

LAB 10

TTL and CMOS Logic Gates

Reading: Hayes and Horowitz, Class 13 and Lab 13.

Today you will be introduced to the circuits of digital electronics. We will start with some circuits made with discrete electronics to perform logical AND, OR and NOT functions. Next, properties of the most commonly used integrated circuit series, the LS-TTL and HC CMOS, are studied. Finally you will use these basic chips to construct more complex circuits.

1. Mickey Mouse Logic and the Totem Pole Output

These are among the simplest logic devices. They are useful in their own right from time to time. Also, they demonstrate the input circuitry to the most commonly used TTL chips, the low-power Schottky (LS-TTL) family. Here we use standard 1N914 signal diodes instead of the faster Schottky diodes used in LS-TTL gates.

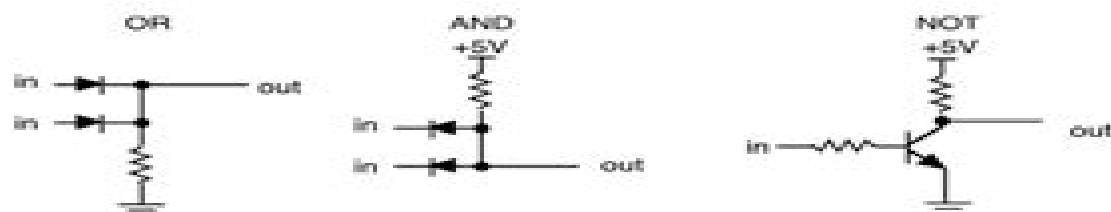


Fig 12.1

The AND circuit illustrated in Fig 12.1 is similar to the input of the 74LS00 NAND gates. Build it and confirm the logic function experimentally and record your results in a truth table. When you test this gate, use 0 V and 5 V for logical false and true.

TTL expects at least 2.0 V input for a high (true) input and guarantees at least 2.4 V for a high output. CMOS requires at least 3.5 V for a high input and delivers at least 4.9 V for high output. In what ways do these circuits disobey these criteria?

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