NEAR EAST UNIVERSITY

Faculty of Engineering

Department of Electrical and Electronic Engineering

LIGHT EMITTINGDIODE(LDE) FLASHER

Graduation Project
EE 400

Student: Mohammad Abu-Hussein (20021950)

Supervisor: Assoc. Prof. Dr.Kadri Bürüncük

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So thanks after all to the N.E.U. who gave all students the opportunity to be better citizens in a better future.

ABSTRACT

The LED is the semiconductor die itself, which sits in a reflective cup that acts as a heat sink and reflector. When voltage is applied to the LED, electrons and holes in the two semiconductor layers are attracted to each other at the junction. When they combine, they create photons. LED (Light Emitting Diode) A display and lighting technology used in almost every electrical and electronic product on the market, from a tiny on/off light to digital readouts, flashlights, traffic lights and perimeter lighting. LEDs are also used as the light source in multimode fibers, optical mice and laser-class printers.

This project will present LEDs flasher, also will present the bulding of the circuit, that the LEDs will be flashing by sustenance from the spical component of this project PIC16F84A. This IC it canbe porgamming to let the LEDs operation by a different manner.

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CHAPTERl

ELECTRICAL DEVELOPMENT

1.1 Overview

In this chapter a description about the electrical development and some of the scientific helped in development of electricity, also some of information about voltage, current, and power.

1.2 Electricity

Electricity is the flow of electrical power or charge. It is a secondary energy source which means that we get it from the conversion of other sources of energy, like coal, natural gas, oil, nuclear power and other natural sources, which are called primary sources. The energy sources we use to make electricity can be renewable or non-renewable, but electricity itself is neither renewable or non-renewable.

1.3 Some Scientific Helped In The Development Of Electricity

1.3.1 Benjamin Franklin

He was bom in America. He was the first to use the terms positive and negative charge. Franklin was one of seventeen children. He quit school at age ten to become a printer. Benjamin Franklin studied electricity, and quite famous even today for his kite and key experiment with lighting. Electricity has the power to light lamps that help us see at night and fule hetars that keep us warm in winter, but it is important not to get in electricity way because it can harm us.

1.3.2 James Watt

Was bom in Scotland. Although he conducted no electrical experiments, he must not be overlooked. He was an instrument maker by trade and set up a repair shop in Glasgow in 1757. Watt thought that the steam engine would replace animal power, where the number of horses replaced seemed an obvious way to measure the charge for performance. Interestingly, Watt measured the rate of work exerted by a horse drawing rubbish up an old mine shaft and found it amounted to about 22,000 ft-lbs per minute. He added a margin of 50% arriving at 33,000 ft-lbs.

1.3.3 William Thomson, Lord Kelvin

Was best known in his invention of a new temperature scale based on the concept of an absolute zero of temperature at -273°C (-460°F). To the end of his life, Thomson maintained fierce opposition to the idea that energy emitted by radioactivity came from within the atom. One of the greatest scientific discoveries of the 19th century, Thomson died opposing one of the most vital innovations in the history of science.

1.3.4 Thomas Seebeck

A German physicist was the discover of the "Seebeck effect". He twisted two wires made of different metals and heated a junction where the two wires met. He produced a small current. The current is the result of a flow of heat from the hot to the cold junction. This is called thermoelectricity. Thermo is a Greek word meaning heat.

1.3.5 Michael Faraday

An Englishman, made one of the most significant discoveries in the history of electricity, electromagnetic induction. His pioneering work dealt with how electric currents work. Many inventions would come from his experiments, but they would come fifty to one hundred years later. Failures never discouraged Faraday. He would say, "the failures are just as important as the successes." He felt failures also teach. The farad, the unit of capacitance is named in the honor ofMichaelFaraday.

Modem technology and Faraday's Law of Inductance join forces to create a virtually indestructible light that has no need for batteries or bulbs. Simply shake the light to charge, this causes a high strength magnet to pass back and forth between a wire coil giving charge to the light's capacitor that can be stored for months.

An indespensible accessory ideal for any outdoor activity including camping, hiking, boating as well as general emergency situations. The last emergency flashlight you'll ever need.

1.3.6 James Maxwell

A Scottish mathematician translated Faraday's theories into mathematical expressions. Maxwell was one of the finest mathematicians in history. A maxwell is the electromagnetic unit of magnetic flux, named in his honor. Today he is widely regarded as secondary only to Isaac Newton and Albert Einstein in the world of science.

1.3.7 Nikola Tesla

Gave us our mass-production system, without his motors it could not exist, he created the robots, and the radio, he invented the radar forty years before its use in World War II, he gave us neon lighting, fluorescent lighting, he gave us the high-frequency currents which are performing their electronic wonders throughout the medical and industrial worlds, he gave us remote control by wireless, etc. Every transmission tower across the country side, every powerhouse, every generator, every motor in the country is a monument to Nikola Tesla.

1.4 History of Electricity

From the writings of Thales of Miletus it appears that Westerners knew as long ago as 600 B.C. That amber becomes charged by rubbing. There was little real progress until the English scientist William Gilbert in 1600 described the electrification of many substances and coined the term electricity from the Greek word for amber. As a result, Gilbert is called the father of modem electricity. In 1660 Otto von Guericke invented a crude machine for producing static electricity. It was a ball of sulfur, rotated by a crank with one hand and rubbed with the other. Successors, such as Francis Hauksbee, made improvements that provided experimenters with a ready source of static electricity. Today's highly developed descendant of these early machines is the Van de Graaf generator, which is sometimes used as a particle accelerator. Robert Boyle realized that attraction and repulsion were mutual and that electric force was transmitted through a vacuum in1675. Stephen Gray distinguished between conductors and nonconductors (1729). C.F.Du Fay recognized two kinds of electricity, which Benjamin Franklin and Ebenezer Kinnersley of Philadelphia later named positive and negative.

1.4.1 The Leyden Jar and the Quantitative Era

Progress quickened after the Leyden jar was invented in 1745 by Pieter van Musschenbroek. The Leyden jar stored static electricity, which could be discharged all at once. In 1747 William Watson discharged a Leyden jar through a circuit, and comprehension of the current and circuit started a new field of experimentation. Henry Cavendish, by measuring the conductivity of materials (he compared the simultaneous shocks he received by discharging Leyden jars through the materials), and Charles A.Coulomb, by expressing mathematically the attraction of electrified bodies, began the quantitative study of electricity.

