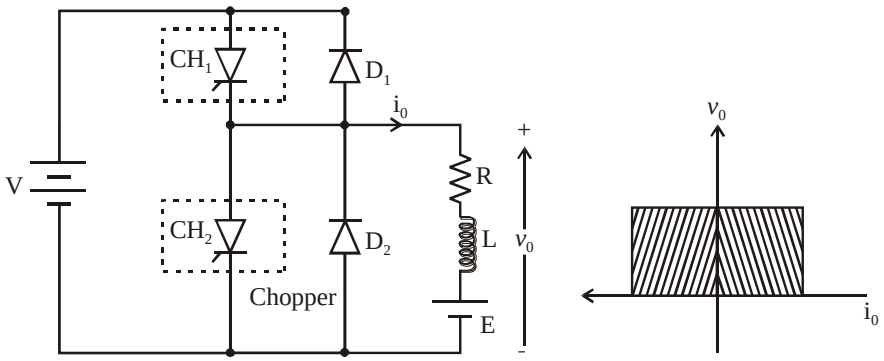
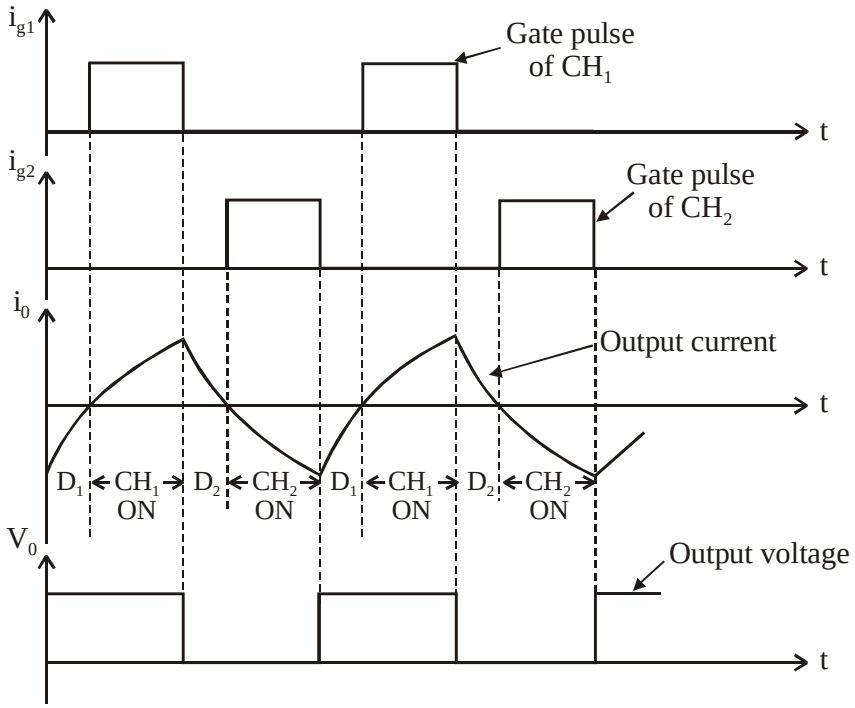
CLASSIFICATION OF CHOPPERS - II

