

Instrumental Technique

TRANSISTOR

Amitava Srimany
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Introduction

Transistor is a semiconductor device used to amplify and switch electronic signals and electrical power.

It was discovered by American physicists John Bardeen, Walter Brattain, and William Shockley in 1947 and they were jointly awarded the 1956 Nobel Prize in Physics.

It is composed of semiconductor material with three terminals for connection to an external circuit.

Today the transistor is the key active component in practically all modern electronics.

The vast majority of transistors are now produced in integrated circuits rather than individually packaged.

About 60 million transistors were built in 2002 for each man, woman, and child on Earth.

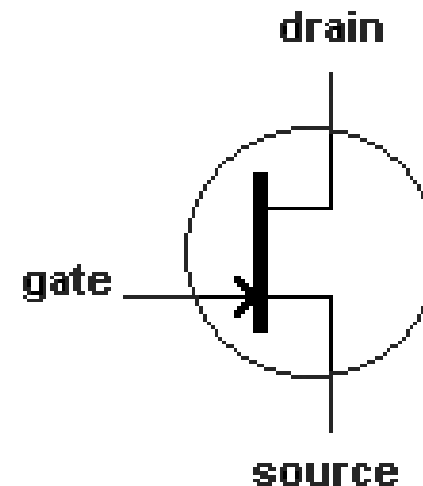
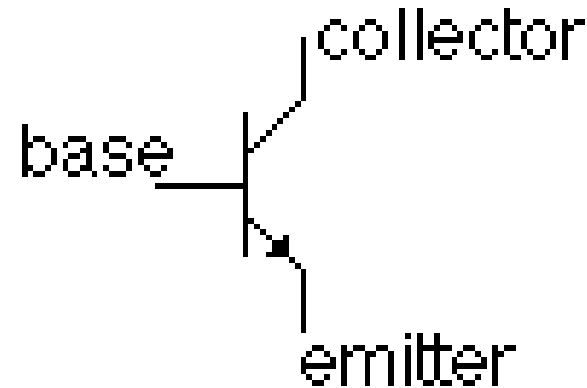
Types of transistors

There are two types of transistors, which have slight differences in how they are used in a circuit.

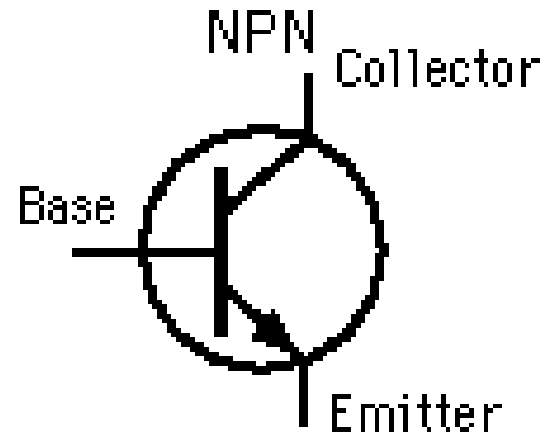
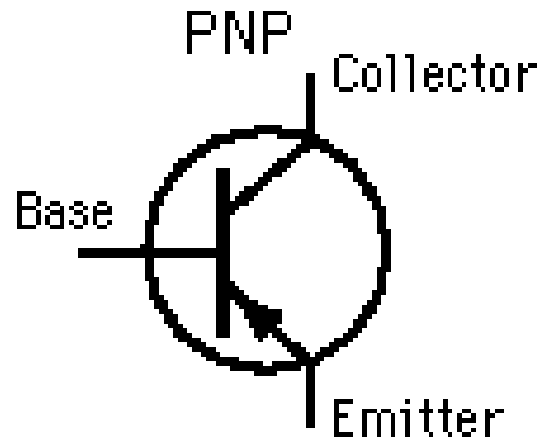
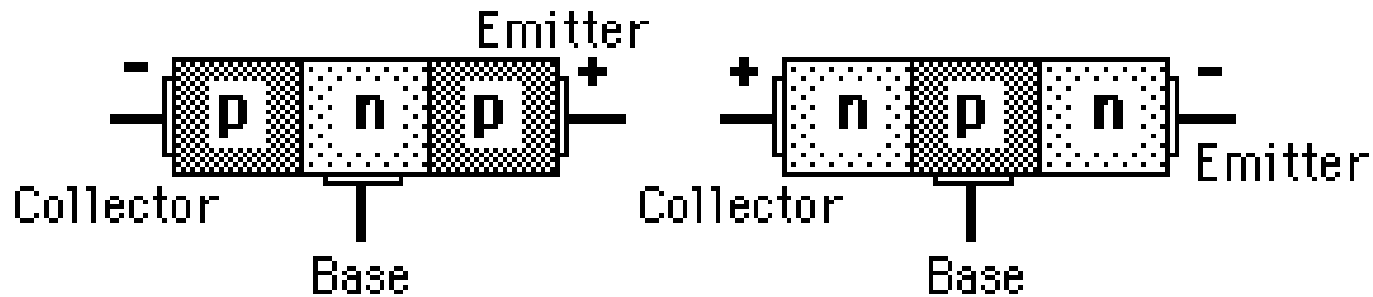
1. Bipolar junction transistor
2. Field-effect transistor