A new interest in current began with the invention of the battery. Luigi Galvani had noticed in 1786 that a discharge of static electricity made a frog's leg jerk. Consequent experimentation produced what was a simple electron cell using the fluids of the leg as an electrolyte and the muscle as a circuit and indicator. Galvani thought the leg supplied electricity, but Alessandro Volta thought otherwise, and he built the voltaic pile, an early type of battery, as proof. Continuous current from batteries smoothed the way for the discovery of G.S.Ohm's law in 1827, relating current, voltage (electromotive force), and resistance, and of J.P.Joule's law of electrical heating in 1841. Ohm's law and the rules discovered later by G.R. Kirchhoff regarding the sum of the currents and the sum of the voltages in a circuit the basic means of making circuit calculations.

1.4.2 Era of Electromagnetism

In 1819 Hans Christian Oersted discovered that a magnetic field surrounds a current-carrying wire. Within two years Andre Marie Ampere had put several electromagnetic laws into mathematical form, D.F.Arago had invented the electromagnet, and Michael Faraday had devised a crude form of electric motor. Practical application of a motor had to wait 10 years, however, until Faraday (and earlier, independently, Joseph Henry) invented the electric generator with which to power the motor. A year after Faraday's laboratory approximation of the generator, Hippolyte Pixii constructed a hand-driven model. From then on engineers took over from the scientists, and a slow development followed, the first power stations were built 50 years later.

In 1873 James Clerk Maxwell had started a different path of development with equations that described the electromagnetic field, and he predicted the existence of electromagnetic waves traveling with the speed of light. Heinrich R.Hertz confirmed this prediction experimentally, and Marconi first made use of these waves in developing radio (1895). John Ambrose Fleming invented (1904) the diode rectifier vacuum tube as a detector for the Marconi radio. Three years later Lee De Forest made the diode into an amplifier by adding a third electrode, and electronics had begun. Theoretical understanding became more complete in 1897 with the discovery of the electron by *I.I.Thomson.* In 1910-1911 Ernest R. Rutherford and his assistants learned the distribution of charge within the atom. Robert Millikan measured the charge on a single electron by 1913.

1.4.3 Electricity- A Secondary Energy Source

Electricity is a basic part of nature and it is one of our most widely used forms of energy. Many cities and towns were built alongside waterfalls (a primary source of mechanical energy) that turned water wheels to perform work. Before electricity generation began slightly over 100 years ago, houses were lit with kerosene lamps, food was cooled in iceboxes, and rooms were warmed by wood-burning or coal-burning stoves. Beginning with Benjamin Franklin's experiment with a kite one stormy night in Philadelphia, the principles of electricity gradually became understood. Thomas Edison helped change everyone's life he perfected his invention the electric light bulb. Prior to 1879, direct current (DC) electricity had been used in arc lights for outdoor lighting. In the late-l 800s, Nikola Tesla pioneered the generation, transmission, and use of alternating current (AC) electricity, which can be transmitted over much greater distances than direct current. Tesla's inventions used electricity to bring indoor lighting to our homes and to power industrial machines.

Despite its great importance in our daily lives, most of us rarely stop to think what life would be like without electricity. Yet like air and water, we tend to take electricity for granted. Everyday, we use electricity to do many jobs for us from lighting and heating,cooling our homes, to powering our televisions and computers. Electricity is a controllable and convenient form of energy used in the applications ofheat, light and power.

1.4.4 Static Electricity

Electricity has been moving in the world forever. Lightning is a form of electricity. It is electrons moving from one cloud to another orjumping from a cloud to the ground. Have you ever felt a shock when you touched an object after walking across a carpet, a stream of electrons jumped to you from that object. This is called static electricity.

Have you ever made your hair stand straight up by rubbing a balloon on it? If so, you rubbed some electrons off the balloon. The electrons moved into your hair from the balloon. They tried to get far away from each other by moving to the ends of your hair. They pushed gainst each other and made your hair move they repelled each other. Just as opposite charges zrtract each other, like charges repel each other.

1.4.5 Magnets and Electricity

In most objects, all of the forces are in balance. Half of the electrons are spinning in one irection, half are spinning in the other. These spinning electrons are scattered evenly :hroughout the object.

Magnets are different. In magnets, most of the electrons at one end are spinning in one irection. Most of the electrons at the other end are spinning in the opposite direction.

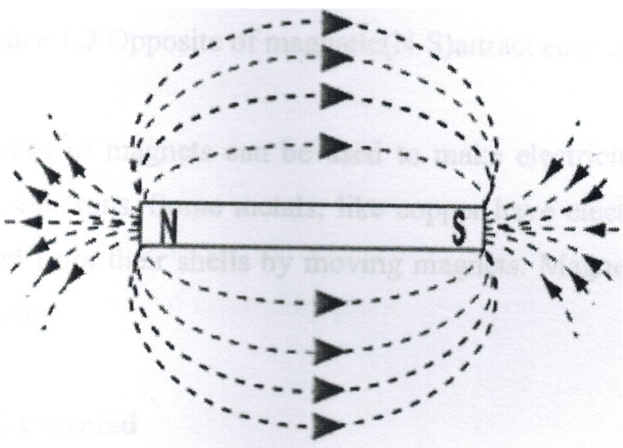


Figure 1.1 Direction of magnatic field

This creates an imbalance in the forces between the ends of a magnet. This creates a magnetic field around a magnet. A magnet is labeled with North (N) and South (S) poles. The magnetic force in a magnet flows from the North pole to the South pole see figure (1.1).

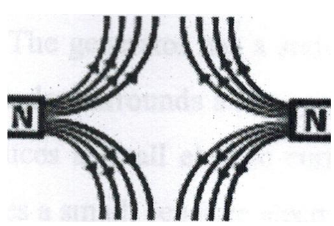


Figure 1.2 Like poles of magnatic (N-N or S-S) repel each other

Have you ever held two magnets close to each other? They don't act like most objects. If you try to push the South poles together, they repel each other. Two North poles also repel each other.

Tum one magnet around and the North (N) and the South (S) poles are attracted to each other. The magnets come together with a strong force. Just like protons and electrons, opposites attract that shoeing in the figure (1.3).

