FILTER CAPACITOR

Filter capacitors are any capacitors used for filtering. Filter capacitors are common in electrical and electronic work, and cover several applications, power rail filtering, vrf work, microwave etc**.**

Fig 1: FILTER CAPACITOR

ZENER DIODE

A zener diode is a special type of diode that is designed to operate in the reverse breakdown region. An ordinary diode operated in this region will usually be destroyed due to excessive current. A zener diode is heavily doped to reduce the reverse breakdown voltage. This causes a very thin depletion layer. As a result, a zener diode has a sharp reverse breakdown voltage. When reverse breakdown voltage is reached two things happen

1. Diode current increases rapidly.
2. The reverse voltage across the diode remains almost constant.

In other words, *the zener diode operated in this region will have a relatively constant voltage across it, regardless of the value of the current through the device*. This permits the zener diode to be used as a *voltage regulator***.**

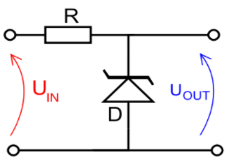


Fig 2: ZENER DIODE

BRIDGE RECTIFIER

The bridge rectifier contains four diodes to form a bridge circuit and hence the name. The a.c. supply to be rectified is applied to the diagonally opposite ends of the bridge through the transformer. Between the other two ends the load is connected. For each half cycle (positive or negative) of a.c. input two diodes in series carry the current in the same direction through the load. Therefore the circuit gives the full-wave rectification**.**

Advantages:

1. The need for the centre-tap on the secondary of the transformer is eliminated.
2. The output voltage is nearly twice that of the centre-tap circuit for a given power transformer.

3. The peak inverse voltage is one-half that of the centre-tap circuit**.**

Disadvantages:

1. It requires four diodes instead of two.
2. As two diodes in series carry the load current during each half cycle, therefore voltage drop is increased.

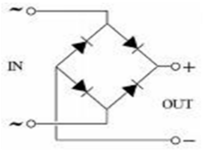


Fig 3: BRIDGE RECTIFIER

LIGHT EMITTING DIODE(LED)

A light emitting diode is a diode that gives off visible light when forward biased. Light emitting diodes are not made from silicon or Germanium but are made by using elements like gallium, phosphorus and arsenic. By varying the quantities of these elements, it is possible to produce light of different wavelengths with colors. When LED is forward biased the electrons from the n-type material cross the pn junction and recombine with holes in the p-type material. When recombination takes place, the recombining electrons release energy in the form of heat and light. In germanium or silicon diodes almost, the entire energy is given up in the form of heat and emitted light is insignificant. However, in materials like gallium and arsenide, the number of photons of light energy is sufficient to produce quite intense visible light.

Advantages:

The light-emitting diode is a solid-state light source. LEDs have replaced incandescent lamps in many applications because of the following:

1. Low voltage
2. Longer life (more than 20 years)
3. Fast on-off switching.

Fig 4: LED

TRANSISTORS

When a third doped element is added to a crystal diode in such a way that two pn junctions are formed, the resulting device is known as transistor. The transistor can achieve amplification of weak signals in a fashion comparable and often superior to that realized by vacuum tubes. Transistors are far smaller than vacuum tubes, have no filament and hence need no heating power and may be operated in any position.

A transistor consists of two pn junctions formed by sandwiching either a p-type or n-type semiconductor between a pair of opposite types. Accordingly, there are two types of transistors

- n-p-n transistor
- p-n-p transistor

In each type of transistor, the following points may be noted:

- These are two pn junctions. Therefore, a transistor may be regarded as a combination of two diodes connected back-to-back.
- There are three terminals taken from each type of semiconductor.
- The middle section is a very thin layer.

In this project the transistor used is a p-n-p type transistor. When a p-n-p type transistor operates the forward bias causes the holes in the p-type emitter to flow towards base. This constitutes the emitter current. As these holes cross into n-type base, they tend to combine with the electrons. As the base is lightly doped and very thin therefore only a few holes combine with the electrons. The remainder (more than 95%) cross into the collector region to constitute the collector's current. In this way almost the entire emitter current flows in the collector circuit. The current conduction within pnp transistor is by holes. However, in the external connecting wires the current is still by electrons.

Two types of transistors are used:

- Transistor BD 140
- Transistor BC 548

Transistor BD140

BD140 are silicon Epitaxial Planar PNP transistors mounted in Jedec SOT-32 plastic package, designed for audio amplifiers and drivers utilizing complementary or quasi-complementary circuits.

Absolute maximum ratings:

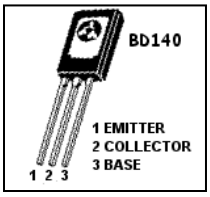
Symbol	**Parameter**	**Value**	**Unit**
Vcbo	Collector-base voltage(Ie=0)	-80	V
Vceo	Collector-emitter voltage(Ib=0)	-80	V
Vebo	Emitter-base voltage(Ic=0)	-5	V
Ic	Collector Ct.	-1.5	A
Icm	Collector peak ct.	-3	A
Ib	Base ct.	-0.5	A
Ptot	Total dissipation at Tc <25 degree C	12.5	W
Ptot	Total dissipation at Tamb <25 degree C	1.25	W
Tstg	Storage temp.	-65 to 150	Degree C
Tj	Max. operating junction temp.	150	Degree C

Transistor BC 548

This device is designed for use as general purpose amplifiers and switches requiring collector currents to 300 mA.

Absolute maximum ratings:

Symbol	Parameter	Value	Unit
Vceo	Collector-emitter voltage	30	V
Vceb	Collector base voltage	30	V
Vebo	Emitter base voltage	5	V
Ic	Collector ct. continues	500	mA
Tj,Tstg	Operating and storage junction temp.	-55 to 150	Degree C



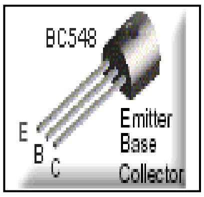


Fig 5: TRANSISTORS

IC LM317

LM 317 Acts as a 0-to-3-volt adjustable regulator. It is a three terminal, adjustable, inexpensive regulator to only some necessary value of such as 36 or 3V.

This value cannot be less than 1.25V without employing other approaches, however. The devices' inner reference voltage is 1.25V, and their output voltage accordingly cannot be less than this value without potential bias. One way to solve this problem is to use a reference-voltage source based on two diodes. Although this approach is suitable for a 1.2 to 15V or higher-voltage regulator, it is not appropriate for an extra-low-voltage fixed- or adjustable-voltage regulator. The two 1N4001 diodes it employs do not provide the needed potential bias of 1.2V, and they have additional temperature instability of approximately 2.5 mV/K. Hence, additional temperature drifting of the output voltage is approximately 100 mV; it is more than 6% for a 1.5V output voltage and 10% for a 1V output voltage if one adjusts the temperature to 20°C—a typical indoor situation. One can solve these problems by using a Fairchild Semiconductor LM185 or an Analog Devices AD589 adjustable-voltage-reference IC. These devices are expensive, however, and, in this case, they require not only additional zero adjustment but also matching. These adjustments at their reference voltages are 1.215 to 1.255V and 1.2 to

1.25V for the LM185 and AD589, respectively. The reference voltage of the LM317 is 1.2 to 1.3V.

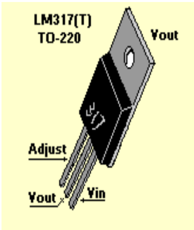


Fig 6: IC LM317

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