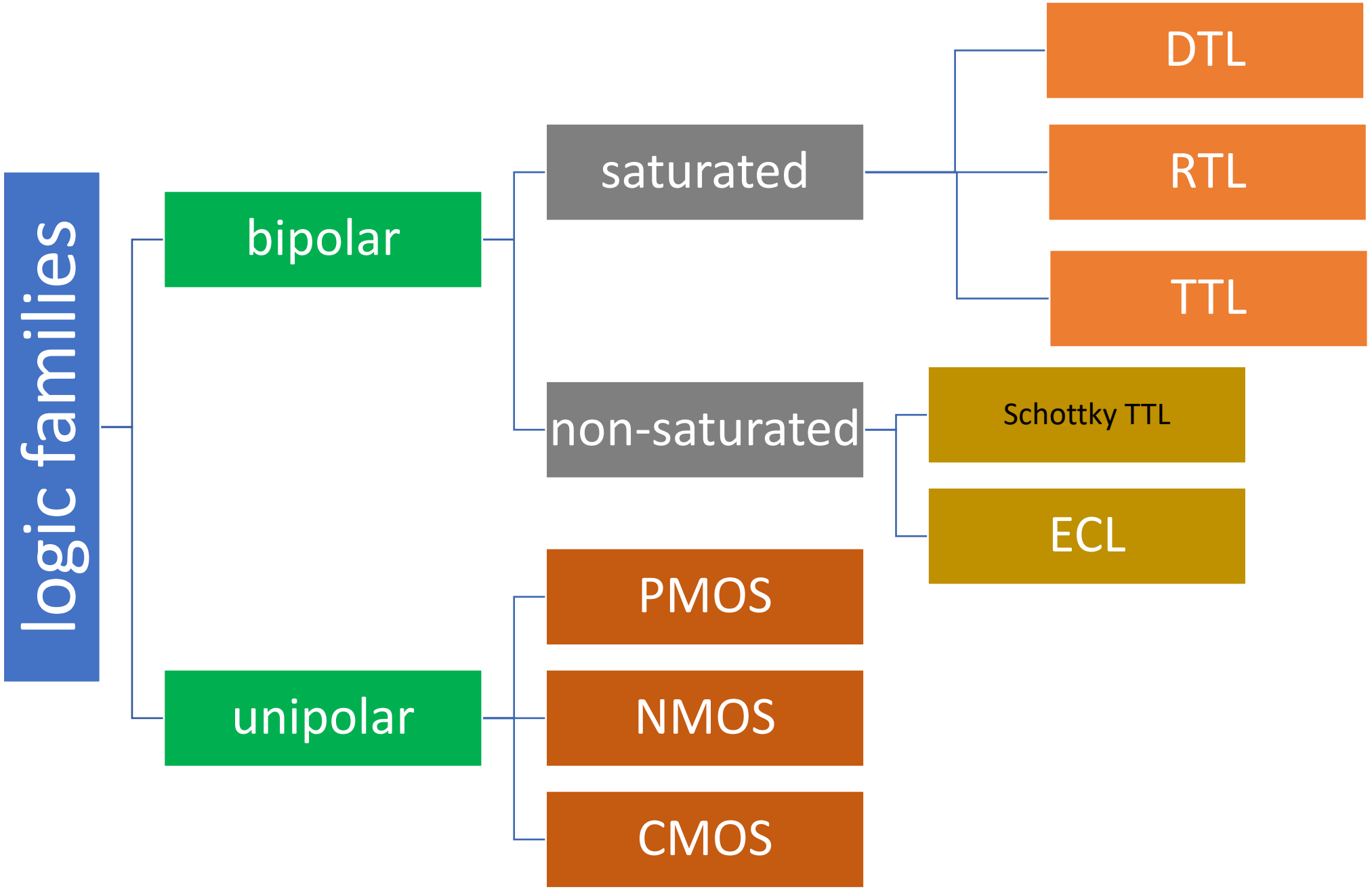
Logic Familes

Most electronic systems which are responsible for modern advances are based on digital technology. All digital systems, computers and microprocessors are assembled from simple circuits called logic circuits. The basic building blocks of logic circuits are logic gates. And logic gates themselves are simple electronic circuits comprising
of diodes, transistors and resistors.


logic families
bipolar
unipolar
saturated
non-saturated
DTL
RTL
TTL
Schottky TTL
ECL
PMOS
NMOS
CMOS

Digital Integrated circuits are produced using several different circuit configurations and production technologies. Each such approach is called a specific logic family. **A logic family is a collection of different integrated circuit chips that have similar input, output, and internal circuit characteristics, but they perform different logic gate functions such as AND, OR, NOT, etc**. The idea is that different logic gate functions, when fabricated in the form of an integrated circuit with the same approach, or which belongs to the same logic family, will have identical electrical characteristics (electrically compatible with each other). These families may vary by speed, power consumption, cost, voltage and current levels

TYPES OF LOGIC FAMILY

The digital integrated circuits are designed using

- **bipolar devices**
- **Metal Oxide Semiconductor (MOS) .**

There are two kinds of semiconductor devices. The logic family which falls under the first kind **Bipolar logic family** and the other is **Unipolar logic family**.