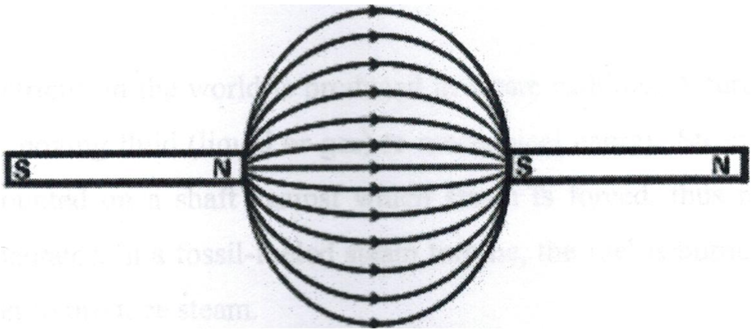


Figure 1.3 Opposite of magnatic(N-S)attract each other

These special properties of magnets can be used to make electricity. Moving magnetic fields can pull and push electrons. Some metals, like copper have electrons that are loosely held. They can be pushed from their shells by moving magnets. Magnets and wire are used together in electric generators.

1.4.6 How Electicity Is Generated

A generator is a device that converts mechanical energy into electrical energy. The process is based on the relationship between magnetism and electricity. In 1831, Faraday discovered that when a magnet is moved inside a coil of wire, electrical current flows in the wire.

A typical generator at a power plant uses an electromagnet a magnet produced by electricity not a traditional magnet. The generator has a series of insulated coils of wire that form a stationary cylinder. This cylinder surrounds a rotary electromagnetic shaft. When the electromagnetic shaft rotates, it induces a small electric current in each section of the wire coil. Each section of the wire becomes a small, separate electric conductor. The small currents of individual sections are added together to form one large current. This current is the electric power that is transmitted from the power company to the consumer.

An electric utility power station uses either a turbine, engine, water wheel, or other similar machine to drive an electric generator or a device that converts mechanical or chemical energy to generate electricity. Steam turbines, internal-combustion engines, gas combustion turbines, water turbines, and wind turbines are the most common methods to generate electricity. Most power plants are about 35 percent efficient. That means that for every 100 units of energy that go into a plant only 35 units are converted to usable electrical energy.

Most of the electricity in the world is produced in steam turbines. A turbine converts the kinetic energy of a moving fluid (liquid or gas) to mechanical energy. Steam turbines have a series of blades mounted on a shaft against which steam is forced, thus rotating the shaft connected to the generator. In a fossil-fueled steam turbine, the fuel is burned in a furnace to heat water in a boiler to produce steam.

1.4.7 The Transformer - Moving Electicity

To solve the problem of sending electricity over long distances, William Stanley developed a device called a transformer. The transformer allowed electricity to be efficiently transmitted over long distances. This made it possible to supply electricity to homes and businesses located far from the electric generating plant.

The electricity produced by a generator travels along cables to a transformer, which changes electricity from low voltage to high voltage. Electricity can be moved long distances more efficiently using high voltage. Transmission lines are used to carry the electricity to a substation. Substations have transformers that change the high voltage electricity into lower voltage electricity. From the substation, distribution lines carry the electricity to homes, offices and factories, which require low voltage electricity.

1.4.8 Measuring Electricity

Electricity is measured in units of power called watts. It was named to honor James Watt, the inventor of the steam engine. One watt is a very small amount of power. It would require nearly 750 watts to equal one horsepower. A kilowatt represents 1,000 watts. A kilowatthour (kWh) is equal to the energy of 1,000 watts working for one hour. The amount of electricity a power plant generates or a customer uses over a period of time is measured in kilowatthours (kWh). Kilowatthours are determined by multiplying the number of kW's required by the number of hours of use. For example, if you use a 40-watt light bulb 5 hours a day, you have used 200 watts of power, or 0.2 kilowatthours of electrical energy.

1.5 Electrical Charge

There are two types of observed electric charges, which we designate as positive and negative. The convention was derived from Benjamin Franklin's experiments. He rubbed a glass with silk and called the charge on the sealing wax negative. Like charges repel and opposite charges attract each other. The unit of charge is called Coulomb (C). The smallest unit of "free" charge known in nature is the charge of an electron or proton, which has a magnitude of $e = 1.602 \times 10^{-19}$ C.

Charge of any ordinary matter is quantized in integral multiples of e . An electron carries one unit of negative charge,-e, while a proton carries one unit of positive charge, +e. In a closed system, the total amount of charge is conserved since charge can neither be created nor destroyed. A charge can, however, be transferred from one body to another.

1.5.1 Coulomb's Law

Coulomb's law tells us that the electrical forces vary inversely with the square of the distance between the charged object. Columbus was first defined in terms of macroscopic phenomena such as the movement of current in a wire. In the early 1900s Robert Milliken and co-workers determined that the electrical charge of single electron is equal to 1.6×10^{-19} coulomb. Consider a system of two point charges ,q1 and q2 , separated by a distance r in vacuum. The force exerted by q1 on q2 is given by Coulomb's law:

$$F = K_e \frac{!l.1..r_2}{q2} \qquad (1.1)$$

Note that the electric force is a vector which has both magnitude and direction. In SI units, the Coulomb constant ke is given by:

$$K_e = \frac{1}{4\pi\varepsilon_o} = 8.9875 \times 10^9 \, N \cdot m^2 / C^2$$

Where:

$$\varepsilon_o = \frac{}{4\pi(8.9875\times10^{9})} = 8.85\times10^{-12}C^2/N\cdot m^2$$

Is known as the "permittivity of free space". Similarly, the force on q_l ql due to q_2 is given by F21 = -F12. This is consistent with Newton's law. Coulomb's law applies to any pair f point charges. When more than two charges are present, the net force on any one charge is simply the vector sum of the forces exerted on it by the other charges. For example, if three charges are present, the resultant force experienced by q3 due to q1 and q2 will be:

$$F_3 = F_{13} + F_{23}$$

1.5.2 Electrical Field

A field is a region of space in which various types of forces can be detected. The electrostatic force, like the gravitational force, is a force that acts at a distance, even when the objects are not in contact with one another. To justify such the motion we rationalize action at a distance by saying that one charge creates a field which in tum acts on the other charge.

An electric charge q produces an electric field everywhere. To quantify the strength of the field created by that charge, we can measure the force a positive " test charge" % experiences at some point. The electric field E is defined as:

$$\bar{E}=lımq\sim o-\frac{F}{\%}$$

1.5.3 Electrical Potential

Electrical potential is called voltage and the unit of measurement of the electrical potential is volt. The change in electric potential, or the voltage difference between two points, is defined as the work performed per unit charge.

$$\text{Electric energy} = \frac{energy}{charge}$$

Another way for saying the same thing is, the different voltage between two points is the change in energy between the points, divided by the magnitude of charge, In equation form:

$$V = \frac{M}{q}$$

Where:

V : voltage in volts.

