An Introduction To Sepic Converters

**Sweta Srivastav **Sanjay Singh

**Dept. of Electronics Design & Technology** Doeacc Centre MMMEC College Campus Gorakhpur

Abstract

This paper presents a novel method for the design of passive components for battery powered SEPIC dc-dc switching regulators. The model can be used as is by any modern circuit simulator to run steady state (DC), large signal (transient) and small signal (AC) analysis.

There are two possible modes of operation in the SEPIC converter: Continuous Conduction Mode (CCM) and Discontinuous Conduction Mode (DCM).

Introduction

SEPIC is a dc to dc converter and is capable of operating in either step up or step down mode and widely used in battery operated equipments. It is considered to be a fourth order dc to dc converter capable of delivering an output voltage which can be greater than or less than the input voltage. Different portable electronic appliances have been benefitted from a power converter which is able to achieve high efficiency with a wide input and output ranges with a small size. But it is not easy for conventional power converter design to maintain high efficiency especially in up and down voltage. Conversion has to be achieved all these characteristics are obtained in SEPIC to dc power conversion system can be realized by different circuit topologies like for example (buck boost, buck boost) are most widely used. Different designs are used using active and passive components.

Systematic Discription Of Sepic Converter

The SEPIC type dc to dc converter is a power electronic supply voltage at the output and can be smaller and higher then the received input. This is done by switching techniques with semiconductor Devices such as diodes and transistors i.e SEPIC converters are usually designed with coupled inductors L1 and L2 in order to reduce production cost and to reduce the input current ripple. Its main advantage to the dc to dc converter elevator reduces type or cuk is that the SEPIC converter maintains the output voltage polarity same to the input voltage which cannot be done with others. As the SEPIC converter a switch mode circuit, its behaviour is strongly dependent in the continuity of the inductor current and capacitor voltage. Due to this the input current example of the SEPIC is smooth (because of the inductor) and the output current signal is chopped (because of the diode feeding the output) then the energy is passed across the capacitors are widely used because of its very high efficiency (around 96%) in PC power supplies, battery chargers DC motor power systems and different industrial applications.

Design Discription For An Active Sepic Converter

Circuit configuration of the proposed isolated buck boost type of active clamp L is input inductor. S and Sa are main and auxiliary switches respectively. Cs and Co are the clamp capacitor and input capacitor respectively.

The capacitor C is medium for transferring energy from the source to the load Cr is the resonant capacitor. Lr is the resonant inductor including the transformer. Lm is the magnetising inductor of the isolation transformer D is rectifier diode. Active clamp circuits in include switch Sa and clamp capacitor. Cc allows utilization of transformer leakage inductor ZVS (zero voltage utilization) to achieve operation and to limit the peak voltage stress of main switch S.

The SEPIC converter consist of an active power switch, a diode two inductors and a capacitor and is thus the fourth order non linear system. Feedback control is usually incorporated into the converter circuit to regulate its output voltage typically by means of pulse width modulation (PWM) To facilitate the feedback control design or system stability analysis the linear model of the converter is needed.

MODES OF OPERATION

There are two modes of operation in it
Continuous Mode Of Operation

Nowadays the use of a dc to dc converter is widespread in modern portable electronic equipments and systems. When in battery operated portable devices when not connected to ac mains the battery provides an input voltage to the converter, which then converts it into the output voltage suitable for use by the electronic load. The battery voltage can vary over a wide range depending upon a charge level. At the low charge level, it may drop below the load voltage. Hence to continue supplying the constant load voltage over the entire voltage, the dc to dc converter that meets this operational requirement are buck boost cuk and Sepic converter. However the buck boost and the cuk converters in their basic form produce the output voltage whose whole polarity is revered from the input voltage. The problem can be corrected by incorporating an isolation transformer into the circuit, but this will invariably lead to increased size and cost of converter.

Discontinuous Mode Of Operation

A SEpic converter is a fourth order dc to dc converter capable of delivering an output voltage which can be greater than or lower than an input voltage. Although the converter may have been designed for continuous mode operation, it can plunge into the discontinuous mode of operation at light loads. In some cases the converter is even intentionally designed to operate in DC mode because of the faster dynamic responses compared with CCM. The small signal dynamic characteristics of the DCM SEpic converter have been modeled. In this the active and passive diode of the SEpic converter were substitute d by the PWM switch model. Transfer function of the interest e.g. duty ratio or input to output transfer function were than derived from the resulting circuit. However the modelling process has assumed that the converter is being ideal and neglected the equivalent series resistance of capacitance. The ESR effects the value of zeroes in the final transfer function excluding it from modelling process only adds to the inaccuracy in the final model.

CONCLUSION:
Thus from the above paper we see that the single ended primary inductance converter is a basic dc to too dc converter which concludes that the dynamic performances, efficiency and cost depends on power stage components, so designer often wish to find a good compromise of these figure of merit among different design solutions by using inductors and transformers.