

DIGITAL CIRCUITS

3.1 Logic Signals and Gates

This chapter covers the “real world” electrical parameters and behaviors associated with digital components and circuits. The practical aspects of making a logic circuit work.

3.2 Logic Families

In the modern world, CMOS is the dominate technology used to construct digital circuit components, especially large-scale integrated circuits. Focus your study on CMOS topics.

Important, make certain that you understand this material

3.3 CMOS Logic

3.3.1 CMOS Logic Levels

3.3.2 MOS Transistors

3.3.3 Basic CMOS Inverter Circuit

3.3.4 CMOS NAND and NOR Gates

3.3.5 Fan-In

3.3.6 Noninverting Gates

3.3.7 CMOS AND-OR-INVERT and OR-AND-INVERT Gates

Briefly

3.4 Electrical Behavior of CMOS Circuits

3.4.1 Overview

3.4.2 Data Sheets and Specifications

Briefly

3.5 CMOS Static Electrical Behavior

3.5.1 Logic Levels and Noise Margins

3.5.2 Circuit Behavior with Resistive Loads

3.5.3 Circuit Behavior with Nonideal Inputs

3.5.4 Fanout

3.5.5 Effects of Loading

3.5.6 Unused Inputs

3.5.7 How to Destroy a CMOS Device

Briefly

3.6 CMOS Dynamic Electrical Behavior

3.6.1 Transition Time

3.6.2 Propagation Delay

3.6.3 Power Consumption

3.6.4 Current Spikes and Decoupling Capacitors

3.6.5 Inductive Effects

3.6.6 Simultaneous Switching and Ground Bounce

You may skip this material

3.7 Other CMOS Input and Output Structures

- 3.7.1 Transmission Gates
- 3.7.2 Schmitt-Trigger Inputs
- 3.7.3 Three-State Outputs
- 3.7.4 Open-Drain Outputs
- 3.7.5 Driving LEDs
- 3.7.6 Multisource Buses
- 3.7.7 Wired Logic
- 3.7.8 Pull-Up Resistors

Briefly, if at all

3.8 CMOS Logic Families

- 3.8.1 HC and HCT
- 3.8.2 AHC and AHCT
- 3.8.3 HC, HCT, AHC, and AHCT Electrical Characteristics
- 3.8.4 AC and ACT
- 3.8.5 FCT and FCT-T
- 3.8.6 FCT-T Electrical Characteristics

You may skip this material

3.9 Low-Voltage CMOS Logic and Interfacing

- 3.9.1 3.3-V LVTTL and LVCMOS Logic
- 3.9.2 5-V Tolerant Inputs
- 3.9.3 5-V Tolerant Outputs
- 3.9.4 TTL/LVTTL Interfacing Summary
- 3.9.5 Logic Levels Less Than 3.3 V

You may skip this material

3.10 Bipolar Logic

- 3.10.1 Diode Logic
- 3.10.2 Bipolar Junction Transistors
- 3.10.3 Transistor-Transistor Logic
- 3.10.4 TTL Logic Levels and Noise Margins
- 3.10.5 TTL Fanout
- 3.10.6 TTL Families
- 3.10.7 A TTL Data Sheet
- 3.10.8 CMOS/TTL Interfacing
- 3.10.9 Emitter-Coupled Logic