Ultra large Gain Step-Up Coupled-Inductor DC–DC Converter with an Asymmetric Voltage Multiplier Network for a Sustainable Energy System

Introduction:

The energy crisis and environment pollution becomes more and more serious, renewable energy becomes increasingly important and prevalent in worldwide, particularly in the distributed generation systems that based on the renewable energy sources, including fuel cells, photovoltaic panels, etc., unfortunately, the renewable energy sources cannot provide enough dc voltage for generating ac line voltage.

Therefore, the step-up converters have been frequently adopted for these low-power conversion applications. Theoretically, the high voltage gain can be provided by the boost converter, which adopts an extremely high duty cycle. However, the voltage conversion ratio is restricted by parasitic parameters. At the same time, the extremely high duty cycle in a boost converter can cause some questions, such as low efficiency, serious diode reverse-recovery problems, and electromagnetic interference.

Existing system:

A great deal of research work has been done to provide a high step-up without a high duty ratio. The high step-up voltage gain can be achieved by a switched-capacitor technique. However, switched-capacitor technique can cause a high surge current. Switched-inductor
technology also extends the voltage gain and reduces the voltage stress of the switch. However, the voltage stress of the switches of converters is still high, and so the high-voltage-rated switch induces serious conduction losses.

By the voltage lift technique, the high step-up voltage gain can be achieved by the transferred energy from the intermediate capacitor; unfortunately, the voltage and current stresses on the intermediate capacitor are serious. By the coupled-inductor technique, the converters can achieve the high step-up voltage gain by adjusting the turn’s ratio of coupled inductor. However, the leakage inductance of the coupled inductor will cause a high voltage spike on active switches when the switch is turned OFF.

**Dis-advantages:**

- High voltage spike
- More current stress.

**Proposed system:**

A novel high step-up converter, which successfully integrates coupled-inductor technology is proposed. Two diodes are turn on in different time zones. Moreover, two capacitors are charged or discharged in different time zones. Besides, the clamped circuit not only reduces the voltage stress on the main switch effectively, but also improves the efficiency. The proposed converter can achieve a high step-up voltage gain and reduce the voltage stress of the main switch. However, the leakage inductor of the coupled inductor may cause high power loss and voltage spike.
Thus, a passive lossless clamped circuit that is the part of the proposed is introduced, and it not only can recycle leakage energy and reduce the voltage spike on the main switch, but also improves the voltage gain effectively. Moreover, three diodes have no reverse-recovery problem due to zcs turn-off, the reverse recovery problem of the output diode is also alleviated by the leakage inductor.

**Advantages:**
- The proposed converter can achieve a high voltage conversion gain with a relatively small duty cycle.
- Reduce the current stress through the switch.

**Applications:**
- Suitable for sustainable energy sources.
Block Diagram:

- Dc input
- Coupled Inductor with DC-DC converter with AVMN
- Load

- 12VDC
- Gate driver circuit

- 5VDC
- Buffer circuit
- Microcontroller circuit