~ E : change in energy.

q : charge in coulombs.

1.5.4 Electrical current

An electrical current is any connected motion of electric charge. Thus, a current arise hen electrons move in wire. A current is also generated when charged particles are ejected from the sun and travel off into space or when ions travel through a liquid. Electric current is a rate of flow. It is defined as the quantity of charge moving past a given point divided by the time.

Current = charge / time, Or:

$$] = \frac{i}{t}$$

Where:

I : current in amperes

q : charge in coulombs

t : time in second

If the charge is expressed in coulombs and time in seconds, current is expressed in amperes. One ampere is the rate of flow of one coulombs per second.

This relation can be rewritten as 1 ampere= 1 (coulomb/sec)= 6.42 x 10^{18} electrons/sec.

1.5.5 Power

Both of electrical and mechanical can be converted to heat or work. Think about analogy of water system. The potential energy of water stored in an evaluated pipe can be converted to eat if the water is allowed to flow down through a sand-filled pipe. Similarly, the potential energy of water can be converted to work if the water is directed to fall through the blades of water wheel. In an electrical system, heat is generated when the current is passed through a esistor, and mechanical work is produced when electric current passed through the coil of an electric motor. We are interested in the rate at which heat or work is produced by an electric :urrent. Power is defined as the rate at which energy is transferred, or energy per unit time.

Power is commonly expressed in watt (abbreviated W) in both mechanical and electrical ıpplications. One watt equal 1 joule per second, therefore:

Power = energy / time

1 watt = 1 (joule / sec)

electrical power can also be defined in terms of current and voltage as shown below.

Power = current · voltage

$$P = I \cdot V$$

There is power loss in the circuit only when there is current moving across a voltage drop. It's important to understand the interrelationship among voltage, current, resistance and power. During this discussion, two important equations are repeated here:

Voltage = current · resistance

$$V = IR \qquad (1.7)$$

Power = current · voltage

Ohms law tells us that, at constant voltage, a circuit with low resistance carries more current than does a circuit with high resistance. This conclusion is responsible. Equation (1.6) ells us that the output of a section of a circuit is equal to the current times the voltage drop.

A circuit will produce the most of heat while there is only low resistance copper wire or another conductor throughout the current loop. Thus, if you were to take an ordinary car artery and bridge the low terminals with a metal bar of low resistance, the bar would glow bright red and the battery will discharge quickly. The low resistance of the bar allows a great deal of current to flow, which produces a large amount of heat in short period of time. Thus, the heating element is a stove gets much hotter than ratio. Similarly, a great of heat would be produced if a copper wire were connected directly across the tow terminal of household outlet. The resistance of circuit would then simply be the resistance of the wire, which is low of the order of 104 ohms. Such low resistance would allow a very high flow of current. This type of situation is called a short circuit. Electrical fires start this way.

1.6 Study of Electronic

We can use electronics devices in many fields especially in areas, as audio system, digital puter, communication system, instrumentation, automatic controls. Each of this areas are ·· ize electronic device such diodes, transistor, integrated circuits, and various special mponent the electrical characteristic of these devices make it possible to construct circuit znat perform useful function in many different kinds of application.

The study of electronic devices is now almost all off equivalent with study of semiconductor devices. Semiconductor material is widely used in terms of its electrical properties because it is neither a conductor devices nor insulator. Silicon, an element found in dinary sand, is now the most widely used semiconductor material, it can be use in many ntrolled manufacturing processes.

If any one trend characterizes modem electronics, it is quest for minimization. We always earn about a new technology advance that resulting ever more polished circuits, but it is packaged in ever smaller integrated circuits. The primary reason for this tend are improved reliability, reduced cost, and in the case of high frequency and digital computer circuits increased speed due to shorting of interconnection paths.

1.7 History of Electronic

Many electronic devices ware used in nineteen century, but its discoveries in eighteen century by Thomas Edison, Heinrich Hertz, and Guglielmo Marconi and Aleksanderd Popov developed into what is generally accepted as the beginning of the electronics era, for example, Marconi is considered the father of the radio after having been the first to send a radio transmission across the Atlantic. Radiotelegraphy was the most common means of long distance communication, by World Ware 1, radio was all over 33222tube invented by Fleming that was based one Edison's early work in transmitting electron current through vacuum. Later on, Lee De Forest developed the triode, a three element vacuum tube capable of voltage amplification. Edwin Armstrong's contributions to radio communication include the vacuum tube oscillator and the superheteroddyne receiver, whose principle is used even today.

The 1920s saw a huge boom is commercial radio communication radio communication. Even during the great depression in 1930s, people all around the world enjoyed many forms radio entertainment as music, show and news. Radio speakers were not of the permanent gnet type. The voice coil was surrounded by an electromagnet that doubled as an inductor the filter in the power supply. After a big success of radio transmission of voice and ic, the natural thing was to move towards transmitting images as well. In 1930s, RCA -eloped television and officially stared broadcasting in 1939 with President Franklin oosevelt in front of the camera. The arrival of World War 2, however, put TV broadcasting hold until the end of the war. The 1950s saw the launch of the television era.

The vacuums of tubes ofthe1940s were much smaller than those of the 1920s, consumed s power, and were more efficient. But they still needed filaments for heating their cathodes ~.~ liberate electrons. In this time, the first electronic device not requiring heat would be troduced the selenium diodes. But by 1947, based on the research of Shockley, Bardeen, d Brattain of Bell Telephone laboratories, the first transistor was developed, and the solid state era began. Transistor radios, however, did not flourish until the late 1950s, perhaps due .„. the existing stocks of vacuum tubes. Minimization of electronic circuits followed the evelopment of the transistor. Jack Kilby of Texas Instrument developed the first integrated circuit in 1959. Integrated circuits contain many semiconductor devices, such as transistors and diodes, in a very small era. In 1961, Robert Noyce of the Fairchild Corporation was the eveloper of the first commercial interconnect equipment is based on integrated circuits that can be manufactured with a high degree of accuracy and relatively low coast. The most palpable example of this is the high performance and low cost of toady's personal computers

1.8 The use of Computer

The study and understanding of electronics demands mathematical skills, because circuit ehavior can be described in particle terms only by equations. Numerical result obtained from olving equation are the principle means we have for comparing, predicting designing, and evaluating electronic circuits .The person given the opportunity to use computers as an aid in obtaining those result.

