Topics

Sigle phase half bridge Inverters

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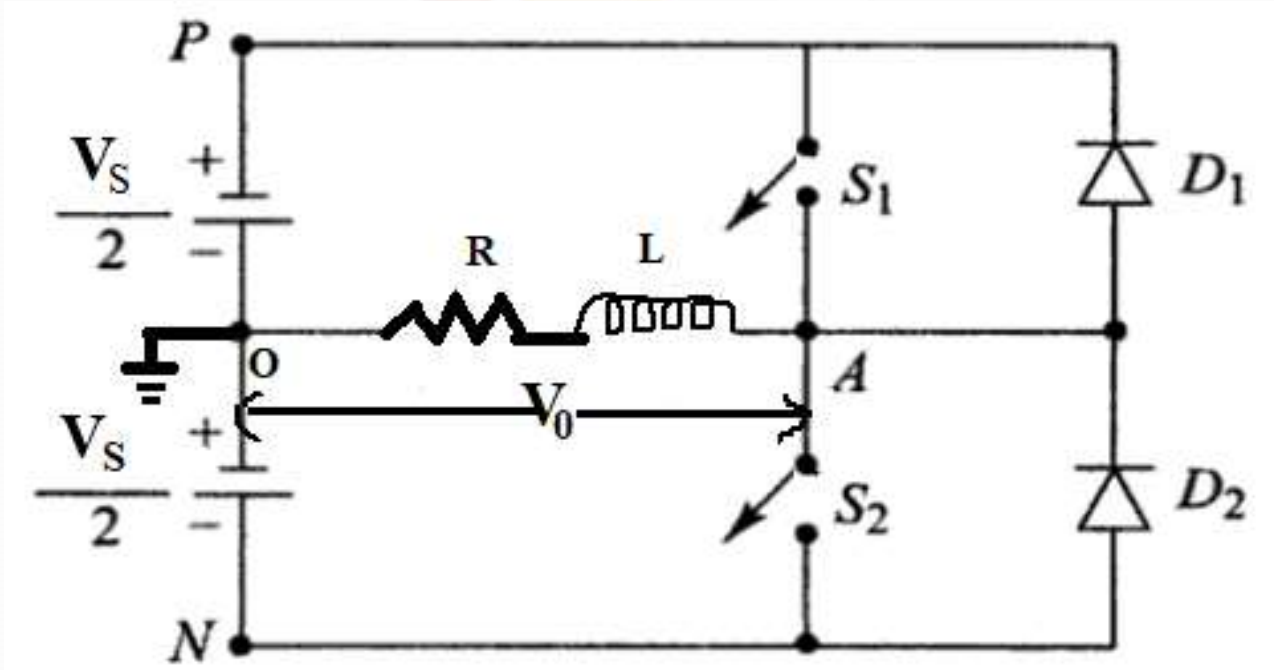
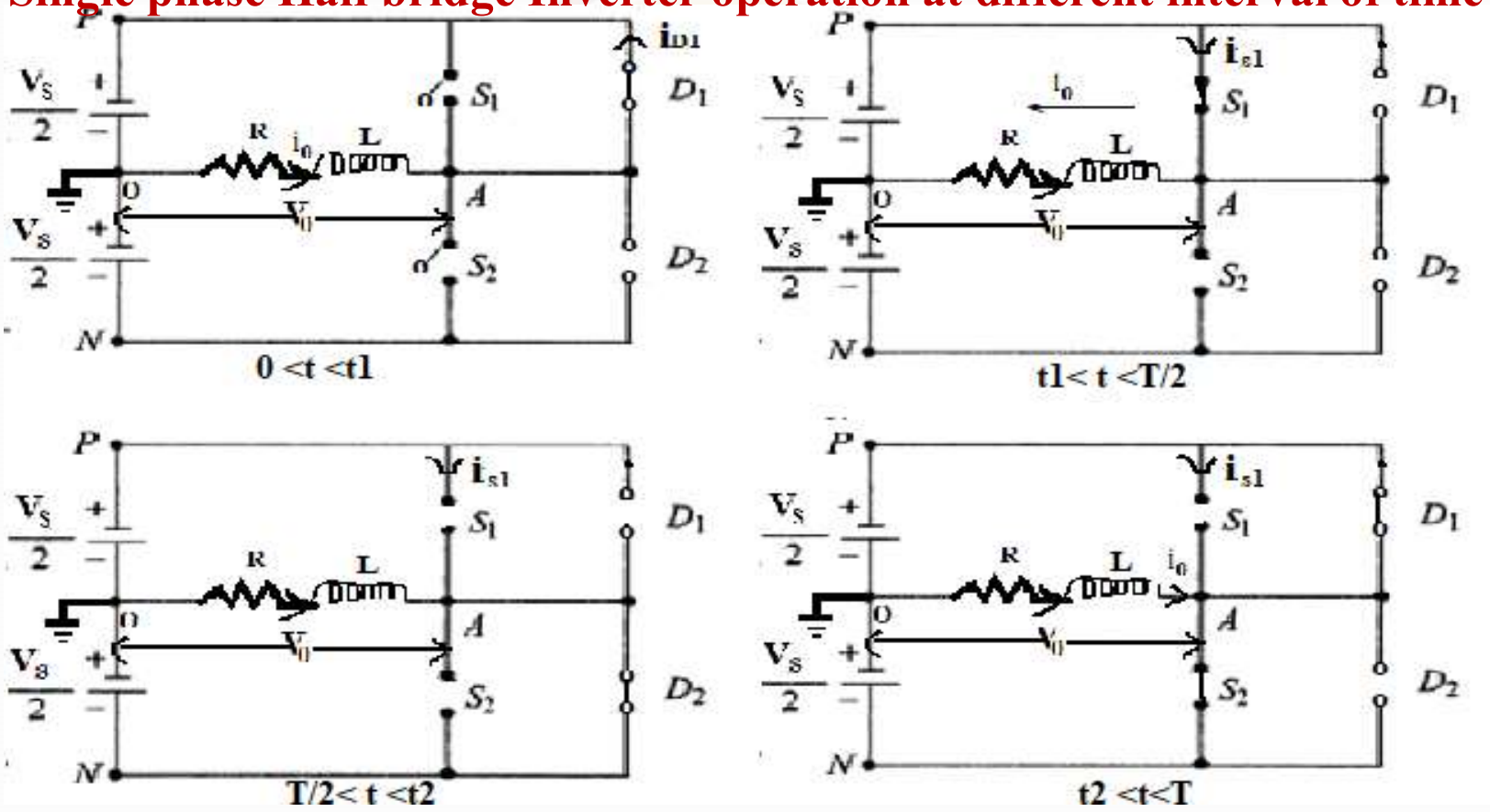
Single phase Half bridge Inverter



