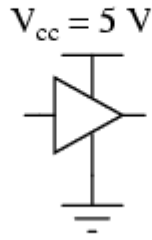
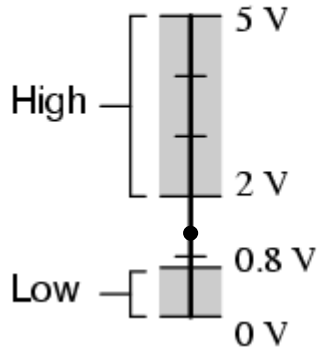
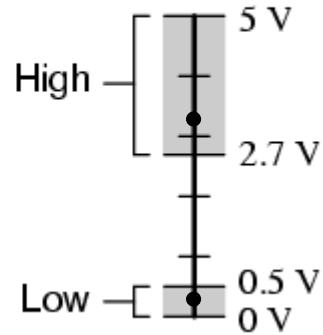


5 V TTL and CMOS Input and Output Voltage Levels

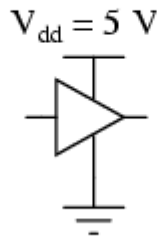
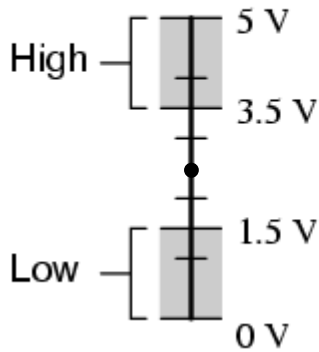
Acceptable TTL gate input signal levels



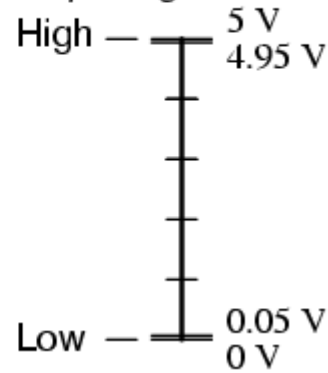
Acceptable TTL gate output signal levels



