

# Bipolar Transistor Circuits

Last updated 1/10/24

# Switch

- Determine the voltages  $V(3)$  and  $V(6)$  in the circuit below for input voltages ( $V_{in}$ ) of 0.5V, 1.5V, 2.5V, 3.5V and 4.5V.

NPN

$$V_{BEon} = 0.65V$$

$$\beta = 200$$

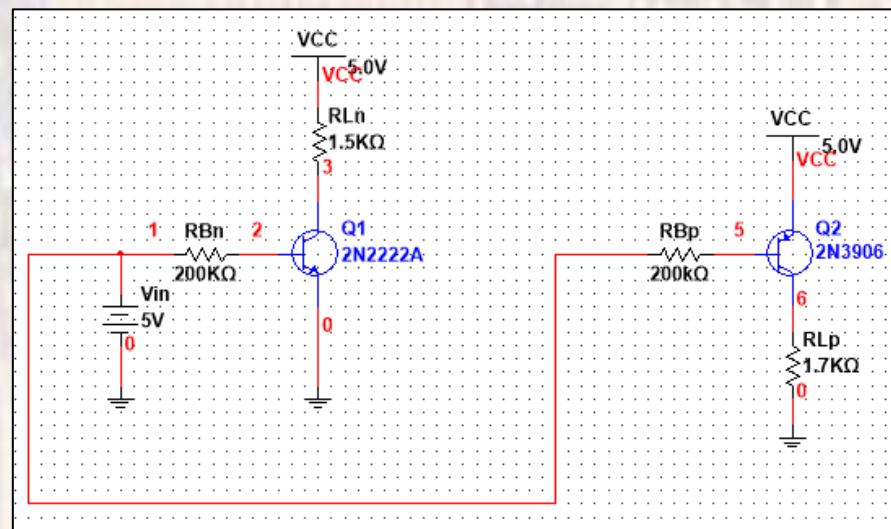
$$V_{CEsat} = 0.2V$$

PNP

$$V_{EBon} = 0.65V$$

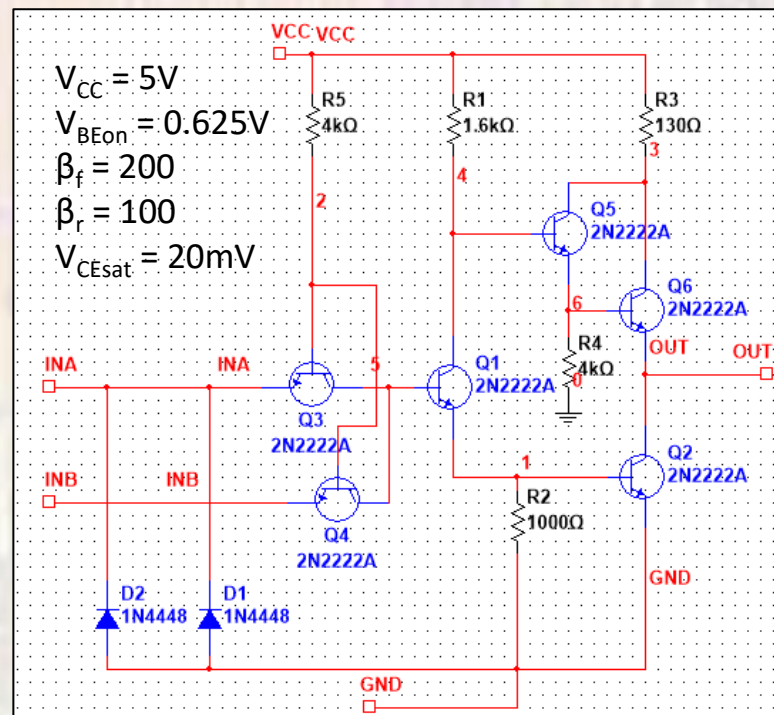
$$\beta = 180$$

$$V_{ECsat} = 0.2V$$



# TTL Logic

- Determine the output voltage swing of this TTL gate
  - Assume it is driven by a similar gate, and drives a single input of a similar gate
  - Is this an inverter, nand, nor, and, or, xor gate?



# Differential Circuit

- Determine the following for this circuit:
  - Input switching point
  - Output swing
  - Why are R1 and R2 not matched?

