

Iconic circuit: Flip-flop circuit

RAM = Random Access Memory

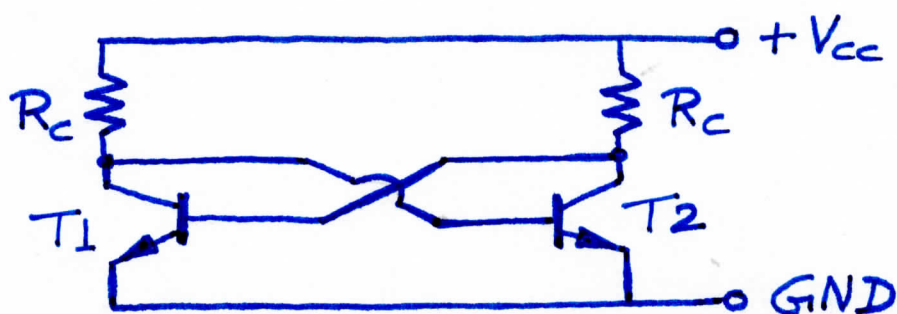
SRAM = Static RAM \Rightarrow Fast, power "hungry", and small (M bytes)

DRAM = Dynamic RAM \Rightarrow Slower, low power consumption, and large (G bytes)

The flip-flop is the basic building block (1 bit memory cell) of the SRAM.

Two states: Flip & flop OR "1" & "0"

Simplified flip-flop circuit:

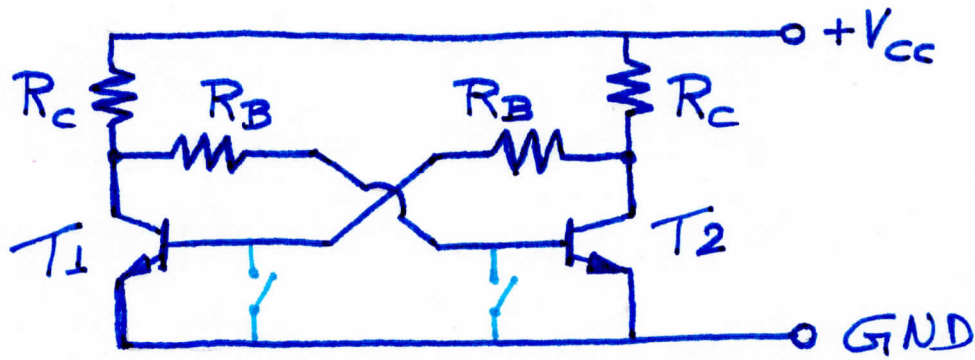


Q: Explain the two stable states of flip-flop?

Q: Anything wrong with the circuit above?

Q: What to change to make this a better circuit?

Improved flip-flop circuit:



Q: What is the purpose of R_C ?

Q: What is the purpose of R_B ?

Q: What is the purpose of *the two switches*?

Q: What is the power consumed by the flip-flop?

Q: Is the following eqn. correct?

$$P \approx \frac{V_{CC}^2}{R_C}$$

Q: Design a 5V, 4-resistor, 2-transistor flip-flop circuit that consumes $1 \mu W$.

Q: What would be the power consumption of a 1 Gbit memory of a flip-flop SRAM with each memory cell consuming $1 \mu W$?