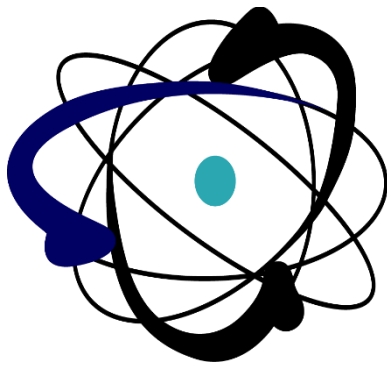


# SUMMARY OF BASIC ELECTRONICS (ACTIVE AND PASSIVE COMPONENTS)



**Politeknik**  
Teknologi Nuklir Indonesia



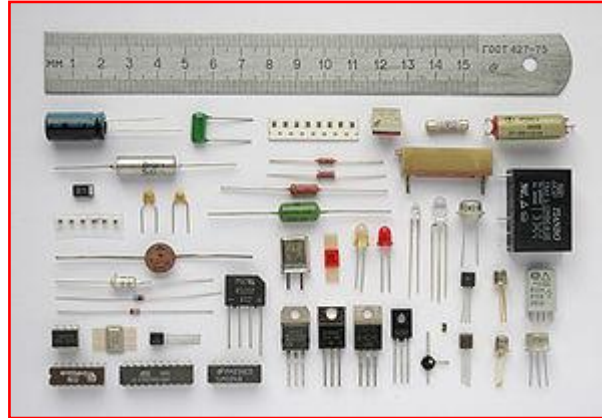
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## HOBI ELEKTRONIKA 2022

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## 1. ELECTRONICS COMPONENTS



**Fig 1.** Some Electronic Components

**Electronic components** are usually a tool in the form of objects that become supporting part of an electronic circuit that can work in accordance with its use. Starting from sticking directly to the circuit board, either in the form of PCB, CCB, Protoboard *or* Veroboard *by soldering or not attaches directly to the circuit board (with other connectors, for example cable).*

This electronic component consists of one or more electronic materials, which composed of one or more elements of matter and when put together, heated, affixed and so on will produce an effect that can produce temperature or heat, trapping or vibrating matter, changing current, voltage, electric power and others.

### **1.1. Definition and Kinds of Components in Electrical Circuits**

An electric circuit is a unified arrangement consisting of several components that have specific goals and objectives. Where are the kinds of Electrical circuit components are divided into 2 types, namely:

a. **Active Components (Current Source, Voltage Source)**

**Active components** are types of electronic components that require current electricity (power supply) in order to work in electronic circuits. The magnitude of the current electricity can be different for each of these components. The active component is drive of all circuits.

b. **Passive Components (Resistors, Capacitors, Inductors)**

**Passive components** are types of electronic components that work without requires electric current (power supply). Passive components can reduce the current entered.

These components are very big influence on electronic components. In its use, these two types of components are almost always used together the same, except in passive circuits that use only passive components such as passive Baxandall circuit, passive filter etc. For IC (Integrated Circuit) is a combination of active and passive components which arranged into an electronic circuit and reduced in physical size.

## 2. ACTIVE COMPONENTS

### 2.1. Diode

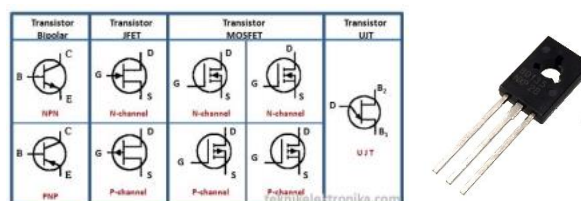


**Fig 2.** Symbol of Diode and Physical of Diode

Diode is a semiconductor that can only conduct electric current and voltage in one direction only. The main materials for the manufacture of diodes are Germanium (Ge) and Silicon/Silsilum (Si). Here are some functions on use diodes, including:

- As a heat sensor, for example in an amplifier.
- As a clamper circuit that can provide additional DC particles for AC signals.
- As a light sensor, generally use a photo diode.
- Stabilize the existing voltage on the voltage regulator.
- As an indicator.
- For a VCO or Voltage Controlled Oscillator circuit, generally use a varactor diode.
- For tools in doubling the voltage.
- For fuse (switch) / safety.
- For rectifier.

### 2.2. Transistor



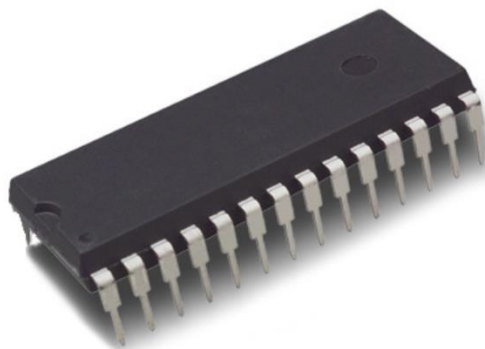
**Fig 3.** Symbol of Transistor and Physical of Transistor

Transistor is a semi-conductor component that has various functions such as as an amplifier, controller, rectifier, oscillator, modulator and so on. Transistor is one of the

most common semiconductor components found in electronic circuits. It can be said that almost all electronic devices use transistors for various needs in their circuits.