BIPOLAR LOGIC FAMILY

There are two kinds of operations in bipolar integrated circuits:

- **Saturated Bipolar Logic family**
- **Non-saturated Bipolar Logic family**

Saturated Bipolar Logic Families

- Diode logic (DL)
- Resistor Transistor Logic (RTL)
- Diode Transistor Logic (DTL)
- Integrated Injection Logic (IIL or I2L)
- Transistor Transistor Logic (TTL)

Non-saturated Bipolar Logic Families

Schottky TTL

Emitter Coupled Logic (ECL)

UNIPOLAR LOGIC FAMILY

Unipolar logic family consists of **Metal Oxide Semiconductor (MOS) logic families**

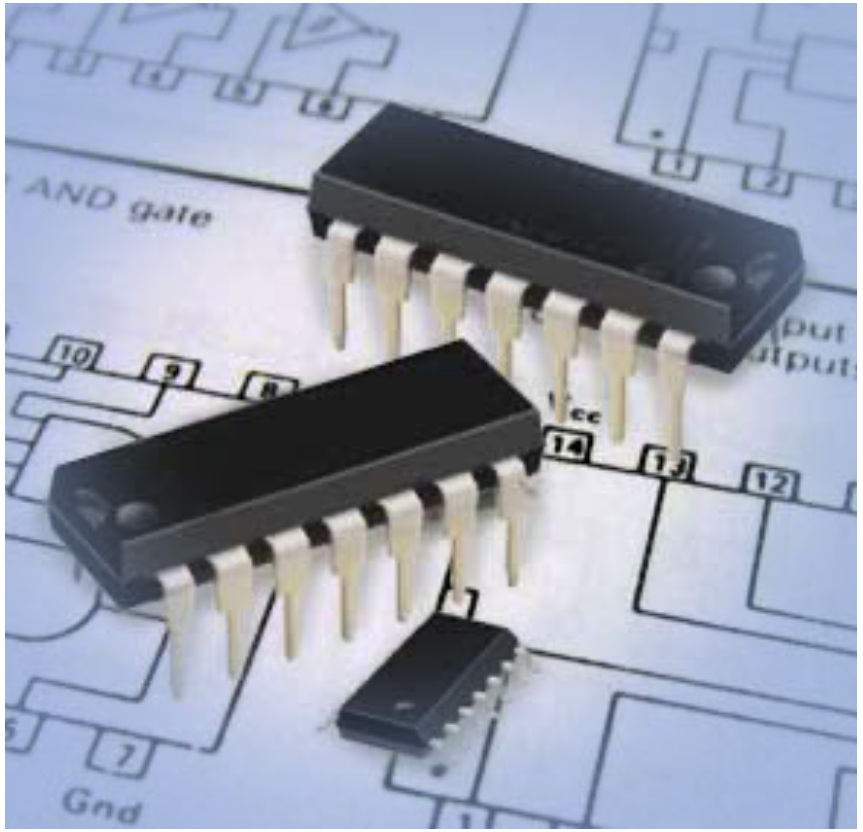
P-type MOS (PMOS) Logic

N-type MOS (NMOS) logic

Complementary MOS (CMOS) logic

Integration levels

- SSI: Small scale integration 12 gates/chip
- MSI: Medium scale integration 100 gates/chip
- LSI: Large scale integration 1K gates/chip
- VLSI: Very large scale integration 10Kgates/chip
- ULSI: Ultra large scale integration 100K gates/chip



Definition Of Parameters
Voltage Parameters

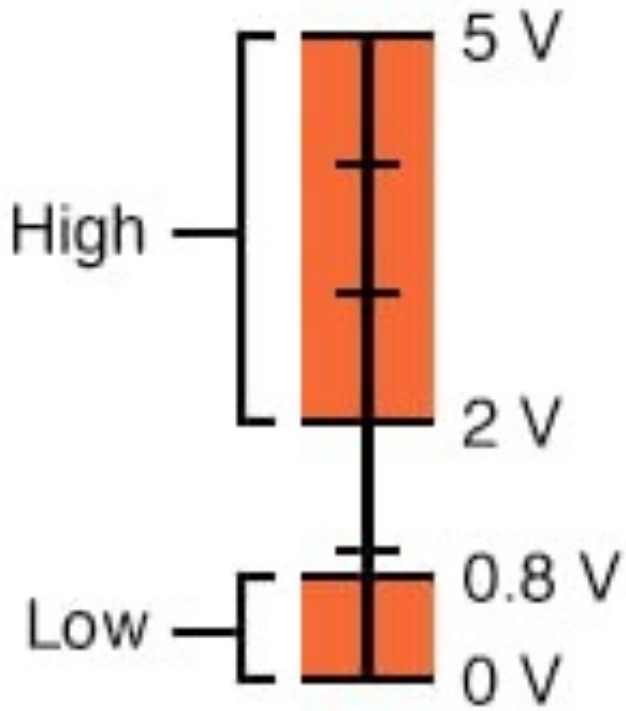
❖**High-level input voltage $V_{IH(min)}$**

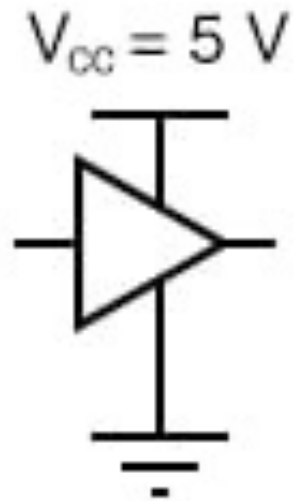
Its the minimum voltage level required for a logical 1 at an input .any voltage below this level will not be accepted as a HIGH by the logic circuit

❖**Low-level input voltage $V_{IL(max)}$**

It’s the maximum voltage level required for a logic 0 at the input .any voltage above this level will not accepted as a LOW by the logic circuit

Acceptable TTL Gate
Input Signal Levels





Acceptable TTL Gate
Output Signal Levels