There are basically two ways that computers are used in the study of electronics .first, we can choose to write our own program is one of the standards computer languages, such as BASIC or FORTRAN .Each program we write will be design to solve a specific circuit problem . For example, we might wish to determine the magnitude of the output voltage in a certain single transistor amplifier .our program will be designed to produce that result , for that circuit.howeever,it is usually very easy to change the values of the components in the circuit and to reuse the program with these changes. When a computer is used this way, programmer must be having a good knowledge of electronic circuit theory, because they must be able to select and rearrange the theoretical equations that apply to circuit. At the same time, ıney must be skilled programmers, having a good knowledge of the computer language and :he ability to use it to solve various kinds of equation.

On the other hand, in the second way of using computers, we rely on someone else's ::ırogrammingskills by acquiring a program specially designed to solve electronic circuit problems. A popular example of such a program is SPICE (simulation program with ıntegrated circuit emphasis), developed in university of California, Berkeley. To use this kind of program, we need only specific the component in the circuit we wish to study, describe · ow they are interconnected, and tell the program what kind of result we want (output ·oltage, current,etc). Very little programming skills are requiring because we simply supply data to a program that is already in computer memory. Also, very little knowledge of electronics theory is required. We need just enough to be able to describe the component in the circuit and how they are connected.

1.9 Circuit Analysis and Circuit Design

In general analysis means finding voltage, current and powers of given devices and the ::omponentvalues in a circuit. Circuit design turns that process around by finding component alues and selecting devise so that certain voltages, current and powers are developed at specific points in a circuit. As simple example, we can analyze a voltage divider to ietermined the voltage it develop, given the voltage a cross it and the values of its resisters. A :ypical design problem is to select resister values so that a specified voltage is developed.

In circuit analysis we usually drive equation for voltage, current, or power interims of :omponent values.thus,circuit design is often performed by solving such equation for :omponent values in terms of voltage, current, or power. However, there are no hard and fast ules for teaching design. Its general a greed that thru understanding of analyzes techniques is rital prerequisite to developing design shills.

CHAPTER2

COMPONENT OF PROJECT

2.1 Overview

In this chapter a description about the electronics components used in general hardware projects will be described briefly in addition to safety guidelines.

2.2 Resistors

A resistor is a two-terminal electrical or electronic component that resists an electric current by producing a voltage drop between its terminals in accordance with Ohm's law.

$$R = \frac{V}{I} \qquad (2.1)$$

The electrical resistance is equal to the voltage drop across the resistor divided by the current through the resistor.

2.2.1 The Ideal Resistor

The SI unit of electrical resistance is the ohm (n). A component has a resistance of 1 n if a voltage of 1 volt across the component results in a current of 1 ampere, or amp, which is equivalent to a flow of one coulomb of electrical charge (approximately 6.241506x 10^{18} electrons) per second. The multiples kilo ohm (1 kn = 1000 n) and mega ohm (1 Mn = 106n) are also commonly used.

In an ideal resistor, the resistance remains constant regardless of the applied voltage or current through the device or the rate of change of the current. Whereas real resistors cannot attain this goal, they are designed to present little variation in electrical resistance when subjected to these changes, or to changing temperature and other environmental factors.

2.2.2 Nonideal Characteristics

A resistor has a maximum working voltage and current above which the resistance may change (drastically, in some cases) or the resistor may be physically damaged (overheat or bum up, for instance). Although some resistors have specified voltage and current ratings, most are rated with a maximum power which is determined by the physical size. Common power ratings for carbon composition and metal-film resistors are 1/8 watt, 1/4 watt, and 1/2 watt. Metal-film and carbon film resistors are more stable than carbon resistors against temperature changes and age. Larger resistors are able to dissipate more heat because of their larger surface area. Wire-wound and resistors embedded in sand (ceramic) are used when a high power rating is required.

Furthermore, all real resistors also introduce some inductance and a small amount of capacitance, which change the dynamic behavior of the resistor from the ideal.

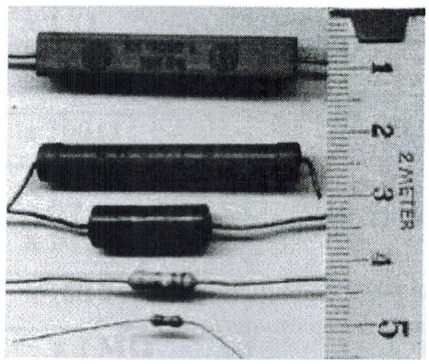


Figure 2.1 For resistor

2.2.3 Identifying resistors

Most axial resistors use a pattern of colored stripes to indicate resistance. SMT ones follow a numerical pattern. Cases are usually brown, blue, or green, though other colors are occasionally found like dark red or dark gray see the table (2.1).

One can use a multimeter to test the values of a resistor.

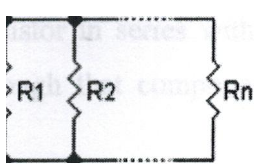
Table 2.1 Resistor Color Code

COLOR	DIGIT	MULTIPLIER	TOLERANCE	TC
Silver		x 0.01 n	±10%	
Gold		xO.1 n	±5%	
Black	0	x 1 n		
Brown	1	x 100	±1%	±100*10-o/K
Red	2	x 100n	±2%	±50*10-0/K
Orange	3	xlkn		±15*10-6/K
Yellow	4	x 10 kQ		±25*10-6/K
Green	5	x 100 kQ	±0.5%	
Blue	6	x I Mn	±0.25%	±10*10-6/K
Violet	7	x 10Mn	±0.1%	±5*10--=0lK
Grey	8	x 100 MO		
White	9	x 1 on		±1*10--=0lK

2.2.4 Resistor Connection

2.2.4.1 Series and parallel circuits

Resistors in a parallel configuration each have the same potential difference (voltage). To find their total equivalent resistance (*Req*):



4. An attenuator is a network of two or more resistors (a voltage divider) used to reduce the voltage of a signal.

5. A line terminator is a resistor at the end of a transmission line or daisy chain bus (such as in SCSI), designed to match impedance and hence minimize reflections of the signal.