The electronic devices referred to are televisions, computers, cell phones, audio amplifiers, audio players, video players, game consoles, power supplies and others. In general, transistors can be classified into two large families, namely Bipolar Transistors and Field Effect Transistors (Field Effect Transistors). The main difference between the two groupings. It lies in the input (or output) bias it uses. Bipolar transistors require current (current) to control the other terminals while Field Effect Transistors (FET) only use voltage (no current required). In operation, the Bipolar Transistor requires a hole and electron carrier charge, while the FET only requires one of them.

### **2.3. IC (Integrated Circuit)**

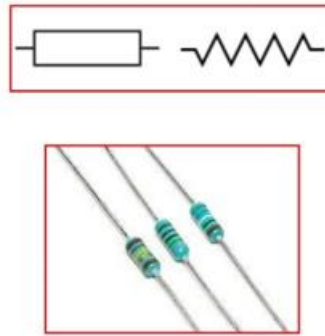


**Fig 4.** Physical Integrated Circuit

IC (Integrated Circuit) is one of the active electronic components. The main material of the IC is a semiconductor in the form of silicon. The IC section consists of hundreds to thousands of electronic components such as resistors, capacitors, transistors and diodes that are combined into one. Although it has many electronic components in it, the IC has a small shape and size. IC functions are also diverse, ranging from amplifiers, switching, controllers, to storage media.

### 3. PASSIVE COMPONENTS

#### 3.1. Resistor



**Fig 5.** Symbol of Resistor and Physical of Resistor

Resistors are two-terminal electronic components designed to withstand electric current by producing a voltage drop between the two terminals according to the current flowing through it, according to Ohm's Law. Resistors are used as part of electronic networks and circuits electronics, and is one of the most frequently used components. Resistors can be made from various compounds and films, even wire resistance (wire made of high resistivity alloys such as nickel-chromium). The main characteristics of a resistor are its resistance and the power can be dissipated. Other characteristics include temperature coefficient, electrical noise, and inductance. Resistors can be integrated into hybrid circuits and circuit boards printed, even integrated circuits. The size and location of the legs depend on the circuit design, the resistor must be physically large enough not to overheat when dissipating power.

### 3.2.Potentiometer



**Fig 6.** Symbol of Potentiometer and Physical of Potentiometer

The potentiometer is a three-terminal resistor with a sliding connection forming an adjustable voltage divider. If only two terminals are used (one of the fixed terminals and the sliding terminal), the potentiometer plays a role. A potentiometer operated by a mechanism can be used as a transducer, for example as a joystick sensor. Potentiometers are rarely used to control high power (more than 1 Watt) directly. The potentiometer is used to adjust the signal level analog (e.g. voice control in audio devices), and as controllers input for electronic circuits. For example, a dimmer using a potentiometer to control the switching of a TRIAC, so indirectly controls the brightness of the lamp. Potentiometers are used as volume controllers sometimes equipped with an integrated switch, so that the potentiometer opens switch when the slider is in the lowest position. as a variable resistor or Rheostat. Potentiometers are usually used to controlling electronic devices such as sound controllers on amplifiers.

### 3.3.Capasitor



**Fig 6.** Physical of Capasitor

A capacitor is a component electronics that can store and release an electric charge or electrical energy. Ability to store electric charge on the capacitor is called the capacitance or capacity. Capacitors can be distinguished from materials that used as a layer between metal plates called dielectric. The dielectric can be in the form of ceramics, mica, mylar, paper, polyester or movies. In general, the capacitor made of materials above the value is less than 1 microfarad (1mF). The unit of capacitor is Farad, where 1 farad =  $10^3$  mF =  $10^6$  mF =  $10^9$  nF =  $10^{12}$  pF. To find out the value of the capacity or the capacitance on the capacitor can be read through the numeric code on the capacitor body which consists of 3 digits first and second show numbers or value, the third number indicates the multiplier or the number of zeros, and the units used is picofarad (pF).



### 3.4. Inductor



**Fig 7.** Physical of Inductor

The inductor is a component electronics that are widely used, especially in the signal processing circuit and frequency. This component is included in passive component group. Definition of an inductor is a component electronics consisting of an arrangement of windings wire forming a coil. Inductor has a unit that is henry. However the henry unit is too large, so use it The smaller unit is the microhenry (mH). Where 1 henry is equal to 1000 electenry(mH). This component is more familiarly called spool or coil, some say inductor as choke or reactor. Method the work of the conductor is taken according to the law Faraday. Faraday's law is a law that explain how electric current can cause electromagnetism. On the other hand, Faraday's law also explains how the magnetic field can change into an electric current. faraday's law put forward by an English scientist named Michael Faraday in 1831