Acceptable CMOS gate input signal levels



Acceptable CMOS gate output signal levels

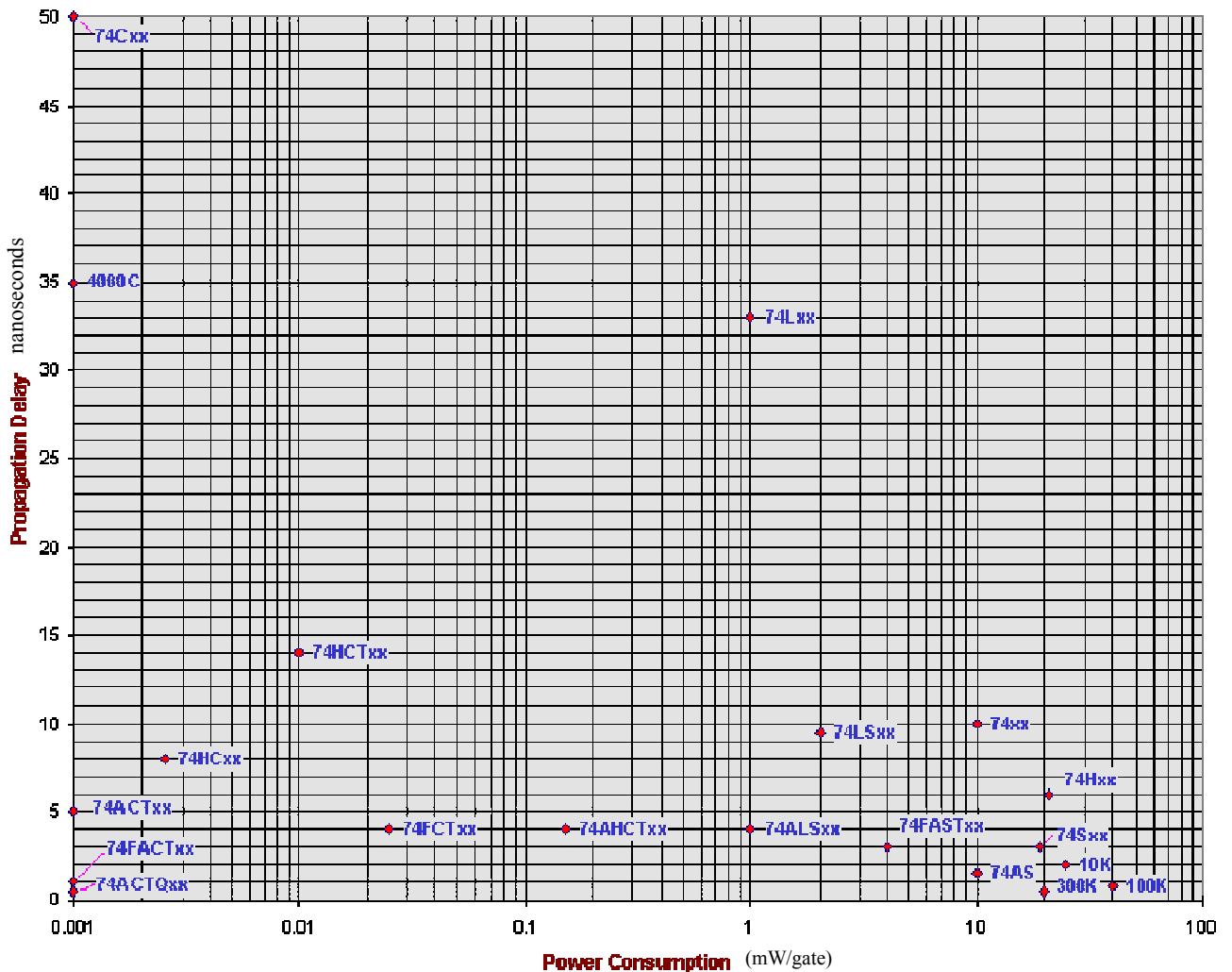


(Figures from: http://www.allaboutcircuits.com/vol_4/chpt_3/10.html, visited 19APR2007)

Comments

- Noise Immunity
 - CMOS _____ than TTL
- Be careful mixing CMOS and TTL logic in the same circuit:
 - TTL → CMOS: you will need to pull up TTL high

 - CMOS → TTL: you may need a buffer to handle extra sinking current when CMOS output goes low



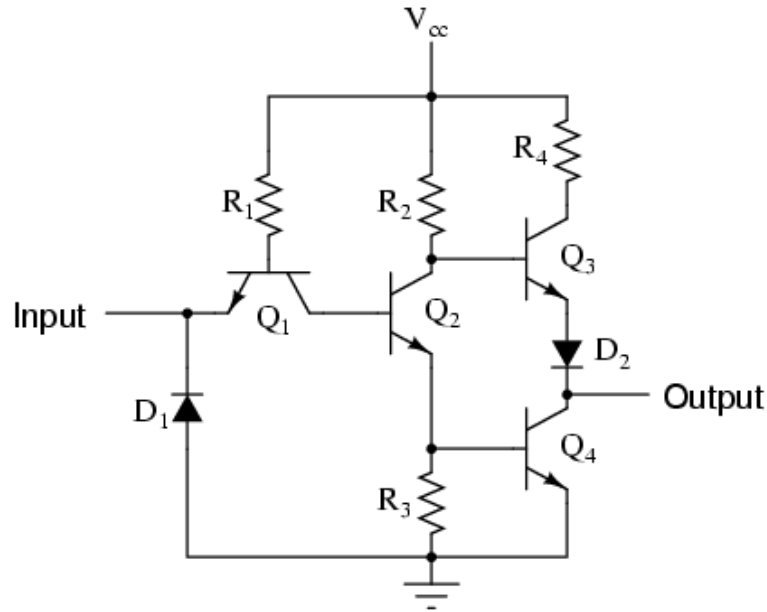
(Figure and table from: http://www.interfacebus.com/Speed-Power_Chart.html, visited 15APR04)

Device Families:

- TTL (74xx) True TTL
- 74L Low power
- 74S Schottky
- 74H High speed
- 74LS Low power - Schottky
- 74AS Advanced - Schottky
- 74ALS Advanced - Low power - Schottky
- 74F(AST) Fast - (Advanced - Schottky)
- 74C CMOS.....check Vcc levels
- 74HC (U) High speed - CMOS (Unbuffered output)
- 74HCT High speed - CMOS - TTL inputs
- 74AHC Advanced - High speed - CMOS
- 74AHCT Advanced - High speed - CMOS - TTL inputs
- 74FCT (-A) Fast - CMOS - TTL inputs (speed variations)
- 74FCT (-T, -AT) Fast - CMOS - TTL inputs (speed variations)
- 74AC Advanced - CMOS
- 74ACT Advanced - CMOS - TTL inputs
- 74FACT AC, ACT (Q) series
- 74ACQ Advanced - CMOS - Quiet outputs
- 74ACTQ Advanced - CMOS - TTL inputs - Quiet outputs

TTL Inverter (Totem Pole Output)

