

# INVERTERS

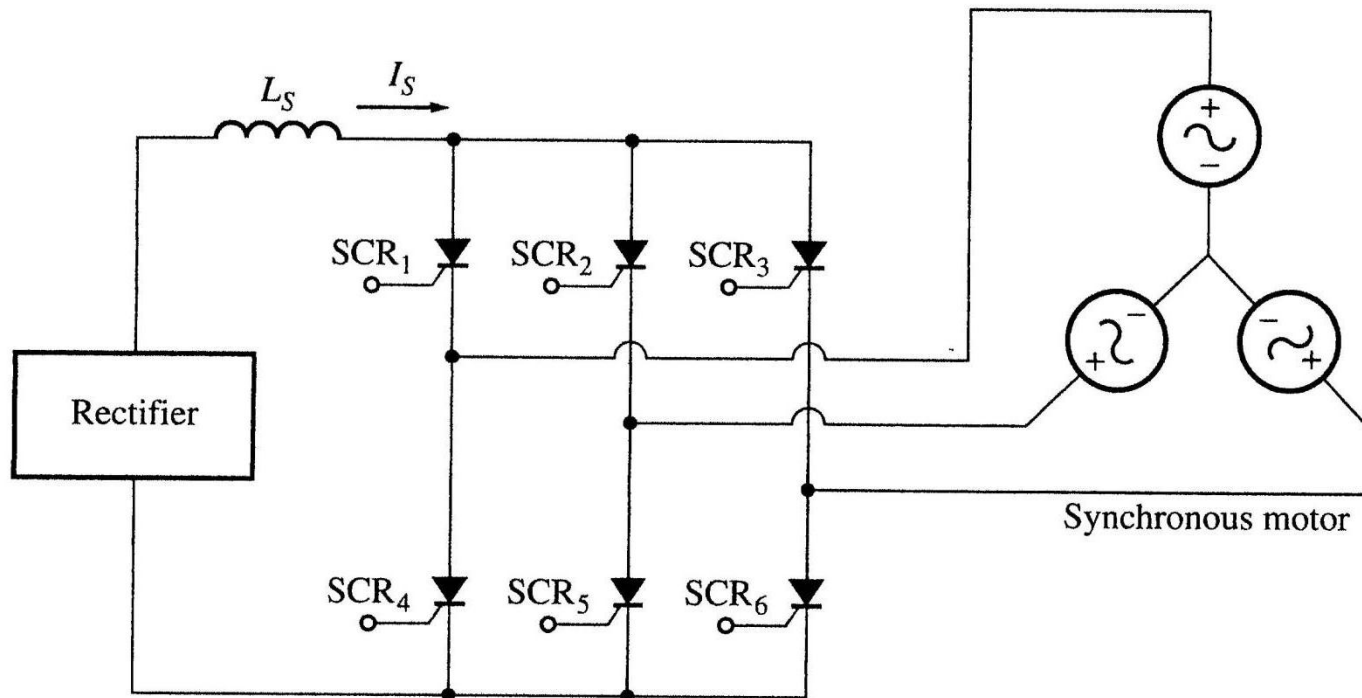
- Inverters are classified into two basic types by the utilized commutation technique:
  - External Commutation
  - Self Commutation

# EXTERNAL COMMUTATION INVERTERS

- External commutation inverters are inverters in which the energy required to turn off the SCRs is provided by an external motor or power supply

# EXTERNAL COMMUTATION INVERTERS

- An example of an **external commutation** is shown below



# EXTERNAL COMMUTATION INVERTERS

- The inverter is connected to a three-phase synchronous motor, which provides the **countervoltage** necessary to turn off one SCR when its companion is fired
- The SCRs in this circuit are triggered in the following order:
  - $SCR_1, SCR_6, SCR_2, SCR_4, SCR_3, SCR_5$

# EXTERNAL COMMUTATION INVERTERS

- When  $\text{SCR}_1$  fires, the internal generated voltage in the synchronous motor provides the voltage necessary to turn off  $\text{SCR}_3$
- Note that if the load is not connected to the inverter, the SCRs would never be turned off and after  $\frac{1}{2}$  cycle a short circuit would develop through  $\text{SCR}_1$  and  $\text{SCR}_4$
- This inverter is also called a **load-commutated inverter**

# SELF-COMMUTATION INVERTERS

- If it is not possible to guarantee that a load will always provide the proper countervoltage for commutation, then a self-commutation inverter must be used
- Self-commutation inverters can be designed using GTOs, IGBTs, or power transistors

# SELF-COMMUTATION INVERTERS

- There are three major types of self-commutation inverters:
  1. Current source inverters (SCI)
  2. Voltage source inverters (VSI)
  3. Pulse-width modulation inverters (PWM)

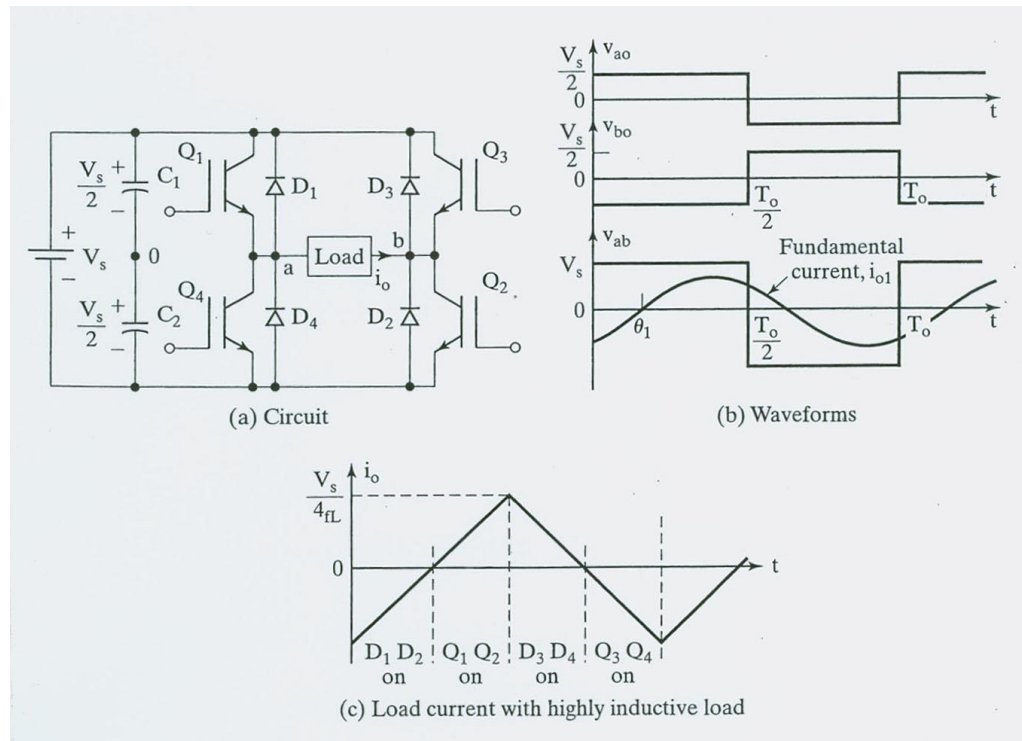
# SELF-COMMUTATION INVERTERS

- **Pulse-width modulation** is the process of modifying the width of the pulses in a pulse train in direct proportion to a small control signal



# SELF-COMMUTATION INVERTERS

- The principle of single-phase inverter operation can be explained with the following figure



# SELF-COMMUTATION INVERTERS

- The figure shown is a three-phase inverter using power transistors as active devices

