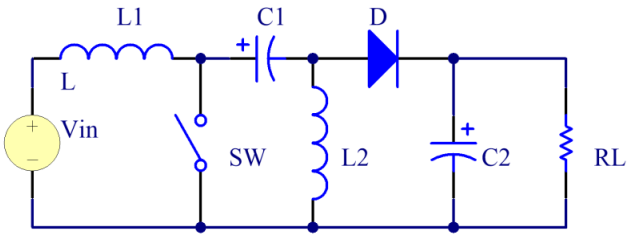
DC-DC SEPIC CONVERTER

The Single-Ended Primary-Inductance Converter (SEPIC) is a DC-DC converter which delivers an output voltage greater than or equal to the input voltage. Its topology consists of two inductances, two capacitors, a diode and a switch whose duty cycle modifies the average output voltage, which we will demonstrate in a later analysis.

The converter topology can be seen in figure below



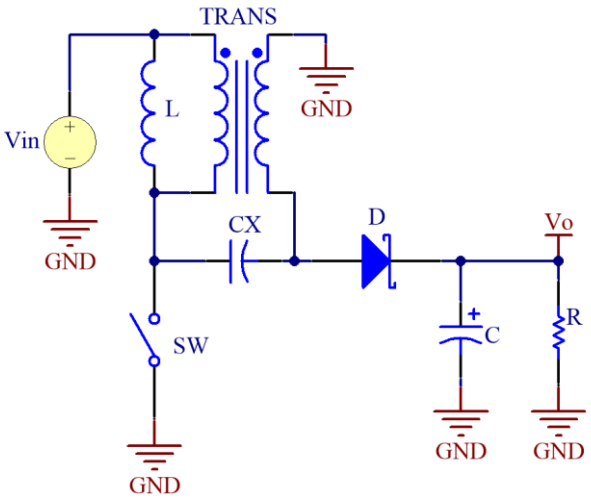
SEPIC converter topology

SEPIC ANALYSIS

Because the inductances in the SEPIC converter can be replaced by a coupled transformer to increase the efficiency and the available area on the printed circuit, we will use a transformer with a 1: 1 turn ratio whose model It is an ideal parallel transformer with a magnetizing inductance.

Figure below nverter efficiency comparison with coupled and decoupled inductors

Taking into account the above, our circuit is as follows:

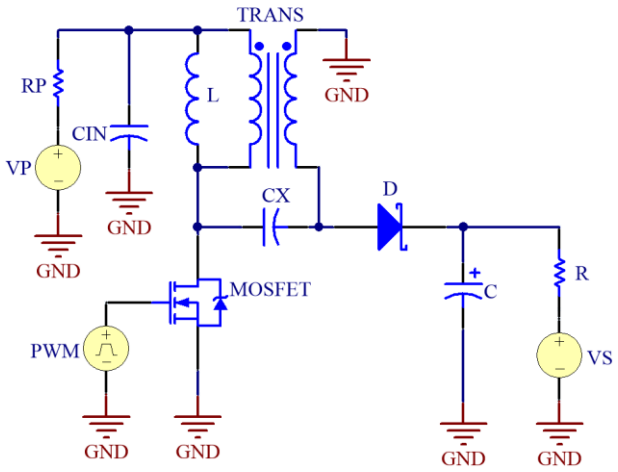


SEPIC converter with 1: 1 transformer as coupled inductors

Because our goal is to power the drive with a solar panel, we will use a decoupling capacitor parallel to the input in order to decouple the panel impedance and thus model the input as a constant voltage source. For the load and input we will use the corresponding models of our project for a proper analysis: the load of the converter is a battery (voltage source in series with a resistor) and the input is a solar panel (voltage source in series with resistor).

The switching will be done by a MOSFET transistor whose gate signal will control its opening and closing.

With the proposed modifications, the converter with which the project will be developed is the following:



Equivalent circuit with panel model and battery