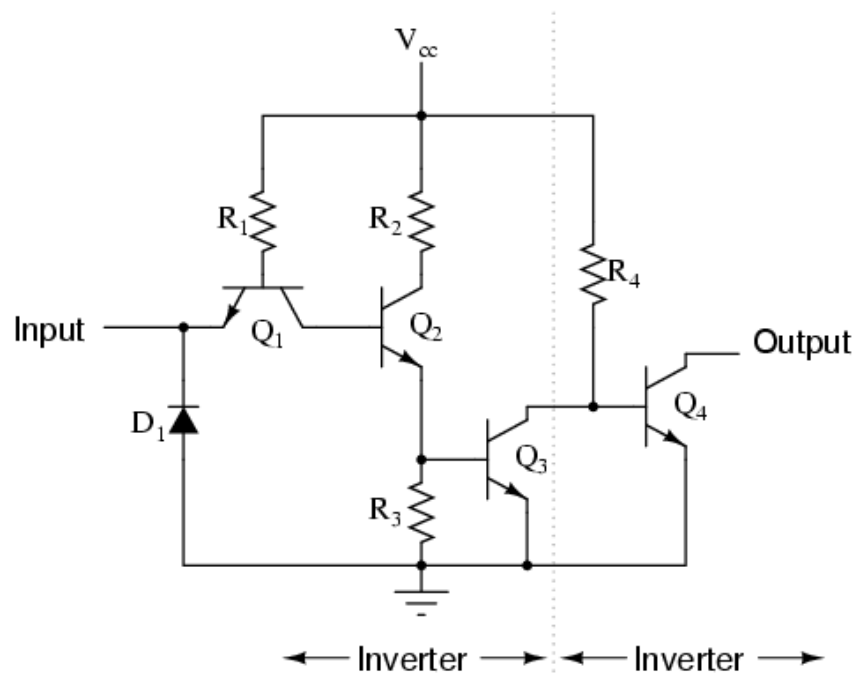
Practical inverter (NOT) circuit



(source: <http://sub.allaboutcircuits.com/images/04073.png>)

TTL Buffer (Open-Collector Output)

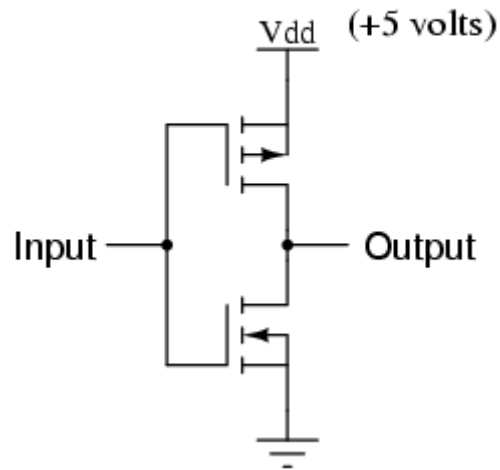
Buffer circuit with open-collector output



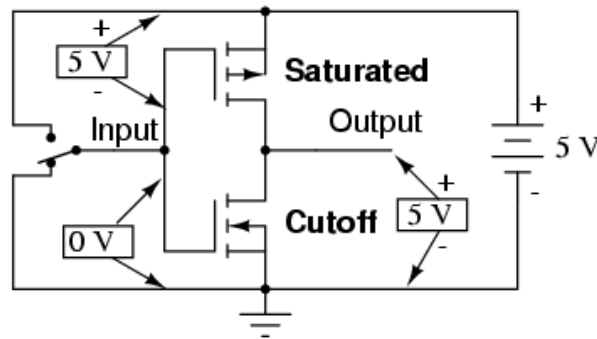
(source: <http://sub.allaboutcircuits.com/images/04089.png>)

CMOS Inverter

Inverter circuit using IGFETs



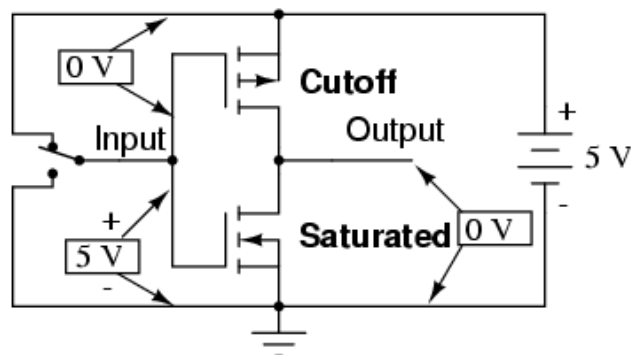
(source: <http://sub.allaboutcircuits.com/images/04132.png>)



Input = "low" (0)

Output = "high" (1)

(source: <http://sub.allaboutcircuits.com/images/04133.png>)



Input = "high" (1)

Output = "low" (0)

(source: <http://sub.allaboutcircuits.com/images/04134.png>)