

What is a Transistor?

A transistor is a small electronic device used to control, amplify, or switch electric current. It is one of the most important parts of electronic circuits (radios, mobiles, computers, etc.).

A transistor has three parts:

Emitter (E)

Base (B)

Collector (C)

Easy Explanation of Transistor Parts

1. Emitter (E)

The emitter sends out charge (electrons or holes).

It is like a tap that releases water.

It supplies current to the transistor.

Emitter = Source of charge

2. Base (B)

The base controls the transistor.

It is very thin and takes very small current.

A small current in the base allows a large current to flow from emitter to collector.

Base = Controller / switch

3. Collector (C)

The collector collects charge from the emitter.

It carries the largest current.

It sends the output current to the rest of the circuit.

Collector = Output

Simple Example (Water Flow)

Emitter → Water source

Base → Valve handle (small movement controls big flow)

Collector → Pipe carrying water away

Current Relationships (α , β , γ)

Let:

= Emitter current

= Base current

= Collector current

1. Alpha (α)

Used in common base (CB) configuration

Value is less than 1 (≈ 0.95 to 0.99)

2. Beta (β)

Used in common emitter (CE) configuration

Value is large (≈ 20 to 300)

This shows how a small base current controls a large collector current

3. Gamma (γ)

Used in common collector (CC) configuration

Value is the largest.

Summary

Emitter → sends charge

Base → controls current

Collector → collects output

$\alpha < 1$, β large, γ largest

What is an NPN and PNP transistor?

A transistor is an electronic device used to switch or amplify electrical signals.

The two most common types are NPN and PNP transistors. Their names come from the type of semiconductor layers used.

1- NPN Transistor

What does NPN mean?

N – P – N means:

Emitter (N-type)

Base (P-type)

Collector (N-type)

How does it work?

The transistor turns ON when a small positive voltage is given to the base.

Current flows from collector to emitter.

Think of it like a switch that turns ON with a positive signal.

Example: Automatic night light

When light sensor sends a small positive signal to the base, the NPN transistor turns ON, the bulb or LED glows.

-Base must be positive

-Current flows Collector → Emitter

-Most commonly used transistor

2- PNP Transistor

What does PNP mean?

P – N – P means:

Emitter (P-type)

Base (N-type)

Collector (P-type)

How does it work?

The transistor turns ON when the base is negative compared to the emitter.

Current flows from emitter to collector.

It acts like a switch that turns ON with a negative signal.

Example:

Battery-powered alarm

When base gets a negative signal, the PNP transistor turns ON, the alarm starts ringing.

Key points

- Base must be negative
- Current flows Emitter → Collector
- Used when negative control is needed.

What is a BJT transistor?

BJT stands for Bipolar Junction Transistor.

It is an electronic device used to amplify signals and act as a switch.

It is called bipolar because it works using two types of charge carriers:

- Electrons
- Holes

Parts of a BJT

A BJT has three terminals:

Emitter (E) – sends charge carriers

Base (B) – controls the transistor (very small current)

Collector (C) – collects charge carriers

A small current in the base controls a large current between collector and emitter.

Types of BJT

There are two types of BJT transistors:

1- NPN Transistor

Turns ON when the base is positive

Current flows collector → emitter

Example:

Used in amplifiers, LED switching, audio circuits

2- PNP Transistor

Turns ON when the base is negative

Current flows emitter → collector

Example:

Used in battery-operated devices, reverse polarity circuits

Think of a BJT like a water tap:

Base = tap handle (small effort)

Collector–Emitter = water flow (large flow)

A small turn of the handle allows a lot of water to flow

Where BJTs are used

- Radios and audio amplifiers
- Mobile chargers
- Automatic lights
- Switching circuits

In one line

A BJT transistor uses a small base current to control a large current, working as a switch or amplifier.