Single phase Half bridge Inverter operation at different interval of time



Mode I(t1<t<t2):

S1 is turned-on at instant t1, the load voltage is equal to +Vs/2 and the positive load current increases gradually. At instant t2, the load- current reaches the peak value. Switch S1 is turned-off at this instant. Due to same-polarity of load voltage and load current, the energy is stored by the load.

Mode II(t2<t<t3):

Due to inductive-load, the load current direction will be maintained even-after S is turned-off. The self-induced voltage in the load will be negative. In this mode, the stored energy in load is fed back to the lower half of the source and the load voltage is clamped to −Vs/2

Mode III(t3<t<t4):

At instant t3, the load-current goes to zero, indicating that a1, the stored energy, has been returned back to the lower half of supply. At instant t3,S2 is turned-on. This will produce a negative load voltage e0=−Vs/2 and a negative load current. Load current reaches a negative peak at the end of this interval.

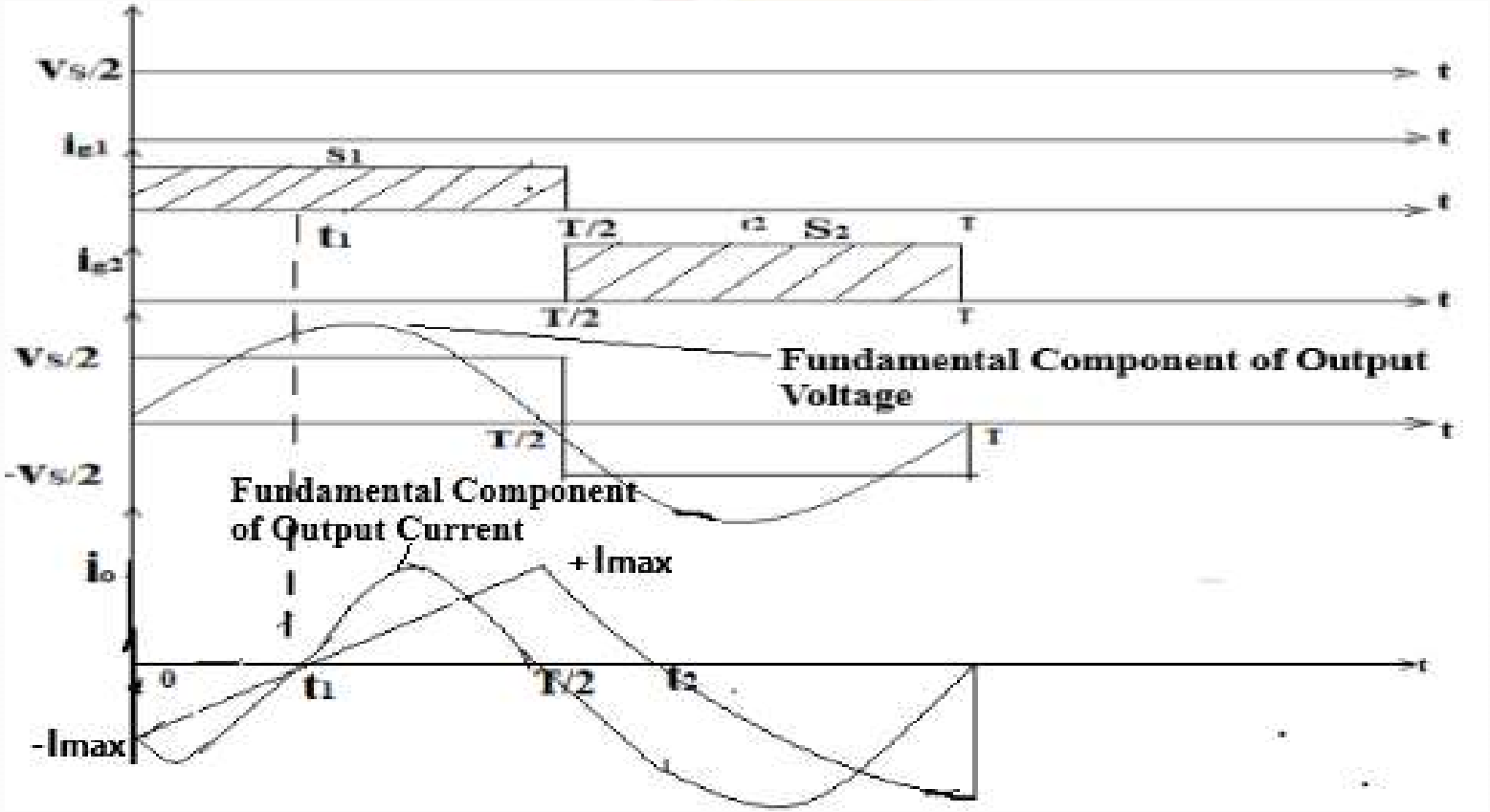
Mode IV(t0<t<t1):

Switch S2 is turned-off at instant t4. The self induced voltage in the inductive load will maintain the load current. The load voltage changes its polarity to become positive Vs/2, load current remains negative and the stored energy in the load is returned back to the upper half of the d.c source. At t5, the load current goes to 0 and S1 can be turned-on again. This cycle of operation repeats.

Summarization of the time intervals by switches and diodes

S.NO	Time Interval	Device Conducts	Output Voltage (V_0)	Output Curent (I_0)	Switch Current (i_{S1})	Switch Diode (i_{D1})
