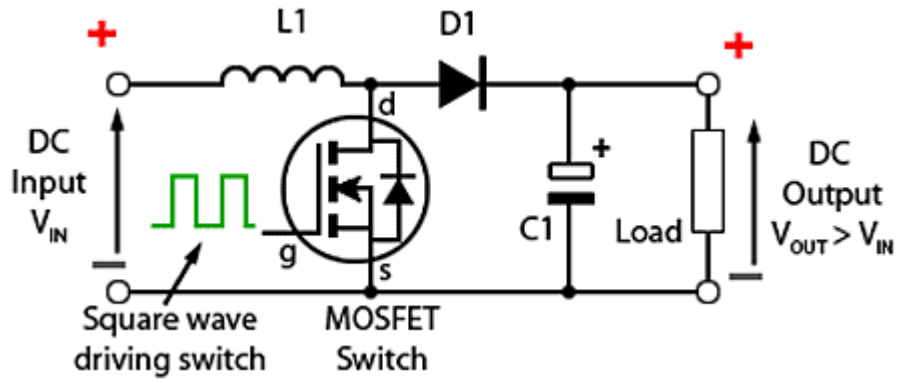
WORKING OF CONVETERS

Boost Converter

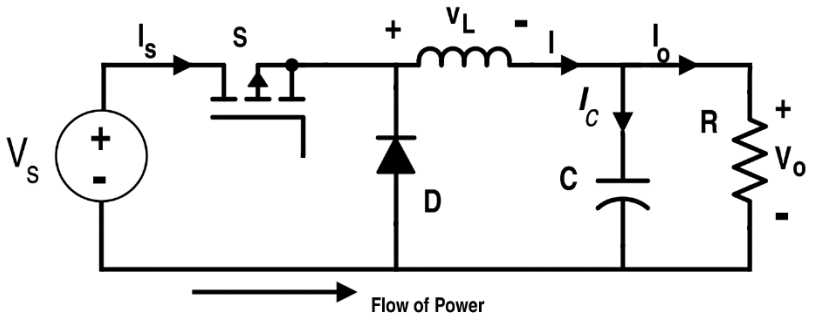


In Boost Converter mode, the high frequency square wave applied to MOSFET switch. During the on periods when MOSFET is conducting, the input current flows through the inductor L and via MOSFET, directly back to the supply negative terminal charging up the magnetic field around L. While this is happening D1 cannot conduct as its anode is being held at ground potential by the heavily conducting MOSFET. For the duration of the on period, the load is being supplied entirely by the charge on the capacitor C, built up on previous oscillator cycles. The gradual discharge of C during the on period (and its subsequent recharging) accounts for the amount of high frequency ripple on the output voltage, which is at a potential of approximately VS + VL.

At the start of the off period of MOSFET, L is charged and C is partially discharged. The inductor L now generates a back e.m.f. and its value that depends on the rate of change of current as MOSFET switches off and on the amount of inductance the coil possesses; therefore the back e.m.f can be any voltage over a wide range, depending on the design of the circuit. Notice particularly that the polarity of the voltage across L has now reversed, and so adds to the input voltage VS giving an output voltage that is at least equal to or greater than the input voltage. D1 is now

forward biased and so the circuit current supplies the load current, and at the same time re-charges the capacitor to VS + VL ready for the next on period of MOSFET switch.

Buck Converter



S is switched on and off by a high frequency square wave from the control unit. When the gate of S is high, current flows though L, charging its magnetic field, charging C and supplying the load. The Schottky diode D is turned off due to the positive voltage on its cathode. The current flow during the buck operation of the circuit when the control unit switches S is off. The initial source of current is now the inductor L. Its magnetic field is collapsing, the back e.m.f. generated by the collapsing field reverses the polarity of the voltage across L. As the current due to the discharge of L decreases, the charge accumulated in C during the on period of Tr1 now also adds to the current flowing through the load, keeping VO reasonably constant during the off period. This helps keep the ripple amplitude to a minimum and VO close to the value of VS.

For better understanding of this topic refer the animated video link:

https://www.youtube.com/watch?v=vwJYIorz_Aw