Bipolar transistor has terminals labelled as base, collector, and emitter. A small current at the base terminal can control or switch a much larger current between the collector and emitter terminals.

Field-effect transistor has terminals labelled as gate, source, and drain. A voltage at the gate can control a current between source and drain.

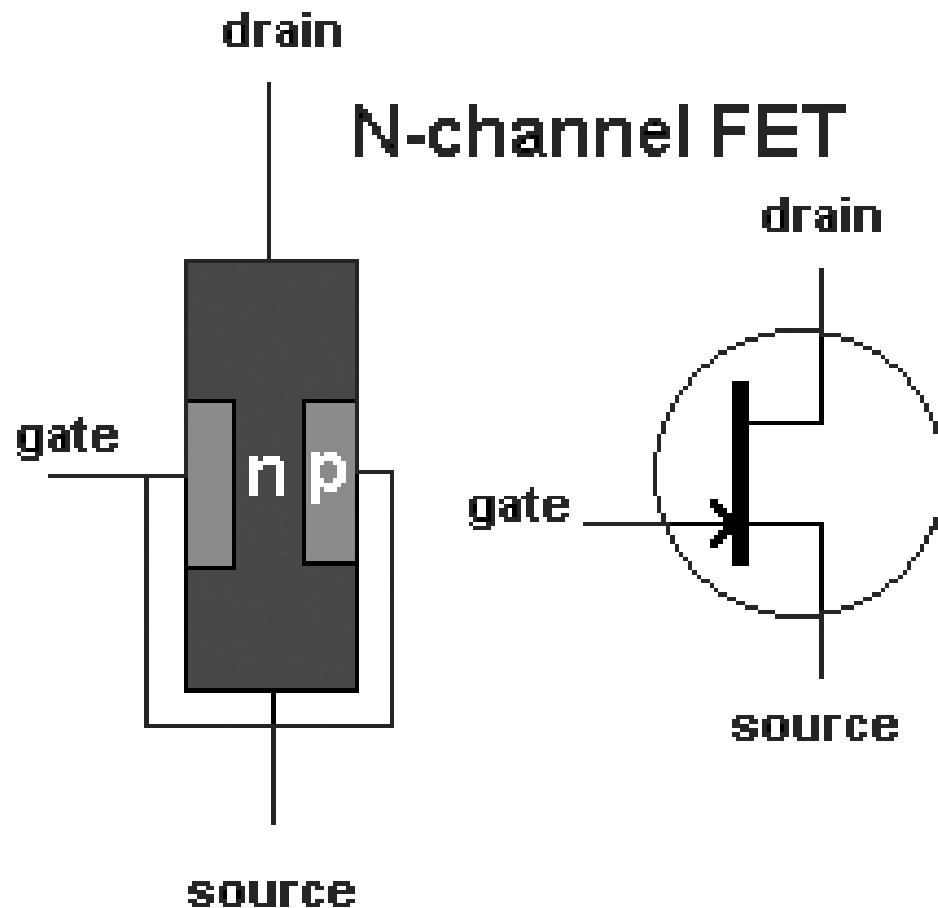


Bipolar junction transistor (BJT)



- High potential at emitter
 - Low potential at collector
 - Allows current flow when base is connected to a low potential
- High potential at collector
 - Low potential at emitter
 - Allows current flow when the base is given a high potential

