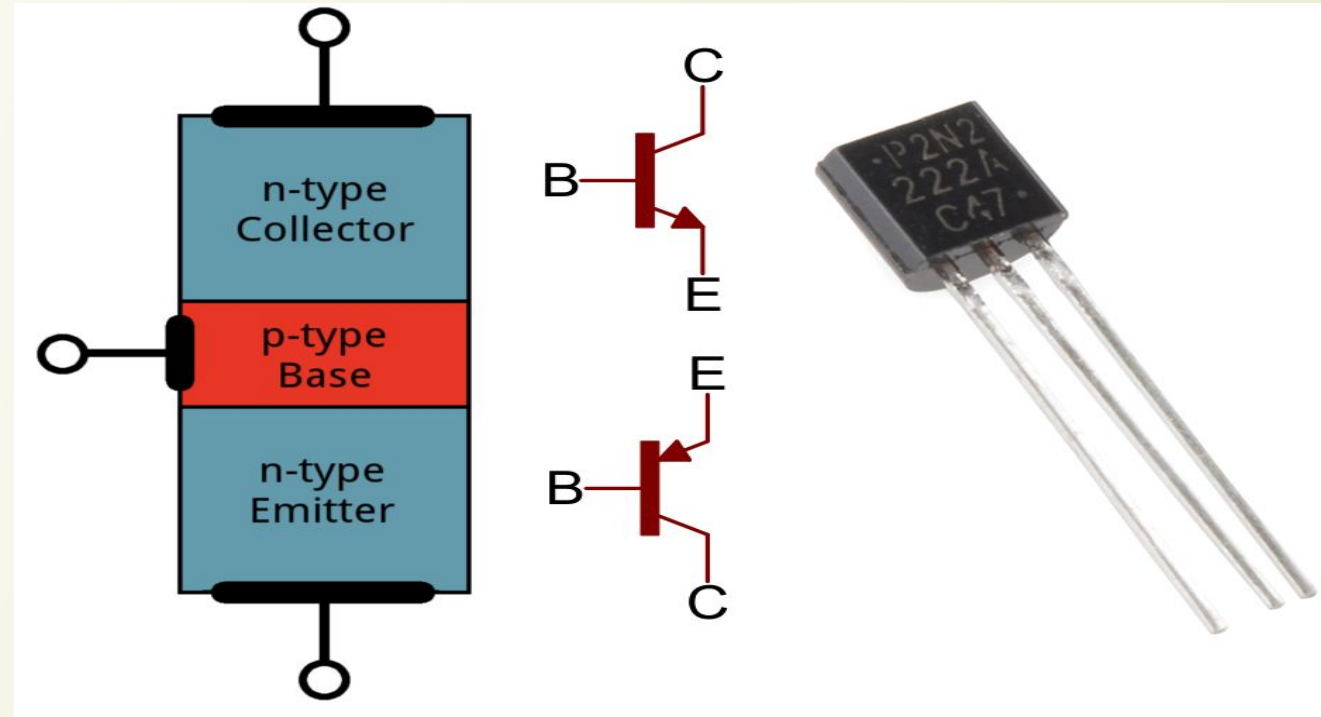


# Transistors

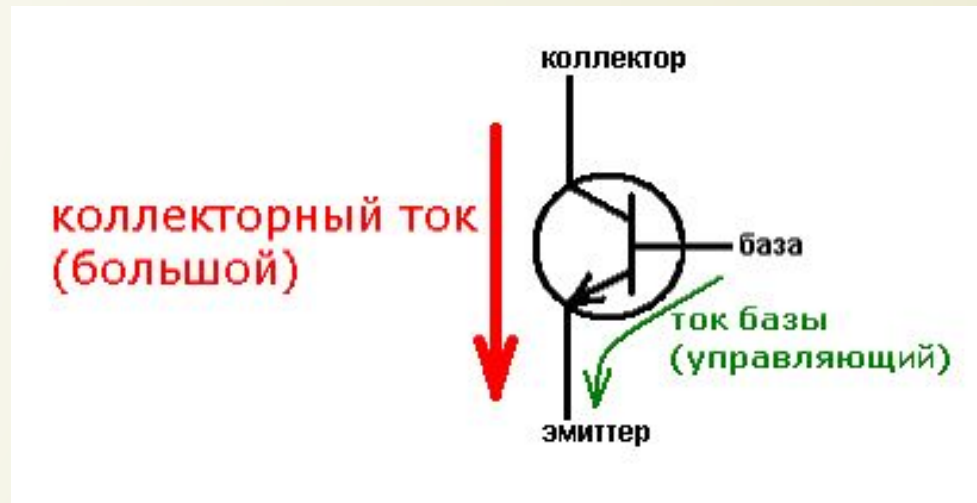
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**Transistor is a semiconductor element of a chip. Depending on the order of the semiconductor layers, transistors are divided into NPN and PNP types.**

