

# Elementos de Sistemas

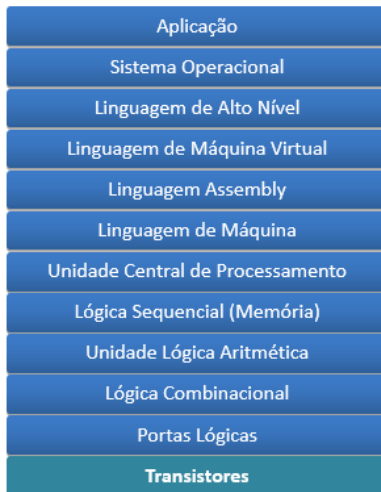
## Transistores e CIs

Renan Trevisoli

Engenharia da Computação

01/09/2023

## Camadas de abstração



# Válvulas



<sup>1</sup>By Stefan Riepl (Quark48) - Self-photographed, CC BY-SA 2.0 de,  
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Insper

# Válvulas



<sup>1</sup>By Stefan Riepl (Quark48) - Self-photographed, CC BY-SA 2.0 de,  
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# Evolução

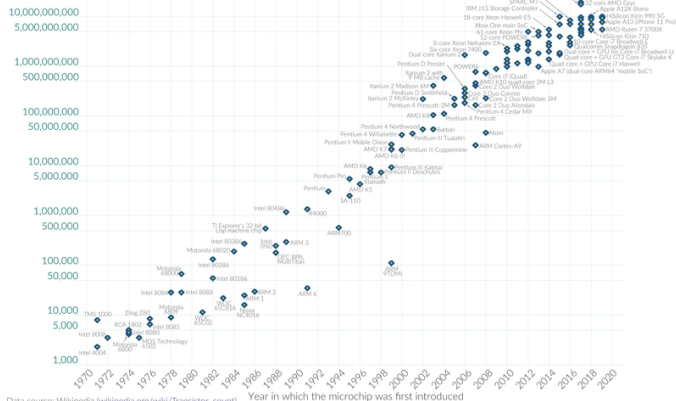
Moore's Law: The number of transistors on microchips doubles every two years

Moore's law describes the empirical regularity that the number of transistors on integrated circuits doubles approximately every two years. This advancement is important for other aspects of technological progress in computing – such as processing speed or the price of computers.

Our World  
in Data

### Transistor count

50.000.000.000



Data source: Wikipedia ([wikipedia.org/wiki/Transistor\\_count](http://wikipedia.org/wiki/Transistor_count))

OurWorldinData.org - Research and data to make progress against the world's largest problems

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<sup>1</sup>[https://en.wikipedia.org/wiki/Transistor\\_count](https://en.wikipedia.org/wiki/Transistor_count)

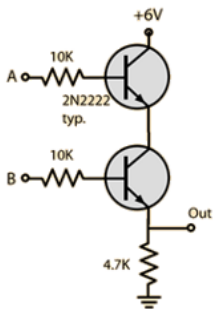
# Transistores

- Vários tipos de transistores

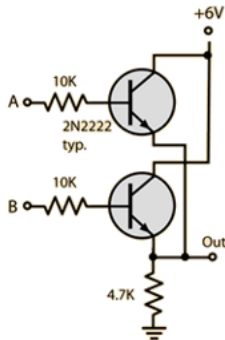
- BJT
- MOS
- 

- Várias formas de realizar

- RTL
- TTL
- CMOS
-

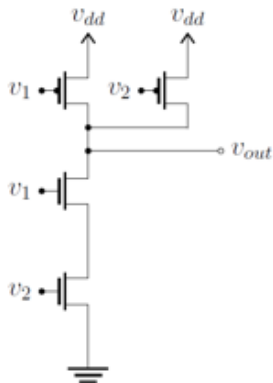


AND

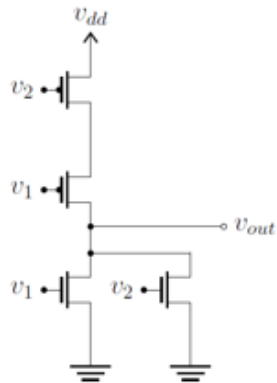


OR

# CMOS



NAND

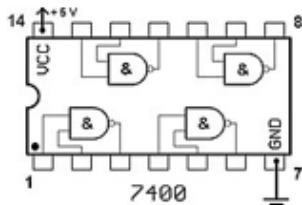


NOR



# CI's

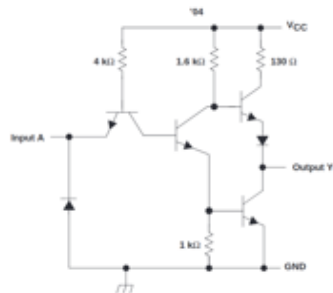
- 74XX



SN5404, SN54LS04, SN54S04,  
SN7404, SN74LS04, SN74S04  
HEX INVERTERS

74LS04 - DECEMBER 1983 - REVISED JANUARY 2004

schematics (each gate)



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# Prática

- Lab. 1
- APS-A

# Próxima aula

- Estudar: Teoria → Componentes
- Estudar: VHDL → Básico