Field-effect transistor (FET)



It has two layers of semiconductor material, one on top of the other

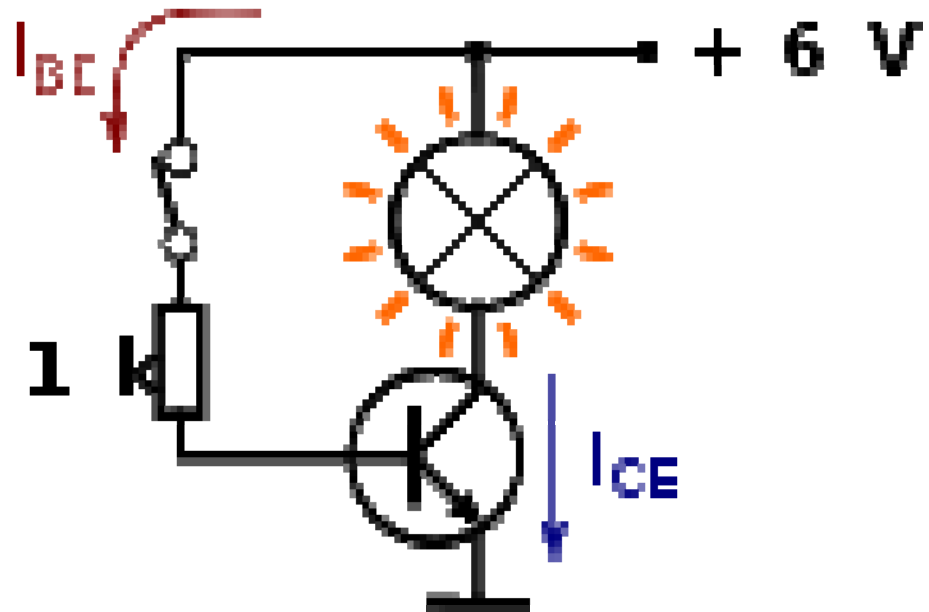
Voltage in the gate, interferes with the current flowing in the channel

There are two varieties of field effect transistors:

Junction field effect transistor (JFET)

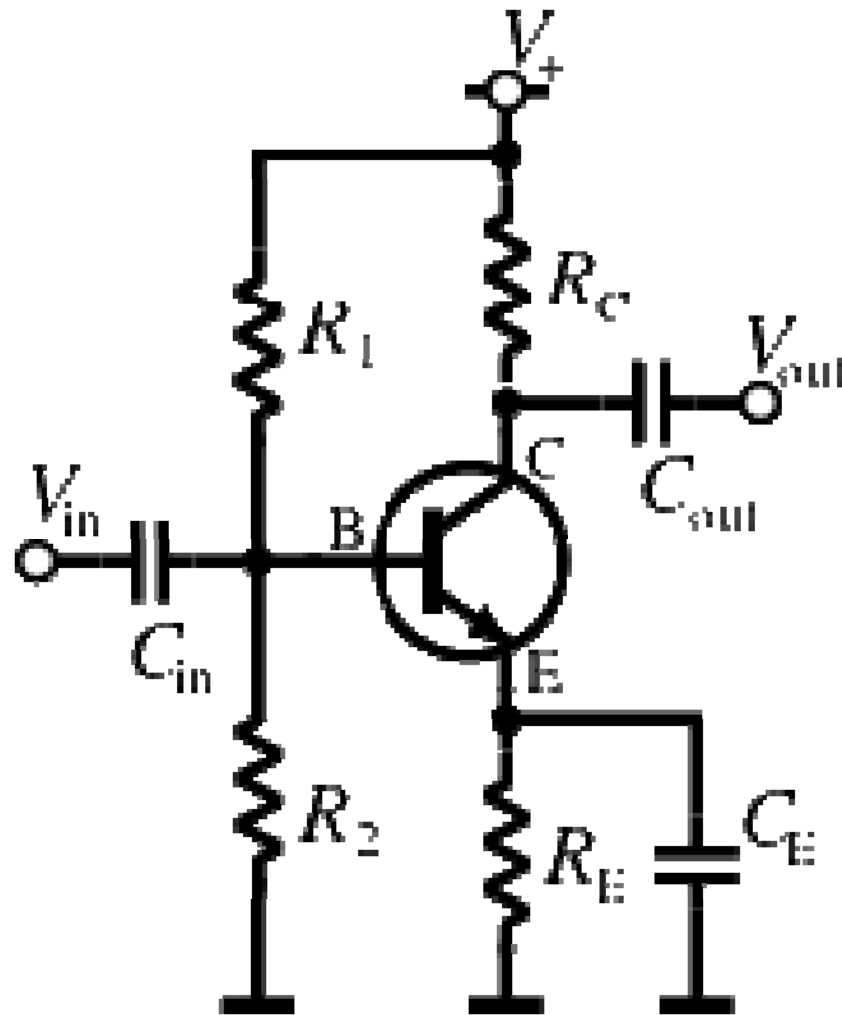
Metal oxide semiconductor field effect transistor (MOSFET)