6. All resistors dissipate heat. This is the principle behind electric heaters.

2.2.5 Composite resistor

Usually some medium power resistors are built in this way. Has low inductance, large capacitance, poor temperature stability, noisy and not very good long time stability. Composite resistor can handle well short overload surges.

2.3 Capacitor

A capacitor is an electrical device that can store energy in the electric field between a pair of closely spaced conductors (called 'plates'). When voltage is applied to the capacitor, electric charges of equal magnitude, but opposite polarity, build up on each plate.

Capacitors are used in electrical circuits as energy-storage devices. They can also be used to differentiate between high-frequency and low-frequency signals and this makes them useful in electronic filters.

2.3.1 Capacitance in a capacitor

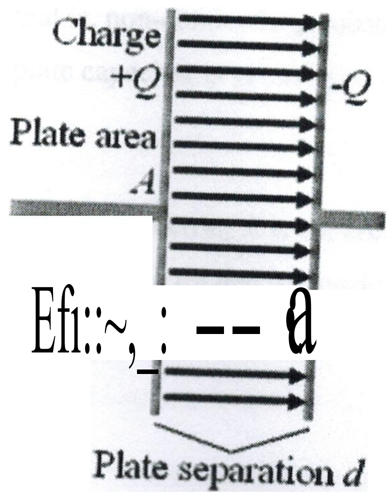


Figure 2.2 Inside the Capacitor

When electric charge accumulates on the plates, an electric field is created in the region between the plates that is proportional to the amount of accumulated charge. This electric field creates a potential difference V = Esd between the plates of this simple parallel-plate capacitor, as shown in the figure (2.20.

The capacitor's capacitance (C) is a measure of the amount of charge (Q) stored on each plate for a given potential difference or voltage (V) which appears between the plates:

$$C=\frac{Q}{V} \tag{2.5}$$

In SI units, a capacitor has a capacitance of one farad when one coulomb of charge causes a potential difference of one volt across the plates. Since the farad is a very large unit, values of capacitors are usually expressed in microfarads (μF), nanofarads (nF), or picofarads (pF).

The capacitance is proportional to the surface area of the conducting plate and inversely proportional to the distance between the plates. It is also proportional to the permittivity of the dielectric (that is, non-conducting) substance that separates the plates. The capacitance of a parallel-plate capacitor is given by:

$$C = \frac{\varepsilon A}{d};\ A >> d^2$$

Where ε is the permittivity of the dielectric, A is the area of the plates and d is the spacing between them. In the diagram, the rotated molecules create an opposing electric field that partially cancels the field created by the plates, a process called dielectric polarization.

2.3.2 Stored energy

As opposite charges accumulate on the plates of a capacitor due to the separation of charge, a voltage develops across the capacitor owing to the electric field of these charges. Ever-increasing work must be done against this ever-increasing electric field as more charge is separated. The energy (measured in joules, in SI) stored in a capacitor is equal to the amount of work required to establish the voltage across the capacitor, and therefore the electric field. The energy stored is given by:

$$E_{stored} = \frac{1}{2}CV^2 = \frac{1}{2}\frac{Q^2}{C} = \frac{1}{2}VQ \qquad (2.7)$$

where V is the voltage across the capacitor.

The maximum energy that can be (safely) stored in a particular capacitor is limited by the maximum electric field that the dielectric can withstand before it breaks down. Therefore, all capacitors made with the same dielectric have about the same maximum energy density (joules of energy per cubic meter).

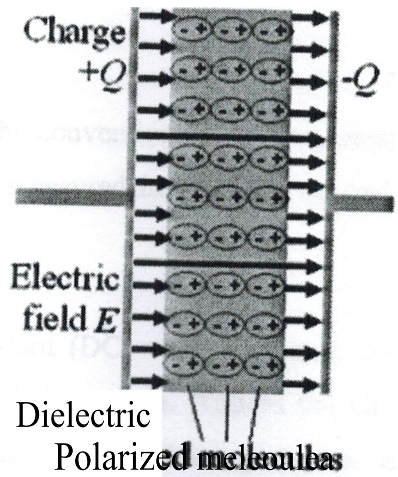


Figure 2.3 Capacitor in electric circuit

The electrons within dielectric molecules are influenced by the electric field, causing the molecules to rotate slightly from their equilibrium positions. The air gap is shown for clarity; in a real capacitor, the dielectric is in direct contact with the plates. Capacitors also allow AC current to flow and blocks DC current.

2.3.3 Circuits with DC sources

Electrons cannot easily pass directly across the dielectric from one plate of the capacitor to the other as the dielectric is carefully chosen so that it is a good insulator. When there is a current through a capacitor, electrons accumulate on one plate and electrons are removed from the other plate. This process is commonly called 'charging' the capacitor even though the capacitor is at all times electrically neutral. In fact, the current through the capacitor results in the separation of electric.charge, rather than the accumulation of electric charge. This separation of charge causes an electric field to develop between the plates of the capacitor giving rise to voltage across the plates. This voltage V is directly proportional to the amount of charge separated Q. Since the current I through the capacitor is the rate at which charge Q is forced through the capacitor (dQ/dt), this can be expressed mathematically as:

$$I = \frac{dQ}{dt} = C\frac{dV}{dt}$$

Where:

I is the current flowing in the conventional direction, measured in amperes, dV/dt is the time derivative of voltage, measured in volts per second, and C is the capacitance in farads.

For circuits with a constant (DC) voltage source, the voltage across the capacitor cannot exceed the voltage of the source. (Unless the circuit includes a switch and an inductor, as in SMPS, or a switch and some diodes, as in a charge pump). Thus, equilibrium is reached where the voltage across the capacitor is constant and the current through the capacitor is zero. For this reason, it is commonly said that capacitors block DC current.

2.3.4 Circuits with AC sources

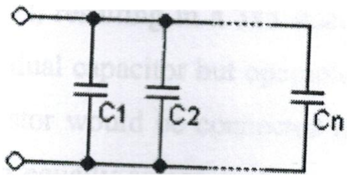
The capacitor current due to an AC voltage or current source reverses direction periodically. That is, the AC current alternately charges the plates in one direction and then the other. With the exception of the instant that the current changes direction, the capacitor current is non-zero at all times during a cycle. For this reason, it is commonly said that capacitors 'pass' AC current. However, at no time do electrons actually cross between the plates, unless the dielectric breaks down or becomes excessively 'leaky'. In this case it would probably overheat, malfunction, bum out, or even fail catastrophically possibly leading to an explosion.

