



Transistors are called *active components* because they introduce power into a circuit.



Gain is a measure of the increase in signal at the output compared with the original input signal level.



A transistor can be used in an analog or digital mode. When biased to only turn on or off, it is called a *switching device*.

# Transistor Basics

All individual basic components used in electronics are called *discrete devices*. These electronic components are then categorized into two general types of main components: passive and active.

## Passive

These are components such as resistors and capacitors that consume or store energy, but cannot introduce any form of energy back into a circuit.

## Active

Components like transistors and integrated circuits are called *active components* because they can inject power or introduce something such as amplification into a circuit.

## Gain

In Chapter 6 you learned how PNP and NPN transistors are constructed and biased for operation. In practice, a transistor is extremely useful because of the ability to use a small signal applied between one pair of its terminals to control a much larger signal at another pair of its terminals.

When appropriately biased, a transistor can produce a stronger output signal of current or voltage that is proportional to a much weaker input signal. In other words, it can act as an amplifier; a property that is called *gain*.

## Switching

A transistor can also be used as an electrically controlled switch to turn current on or off in a circuit. In this case, the transistor is biased to either fully conduct or turn fully off. The current it switches on or off does not pass through the transistor but through another device, such as the contacts of a relay.

The transistor simply needs to pass enough current to energize the relay; the benefit being that the switched current and the switching transistor are isolated from each other. Also, the switched current can be large, whilst the switching current can be very small. A simple switching circuit is shown where a NPN transistor is used to operate a relay that can switch a higher current.