1	$0<t<t_1$	D_1	$V_0>0$	$I_0<0$	0	$-I_0$
2	$t_1<t<T/2$	S_1	$V_0>0$	$I_0>0$	I_0	0
3	$T/2<t<t_2$	D_2	$V_0<0$	$I_0>0$	0	0
4	$t_2<t<T$	S_2	$V_0<0$	$I_0<0$	0	0

The output voltage waveform of a single-phase half-bridge inverter with RL load



Half Bridge Inverter Vs Full Bridge Inverter

S.NO	Half Bridge Inverter	Full Bridge Inverter
1	The efficiency is high in half-bridge inverter	In full-bridge inverter also, the efficiency is high
2	In half-bridge inverter the output voltage waveforms are square, quasi square or PWM	In full-bridge inverter the output voltage waveforms are square, quasi square or PWM
3	The peak voltage in the half-bridge inverter is half of the DC supply voltage	The peak voltage in the full-bridge inverter is the same as the DC supply voltage
4	The half-bridge inverter contains two switches	The full-bridge inverter contains four switches
5	The output voltage is E0= EDC /2	The output voltage is E0= EDC
6	The fundamental output voltage is E1= 0.45 EDC	The fundamental output voltage is E1= 0.9 EDC
7	This type of inverter generates bipolar voltages	This type of inverter generates monopolar voltages

Advantages

The advantages of the single-phase half-bridge inverter are

- Circuit is simple
- Cost is low

Disadvantages

The disadvantages of the single-phase half-bridge inverter are

- The TUF (Transformer Utilization Factor) is low
- Efficiency is low

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Reference:

- All the contents are taken from open source.
- Power Electronics by Dr. PS Bimbhra

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