Since the voltage across a capacitor is proportional to the integral of the current, as shown above, with sine waves in AC or signal circuits this results in a phase difference of 90 degrees, the current leading the voltage phase angle. It can be shown that the AC voltage across the capacitor is in quadrature with the AC current through the capacitor. That is, the voltage and current are 'out-of-phase' by a quarter cycles. The amplitude of the voltage depends on the amplitude of the current divided by the product of the frequency of the current with the capacitance, C.

2.3.5 Capacitor networks

2.3.5.1 Series or parallel arrangements

Capacitors in a parallel configuration each have the same potential difference (voltage). Their total capacitance (Ceq) is given by:

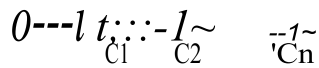


$$C_{eq} = C_1 + C_2 + ... + C_n \tag{2.9}$$

The reason for putting capacitors in parallel is to increase the total amount of charge stored. In other words, increasing the capacitance also increases the amount of energy that can be stored. Its expression is:

$$E_{\text{stored}} = \frac{1}{2}CV^2.$$

The current through capacitors in series stays the same, but the voltage across each capacitor can be different. The sum of the potential differences (voltage) is equal to the total voltage. Their total capacitance is given by:



$$\frac{1}{C_{eq}} = \frac{1}{C_1} + \frac{1}{C_2} + \dots + \frac{1}{C_n} \tag{2.10}$$

In parallel the effective area of the combined capacitor has increased, increasing the overall capacitance. While in series, the distance between the plates has effectively been increased, reducing the overall capacitance.

In practice capacitors will be placed in series as a means of economically obtaining very high voltage capacitors, for example for smoothing ripples in a high voltage power supply. Three "600 volt maximum" capacitors in series will increase their overall working voltage to 1800 volts. This is of course offset by the capacitance obtained being only one third of the value of the capacitors used. This can be countered by connecting 3 of these series set-ups in parallel, resulting in a 3x3 matrix of capacitors with the same overall capacitance as an individual capacitor but operable under three times the voltage. In this application, a large resistor would be connected across each capacitor to ensure that the total voltage is divided equally across each capacitor and also to discharge the capacitors for safety when the equipment is not in use.

Another application is for use of polarized capacitors in alternating current circuits; the capacitors are connected in series, in reverse polarity, so that at any given time one of the capacitors is not conducting.

2.4 Diodes

Diodes are non-linear circuit elements. It is made of two different types of semiconductors right next to each other. Qualitatively we can just think of an ideal diode has having two regions: a conduction region of zero resistance and an infinite resistance non-conduction region. For many circuit applications, the behavior of a (junction) diode depends on its polarity in the circuit. If the diode is reverse biased (positive potential on N-type material) the current through the diode is very small. The following figure is shown the characteristic of diode.

Figure 2.4 Diode

2.4.1 Forward Biased P-N Junction

You can obtain from the figure (2.5) that, forward biasing the p-n junction drives holes to the junction from the p-type material and electrons to the junction from the n-type material. At the junction the electrons and holes combine so that a continuous current can be maintained.

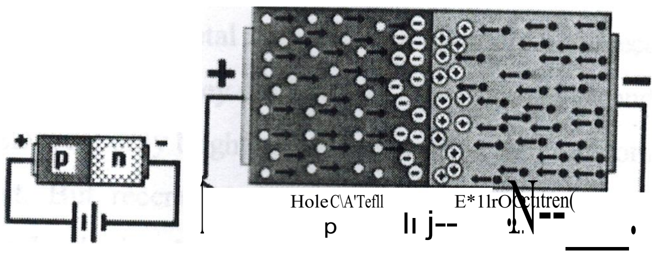


Figure 2.5 Forward Biased P-N Junction.

2.4.2 Reverse Biased P-N Junction

The application of a reverse voltage to the p-n junction will cause a transient current to flow as both electrons and holes are pulled away from the junction. When the potential formed by the widened depletion layer equals the applied voltage, the current will cease except for the small thermal current see figure (2.6).

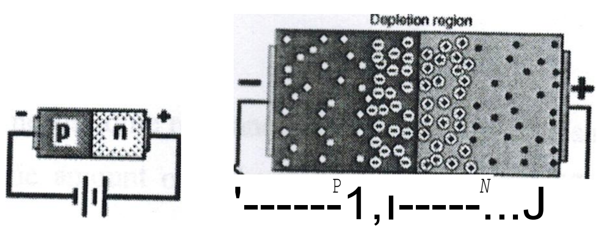


Figure 2.6 Reverse Biased P-N Junction

'ıuaımo PBXa Silfl U!BlqO Ol popoou S! JOlS!S::lJ JO ::ınft?A ::ım~ds V 'l~H lSOW aql oonpord InM 03:ı aql q::>!qM lB ıuaımo ::ıqı OSfB PUB 'l! 2u!2BWBp ınoql!M 03:ı ::ıqı ~noıql SSBd UB::> ıaqı ıuaımo ısouı aqı S! S~l 'U::lA!2 Afft?nsn S! 8UHBJ "ıuaımo pmMJOJ WilW!XBW" B 'SQt{ı IOJ SUO!lB::>!J!::>::ıds ::ıql 8uowy ·a:,UBlS!SaJ JO lUnOWB ::>!J!::>::ıds AfaA B poau aM AIIBnPV 'l!n::>ıp ıroqs B l,US! H ıaqı os 'l! il! eoueıstsor ouıos spoou l!OJJ!::> 03:ı UB os

'03:ı lilOA unu AfqBqoıd prnoM noA 'pnq S,lBql ·nn::ııp ıroqs B ::lABq n,no,{ 'AfapBq B Ol 03:ı UB ıoouuoo ısn]' no,{ J! lBql SUBaw s~ı '::l::>UBlS!S::lJ ON 8ll!ABq SB waıp JO)JU~l oı lS;}!SB;} s,n lns: ·waqı ~noıqı sassed ıuaırno qonuı Moq uo 2ti!PU;}d::)p a8UBq::> a::>UBlS!saı l!aql S! q::ı!qM 'a::>UBlS!SaJ ::>!WBUAp B aABq SQt{ı 'soop JOlS!SaJ B a)f!f a::>UBlS!SaJ aABq lOU Op SQt{ı

'ıuaırno pUB ';}::>UBlS!SaJ 'a8BlfOA JO stdoouoo aqı PUB 'MB£ s,wqo ql!M mn!WBJ aq oı sdraq H 'sımorto 03:ı pjmq Ol

