain, inherent soft-switching, continuous input, & output currents**.
- ❖ Said first, second, third, & fourth switching devices (S1, S2, S3, & S4) include **a control input**, a pair of **switched power terminals**, a predetermined **minimum capacitance** & **current blocking anti-paralleled diode** effect between said switched power terminals.
- ❖ The first (S1) & fourth (S4) switching devices of the **lagging leg** are switched with a duty cycle fixed **at 50%** & the second (S2) & third (S3) switching devices of the **leading leg** (114) are **switched with a ϕ phase delay** between the leading (114) & lagging (112) legs & with an **asymmetrically duty cycle with a change of Δd** .
- ❖ Only one **input inductor** (Lb) connected between the input source & lagging leg pole point, **doubling the DC voltage gain** with respect to that of the conventional Phase-shifted Full bridge topology.
- ❖ The **DC-current** in the transformer primary winding is **eliminated** in topology of the currently claimed subject matter.
- ❖ Said switching devices (S1, S2, S3, & S4) is a **Metal Oxide Semiconductor Field Effect Transistor (MOSFET)**.
- ❖ Applicable in **Electronic System & Design Manufacturing (ESDM)**, Power Supply, Power Electronics, Telecommunication & others.

CONTACT US

Dr. Dara Ajay, Head TTO
Technology Transfer Office,
IPM Cell- IC&SR, IIT Madras

IITM TTO Website:
<https://ipm.icsr.in/ipm/>

Email: smipm-icsr@icsrpis.iitm.ac.in

sm-marketing@imail.iitm.ac.in

Phone: +91-44-2257 9756/ 9719