Transistor as a switch



BJT used as an electronic switch, in grounded-emitter configuration

Transistor as an amplifier



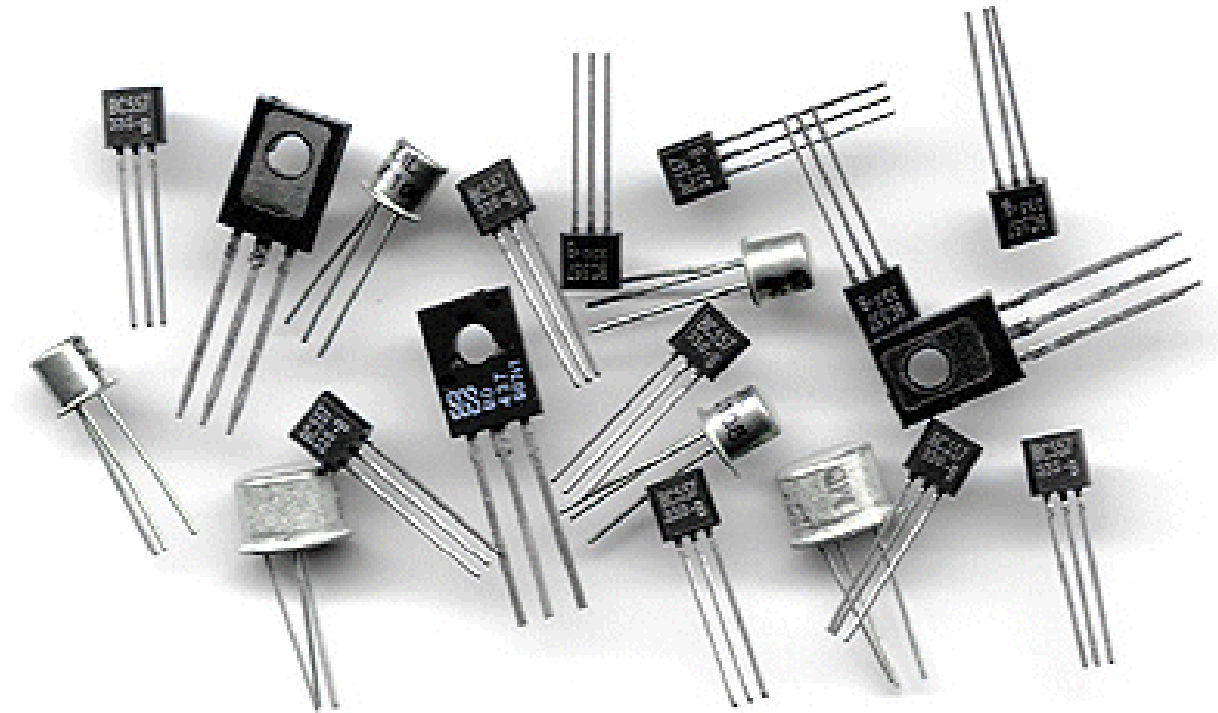
Amplifier circuit, common-emitter configuration with a voltage-divider bias circuit

Usage of bipolar and field-effect transistors

The bipolar junction transistors (BJT) are used for many analog circuits such as amplifiers because of their greater linearity and ease of manufacture.

MOSFETs can be used in analog circuits, voltage regulators, amplifiers, power transmitters and motor drivers.

Flexible transistors (organic field-effect transistors) are useful in flexible displays and flexible electronics.



THANK YOU