

عنوان البحث

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| اســـــم الطالب | :عبدالرحمن عمادالدين محمد الشافعي |
| الرقـــم القومي | :30004301700253 |
| البريد الأكاديمي | :ab.al.shafei@el-eng.menofia.edu.eg |
| اشـــــــــــــراف | : أ.د./ عبدالمجيد شرشر  : أ.د./ أحمد نبية راشد |

**Abstract**

A transistor is a semiconductor device used to amplify or switch electronic signals and electrical power. It is composed of semiconductor material usually with at least three terminals for connection to an external circuit. A voltage or current applied to one pair of the transistor's terminals controls the current through another pair of terminals. Because the controlled (output) power can be higher than the controlling (input) power, a transistor can amplify a signal.

**Introduction**

The Bipolar Junction Transistor usually called BJT is a semiconductor device which can be used for switching or amplification. If we join two diodes back-to-back, this will give us two PN-junctions sharing a common P or N terminal. The fusion of these two diodes produces a three-layer, two junction, three-terminal device forming the basis of a Bipolar Junction Transistor. The three terminals are labelled as the Emitter (E), the Base (B) and the Collector (C) respectively. Transistors are made from different semiconductor materials that can act as either an insulator or a conductor by the application of a small signal voltage. The transistor’s ability to change between these two states enables it to have two basic functions: “switching” (digital) or “amplification” (analog). Thus, BJTs can operate within three different regions:

* **Active Region**: the transistor operates as an amplifier,
* **Saturation**: the transistor is operating as On-switch

Figure 2- A typical bipolar transistor

* **Cut-off**: the transistor is operating as Off-switch,

There are basically three possible ways to connect the BJT within an electronic circuit with one terminal being common to both the input and output.

* **Common Base Configuration** – has Voltage Gain but no Current Gain.
* **Common Emitter Configuration** – has both Current and Voltage Gain.
* **Common Collector Configuration** – has Current Gain but no Voltage Gain.

**Research Project Contents**

**The Common Base (CB) Configuration:**

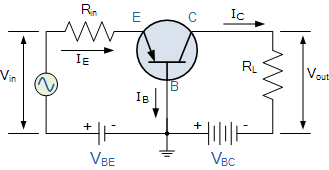


Figure -Common Base Transistor Circuit

As its name suggests, in the Common Base or grounded base configuration, the **base** **connection** is common to both the input signal AND the output signal. The input signal is applied between the transistors base and the emitter terminals, while the corresponding output signal is taken from between the base and the collector terminals as shown. The base terminal is grounded or can be connected to some fixed reference voltage point.

The input current flowing into the emitter is quite large as its the sum of both the base current and collector current respectively therefore, the collector current output is less than the emitter current input resulting in a current gain for this type of circuit of “1” (unity) or less, in other words the common base configuration “attenuates” the input signal.

The Common Base Transistor Circuit

common base configuration

This type of amplifier configuration is a non-inverting voltage amplifier circuit, in that the signal voltages Vin and Vout are “in-phase”. This type of transistor arrangement is not very common due to its unusually high voltage gain characteristics. Its input characteristics represent that of a forward biased diode while the output characteristics represent that of an illuminated photo-diode.

Also this type of bipolar transistor configuration has a high ratio of output to input resistance or more importantly “load” resistance ( RL ) to “input” resistance ( Rin ) giving it a value of “Resistance Gain”. Then the voltage gain ( Av ) for a common base configuration is therefore given as:

Common Base Voltage Gain

common base transistor gain

Where: Ic/Ie is the current gain, alpha ( α ) and RL/Rin is the resistance gain.

The common base circuit is generally only used in single stage amplifier circuits such as microphone pre-amplifier or radio frequency ( Rƒ ) amplifiers due to its very good high frequency response.

**References**

Write the references of the research project in this part.

1. Reference 1.
2. Reference 2.
3. Reference 3.
4. Reference 4.
5. Reference 5.

المراجع: يكتب فيها أسماء المراجع المرتبطة بالمشروع البحثي بشرط لا تقل عن 5 مراجع وان يكون معظمها من بنك المعرفة المصري.