

Digital Design and System Implementation

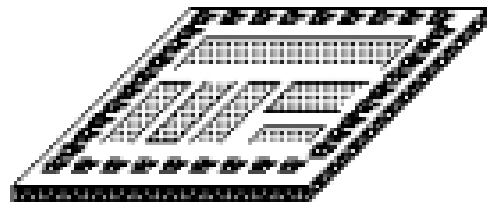
- Overview of Physical Implementations
 - CMOS devices
 - CMOS transistor circuit functional behavior
 - Basic logic gates
 - Transmission gates
 - Tri-state buffers
 - Flip-flops vs. latches revisited

Overview of Physical Implementations

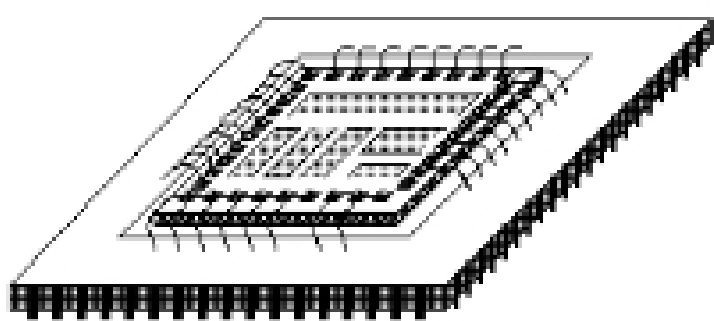
The stuff out of which we make systems

- Integrated Circuits (ICs)
 - Combinational logic circuits, memory elements, analog interfaces
- Printed Circuits (PC) boards
 - substrate for ICs and interconnection, distribution of CLK, Vdd, and GND signals, heat dissipation
- Power Supplies
 - Converts line AC voltage to regulated DC low voltage levels
- Chassis (rack, card case, ...)
- 1-25 conductive layers
 - holds boards, power supply, fans, provides physical interface to user or other systems
- Connectors and Cables

Integrated Circuits



Chip in Package



- Primarily Crystalline Silicon
- 1mm - 25mm on a side
- 200 - 400M effective transistors
- (50 - 75M "logic gates")
- 3 - 10 conductive layers
- 2007 feature size ~ 65nm = 0.065×10^{-6} m
45nm coming on line
- "CMOS" most common -
complementary metal oxide
semiconductor

- Package provides:
 - Spreading of chip-level signal paths to board-level
 - Heat dissipation.
- Ceramic or plastic with gold wires