**The electrodes of this element are called base, emitter and collector.**

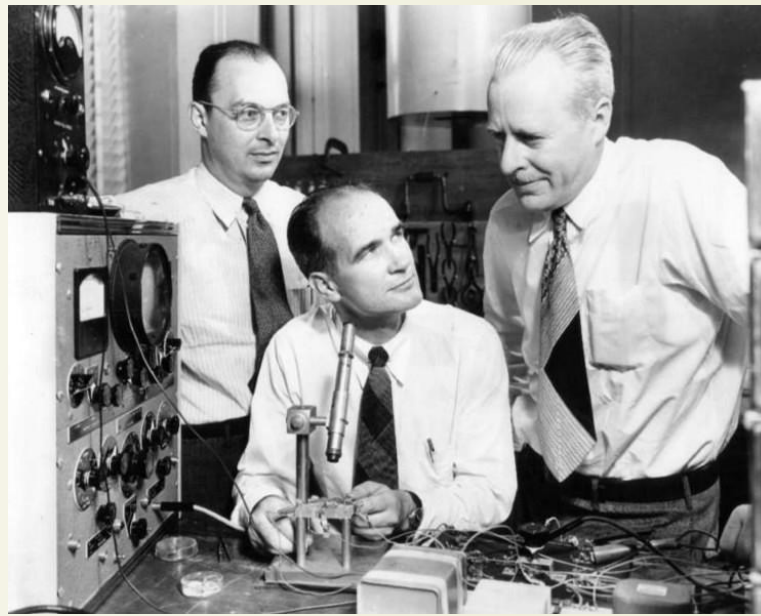
**In the scheme, the direction of the current passing through the transistor shown by emitter arrow. The base is designed to regulate the current value in the circuit.**



### How the transistor works

The transistor is controlled by a small voltage applied to the base, but the transistor itself controls a large current passing through the collector and emitter.

By small change in the voltage at the base you can change the strength of the current passing through the transistor over a wide range.



## **History**

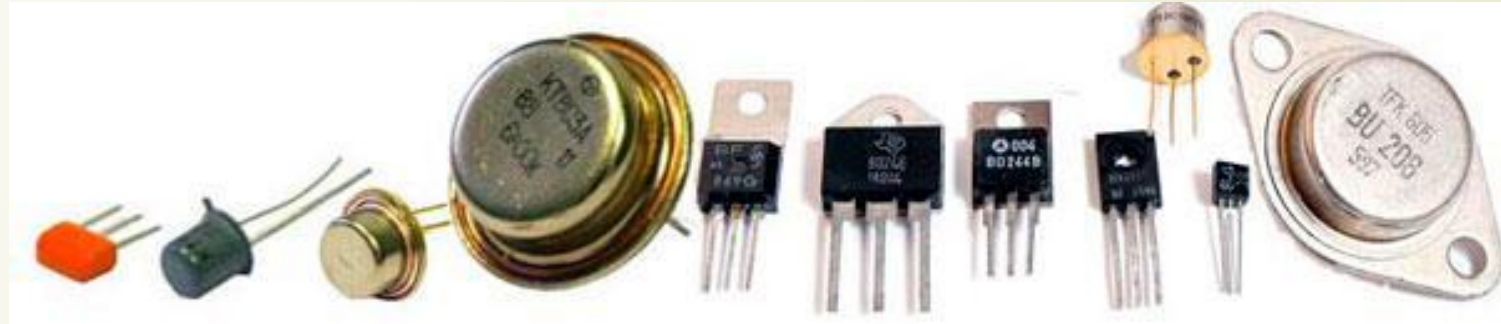
**The experiments of Michael Faraday in 1833 led to the beginning of the development of semiconductor electronics, which eventually allowed the creation of transistors.**

**In 1934, German physicist Oskar Heil patented a field-effect transistor.**

**In 1947, William Shockley, John Bardeen and Walter Brattain assembled the first working bipolar transistor.**

**December 23 is considered the day of the invention of the bipolar transistor, when the first bipolar transistor was officially presented.**