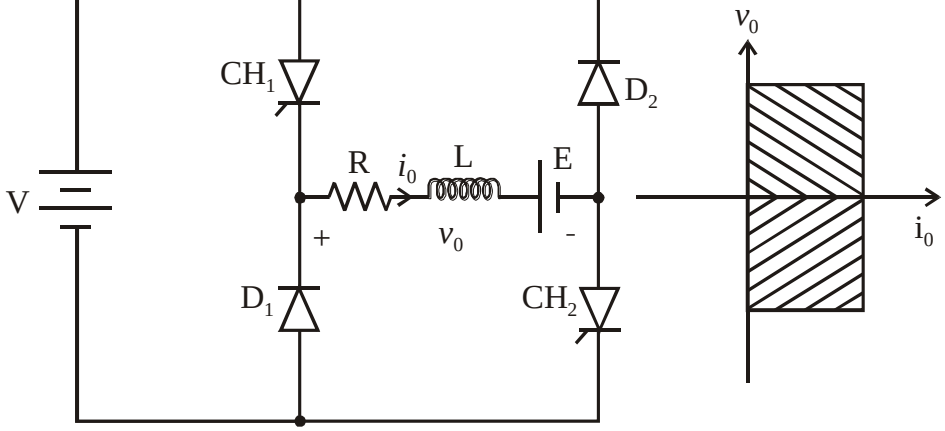
3. Class C Chopper



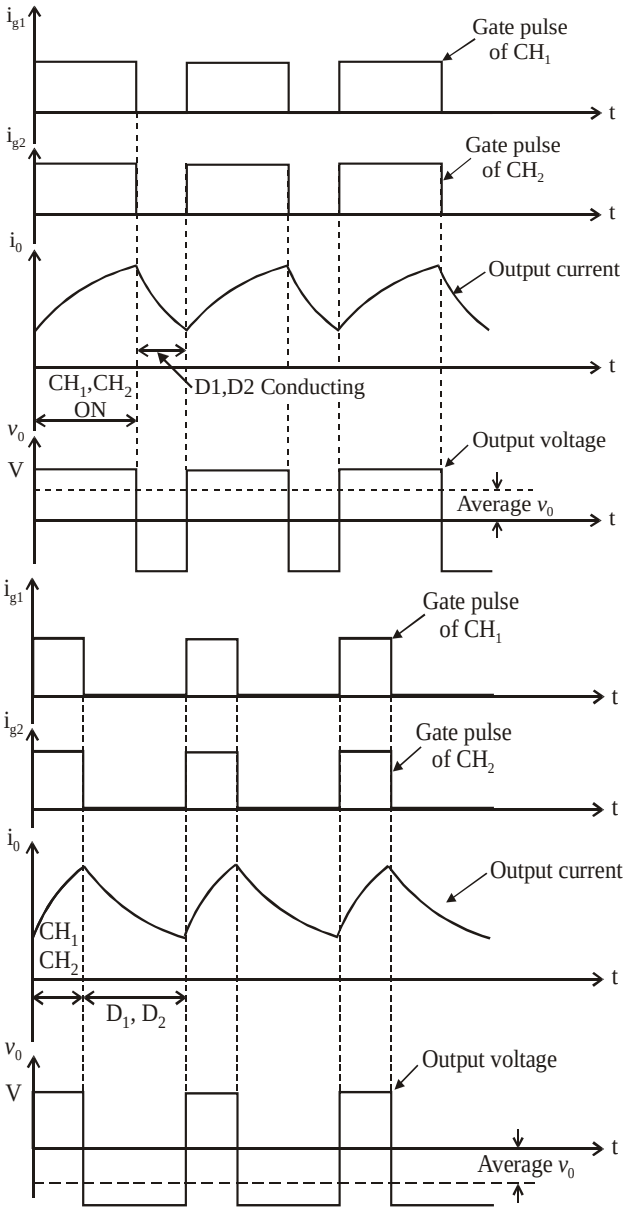
- *Class C Chopper* is a combination of *Class A* and *Class B Choppers*.
- For first quadrant operation, *CH1* is ON or *D2* conducts.
- For second quadrant operation, *CH2* is ON or *D1* conducts.
- When *CH1* is ON, the load current is positive.
- The output voltage is equal to *'V'* & the load receives power from the source.
- When *CH1* is turned OFF, energy stored in inductance *L* forces current to flow through the diode *D2* and the output voltage is zero.
- Current continues to flow in positive direction.
- When *CH2* is triggered, the voltage *E* forces current to flow in opposite direction through L and *CH2* .
- The output voltage is zero.
- On turning OFF *CH2* , the energy stored in the inductance drives current through diode *D1* and the supply
- Output voltage is *V*, the input current becomes negative and power flows from load to source.
- Average output voltage is positive
- Average output current can take both positive and negative values.
- Choppers *CH1 & CH2* should not be turned ON simultaneously as it would result in short circuiting the supply.
- *Class C Chopper* can be used both for dc motor control and regenerative braking of dc motor.
- *Class C Chopper* can be used as a step-up or step-down chopper.



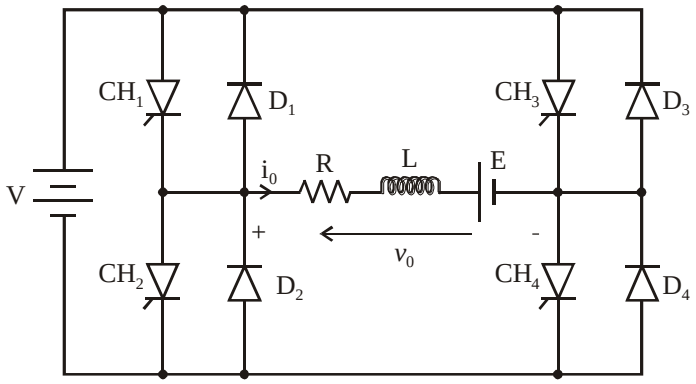
4. Class D Chopper



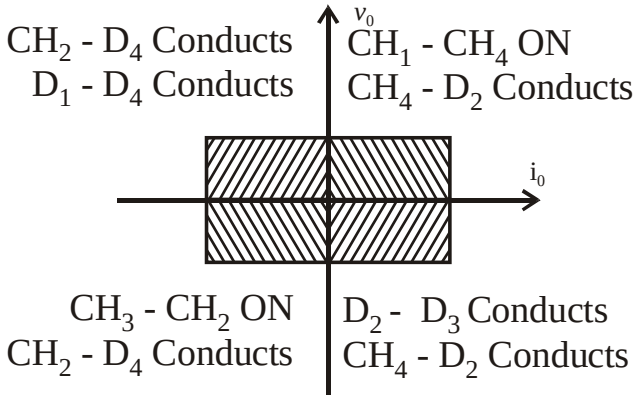
- Class D is a two quadrant chopper.
- When both *CH1* and *CH2* are triggered simultaneously, the output voltage *vO = V* and output current flows through the load.
- When *CH1* and *CH2* are turned OFF, the load current continues to flow in the same direction through load, *D1* and *D2* , due to the energy stored in the inductor L.
- Output voltage *vO = - V* .
- Average load voltage is positive if chopper ON time is more than the OFF time
- Average output voltage becomes negative if *tON < tOFF* .
- Hence the direction of load current is always positive but load voltage can be positive or negative.



5. Class E Chopper



Four Quadrant Operation



- Class E is a four quadrant chopper
- When *CH1* and *CH4* are triggered, output current i_O flows in positive direction through *CH1* and *CH4*, and with output voltage $v_O = V$.
- This gives the first quadrant operation.
- When both *CH1* and *CH4* are OFF, the energy stored in the inductor L drives i_O through D2 and *D3* in the same direction, but output voltage $v_O = -V$.
- Therefore the chopper operates in the fourth quadrant.
- When *CH2* and *CH3* are triggered, the load current i_O *flows* in opposite direction & output voltage $v_O = -V$.
- Since both i_O and v_O are negative, the chopper operates in third quadrant.
- When both *CH2* and *CH3* are OFF, the load current i_O continues to flow in the same direction *D1* and *D4* and the output voltage $v_O = V$.
- Therefore the chopper operates in second quadrant as v_O is positive but i_O is negative.

Source : http://elearningatria.files.wordpress.com/2013/10/ece-vii-power-electronics-10ec73-notes.pdf