A Wide Load Range ZVS Push-Pull DC/DC Converter with Active-Clamped

Introduction:

Currently, most electrical equipments are designed with the focus on isolation, light weight, small size, high power density, and high reliability, low cost and low electromagnetic interference (EMI) to meet high expectations of the consumer. The push-pull converters have attributes of simple circuitry, galvanic isolation, high-voltage conversion ratio and better transformer utilization; also, they are widely used in low-input-voltage applications such as uninterruptible power supply (UPS), battery chargers, electric vehicles, fuel cell systems and photovoltaic systems, etc. It is worth to mention that on one hand the conventional push-pull converter suffers from high turn-off voltage spike because of transformer leakage inductor, on the other hand, the hard-switched results in the amount of switching losses. Besides, the problem of EMI will be serious when the switching frequency is higher. As a consequence, the conventional push-pull converter is unable to meet aforesaid requirements because of high switch stress, high switching losses and the problem of EMI. In order to fulfill the above said demand and overcome the aforementioned limitations, many zero voltage switching (ZVS) and zero current switching (ZCS) topologies have been proposed and developed. The soft-switching converter switches can be controlled to be at zero or near zero at the moment of switching. Such operation principle is usually achieved by making use of
series resonance phenomenon, parallel resonance phenomenon and series–parallel resonance phenomenon that occur between dedicated components or parasitic elements in the converter circuit itself.

**Existing system:**

The proposed active-clamped push-pull converter solves the discharge problem of the clamping capacitor and can feedback energy of the clamping capacitor to output. However, this converter adds too many power devices. The active power switches of the converters are located both on the primary and secondary sides of the high transformer and all of the active switches can achieve ZVS. However, the complicated driver circuits are needed and the cost is high. The three-phase push-pull converters with active-clamp circuits also increase the driving complexity and associated cost. The topology adds two active clamping circuits to recycle leakage energy at the primary side of high transformer and the clamping switches can also realize ZVS.
Drawbacks:
- But the components stress imposed on the clamping switches are greater than twice the input voltage.
- High switch-voltage-stress and hard-switching.

Proposed system:
A new ZVS push-pull converter with active-clamped has been presented in this paper. All of three switches can achieve ZVS turn-on in a wide load range, which is to reduce the switching losses and increase the transfer efficiency. The voltage across switch can be clamped at a lower level which is much less than that enabling the use of lower-voltage, lower-performance and lower cost devices. Besides, the problems of flux-imbalance existing in the conventional push-pull converter can be eliminated and the energy stored in the leakage inductor can be recycled.
Advantages:

- Simple topology.
- High-efficiency.
- High-performance and galvanic isolation.
- Reduce the switching losses.
- Increase the transfer efficiency.

Applications:

- Battery and super-capacitor source applications.
Block diagram:

1. Input DC Supply
2. Half Bridge Inverter With Active Clamping circuit
3. High frequency Multi-winding Transformer
4. Isolation Circuit
5. Full Bridge Diode Rectifier
6. Filter
7. Load
8. 12V DC
9. Buffer Circuit
10. Micro Controller Circuit
11. 5V DC