**It was a breakthrough in the development of integrated circuits and computers, thanks to bipolar transistors.**



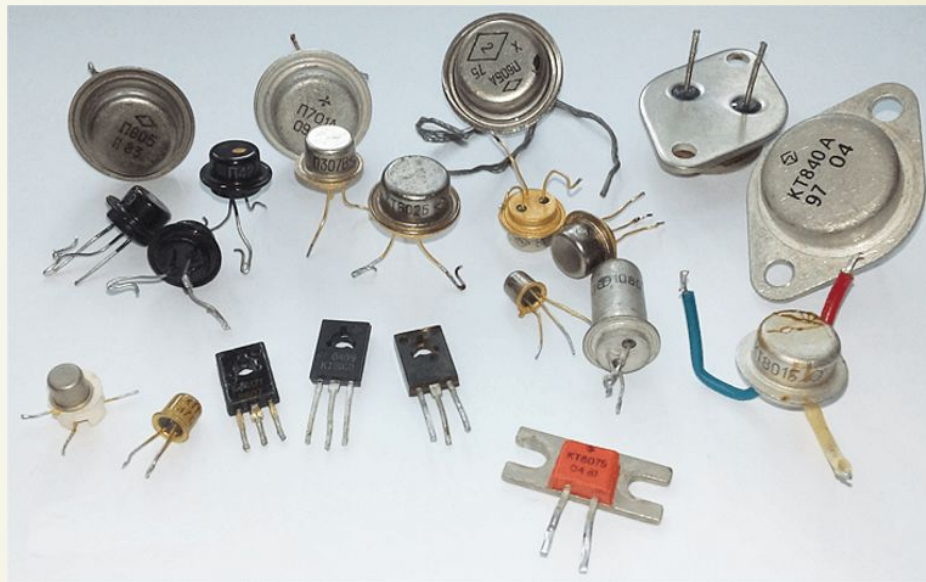
## **Application of transistors**

**In amplifier circuits transistors work mainly in the amplifying mode. But there are experimental developments of fully digital DAC-based amplifiers consisting of high-power transistors which worked in key mode.**

**Signal generator. Transistors can operate in key or amplifying mode depending on the type of generator.**

**Electronic switches. Transistors operate here in key mode. Sometimes electronic keys are used to control the current in an analog capacity, such as in incandescent lamp dimmers, switching power supplies and heating appliances.**





## **Classification of transistors**

**In addition to the main semiconductor material, in the transistors used a large number of functional elements, such as metal contacts, housing made of different materials and other elements.**

**So, there are some classifications:**

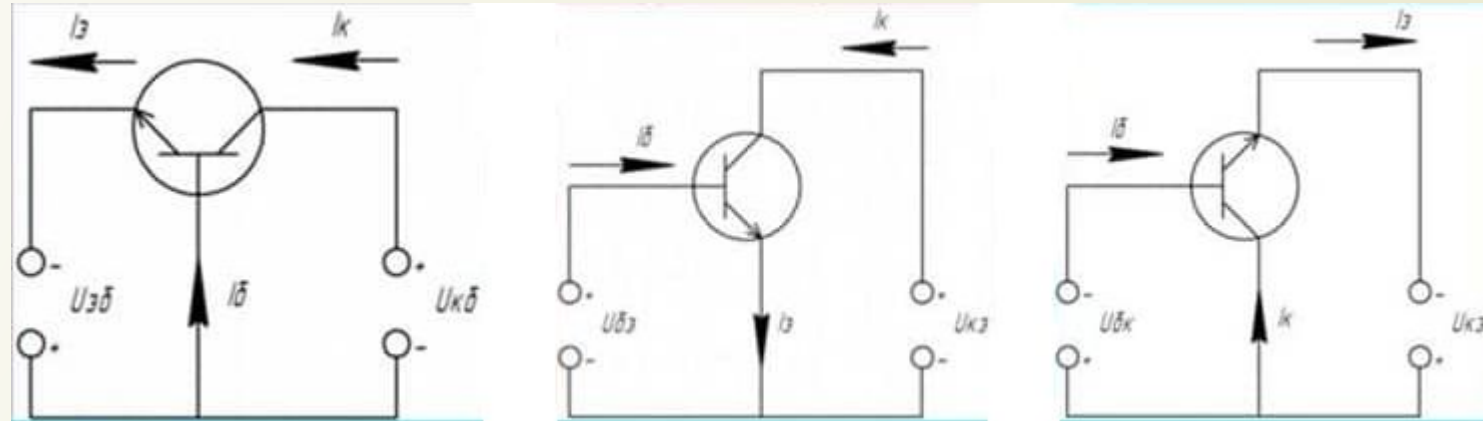
**By the main semiconductor material**

**By structure**

**By capacity**

**By creation technology**

**By materials and construction of the case**



### Schemes of connection

To include an element in the scheme, you must have four contacts - two inputs and two outputs. But transistors basically have three contacts, that's why one of them we assigned to a common one, so there are three types of switching on the transistor:

**With a common base – it amplifies only voltage (left picture).**

**With a common emitter - it amplifies current and voltage (central picture).**

**With a common collector - it amplifies only current (right picture).**



## **Advantages of transistors**

**Before transistors were created, electronic lamps were used in electrical engineering. So, there are some reasons why electronic lamps lost out:**

**Tiny size and light weight of transistors. That allows you to reduce the size of device.**

**High degree of production automation.**

**Low operating voltage.**

**They do not require preparation for work.**

**Low power loss compared to electronic lamps.**

**High mechanical strength and reliability.**

**Long service life.**

**Ability to combine multiple elements under one case.**





## **Disadvantages of transistors**

**Transistors can not replace electronic lamps everywhere. Here we see some disadvantages of transistors:**

**To work with high voltages we had to create a new type of transistor.**

**Using transistors in high power transmitters is often too expensive.**

**Transistors are more affected by electromagnetic pulses than electronic lamps.**

**Transistors are more sensitive to radiation impact.**



***Thanks for watching***