SJfDJ.1!.:) 0::t['J J,'J,'Z

'UOHB::>!fddn AUB lSOWfB U! sqjnq ıua::ısapUB::>u! a::>Bfdaı UB::> 03:ı uıapow ·sa!8orouq::ıal 8u!l~H fBUO!l!PBJl fl?A!J Ol ~noua lq8µq 03:ı opauı aABq sa::>UBApB ıuooaı ıns: ·luawdrnba omonoop 10 sprsoqqsnp uo SJOlB::>!PU! SB posn aq Ol q2nOU;} ı~µq AfUO aıaM 03:ı 08B 8uor lON ·sqrnq ıtrcosapımom ıraqı ıua!::>YJ::) arouı mJ am ,{aqı 'lBaq B!A ıou pUB Afpaırp suoıoqd oonpord 03:ı asnB::>ag 'ıoq al!qM SH jnun lUaWBıy [8l;}W B 8U!lBaq ,{q l~!{ oonpord sqjnq l~H fBWJON 'ıonpordxq B SB suoıoqd sırma l! 'aaı: aqı q8noıql sassed ıuaırno uaııM

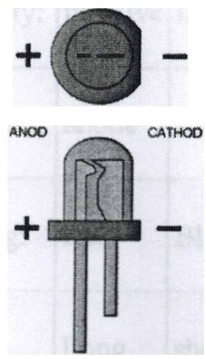
·aaı:JO roqw,{s aqı UMoqs lBql (l'Z) am8y aas 'opuıru pun 'tunrpın 'opnrosm 'wnnf88 SB qons 'uoorps aqı oı poppa am lBqı sotıtrndun fB::>!Waq:, JO SlUOOWB ffl?WS aqı am l~!f JJO aA!2 03:ı UB S;})fBW lBIJM 'uooıps JO mo opauı S! 03:ı 'saporp ıaqw pUB 'sıolS!SUBJl a)fq ·sa::>!Aap ıopnpuo::>!W;}S am 03:ı

(a:ı1:)3PO!O~Il!»JUl:IJq~n£'1:"Z

There is one more complication. LEDs consume a certain voltage. This is known as the "forward voltage drop", and is usually given with the specs for that LED. This must be taken into account when calculating the correct value of resistor to use.

So to drive an LED using a voltage source and a resistor in series with the LED, use the following equation to determine the needed resistance:

Ohm's = (Source Voltage - LED Voltage Drop) / Amps.



+~-

Figure 2.7 Symbols of LEDs

Like incandescent light bulbs, which light up regardless of the electrical polarity, LEDs will only light with positive electrical polarity. When the voltage across the p-n junction is in the correct direction, a significant current flows and the device is said to be forward-biased. If the voltage is of the wrong polarity, the device is said to be reverse biased, very little current flows, and no light is emitted. LEDs can be operated on an Alternating current voltage, but they will only light with positive voltage, causing the LED to tum on and off at the frequency of the AC supply.

Table (2.2) LEDs Polarity

sign:	+	-
polarity:	positive	negative
terminal:	anode	Cathode
wiring:	Red	Black
leads:	Long	short

2.4.5 How The LEDs Operate

Because the voltage versus current characteristics of an LED are much like any diode (that is approximately exponential), a small voltage change results in a huge change in current. Added to deviations in the process this means that a voltage source may barely make one LED light while taking another of the same type beyond its maximum ratings and potentially destroying it.

Since the voltage is logarithmically related to the current it can be considered to remain largely constant over the LEDs operating range. Thus the power can be considered to be almost proportional to the current. To try and keep power close to constant across variations in supply and LED characteristics the power supply should be a current source. If high efficiency is not required (e.g. in most indicator applications), an approximation to a current source made by connecting the LED in series with a current limiting resistor to a voltage source is generally used.

Most LEDs have low reverse breakdown voltage ratings, so they will also be damaged by an applied reverse voltage of more than a few volts. Since some manufacturers don't follow the indicator standards above, if possible the data sheet should be consulted before hooking up an LED, or the LED may be tested in series with a resistor on a sufficiently low voltage supply to avoid the reverse breakdown. If it is desired to drive an LED direct from an AC supply of more than the reverse breakdown voltage then it may be protected by placing a diode (or another LED) in inverse parallel.

LEDs can be purchased with built in series resistors. These can save PCB space and are especially useful when building prototypes or populating a PCB in a way other than its designers intended. However the resistor value is set at the time of manufacture, removing one of the key methods of setting the LEDs intensity. To increase efficiency (or to allow intensity control without the complexity of a DAC), the power may be applied periodically or intermittently; so long as the flicker rate is greater than the human flicker fusion threshold, the LED will appear to be continuously lit.

Provided there is sufficient voltage available, multiple LEDs can be connected in series with a single current limiting resistor. Parallel operation is generally problematic. The LEDs have to be of the same type in order to have a similar forward voltage. Even then, variations in the manufacturing process can make the odds of satisfactory operation low. For more information see Nichia Application Note.

Bicolor LED units contain two diodes, one in each direction (that is, two diodes in inverse parallel) and each a different color (typically red and green), allowing two-color operation or a range of apparent colors to be created by altering the percentage of time the voltage is in each polarity. Other LED units contain two or more diodes (of different colors) arranged in either a common anode or common cathode configuration. These can be driven to different colors without reversing the polarity. LED units may have an integrated multi vibrator circuit that makes the LED flash.

2.5 Resonator

A resonator is a device or system that exhibits resonance or resonant behavior. Many objects that use resonant effects are referred to simply as resonators. Examples of resonators are discussed in this article.

Electrical resonance occurs in an electric circuit at a particular resonant frequency when the impedance between the input and output of the circuit is at a minimum (or when the transfer function is at a maximum). Often this happens when the impedance between the input and output of the circuit is zero and when the transfer function equals one.

I used 10-MHzresonator. A ceramic vibrator and capacitors for the oscillation are combined inside.

Figure 2.8 Resonator

2.6 **Pic16F84A**

PIC is the name for the Microchip microcontroller (MCU) family, consisting of a microprocessor, I/O ports, timer(s) and other internal, integrated hardware. The main advantages of using the PIC are low external part count, a wide range of chip sizes (now from 5-pin up!) available, nice choice of compilers (assembly, C, BASIC, etc.) good wealth of example/tutorial source code and easy programming. Once bought, the PIC's program memory is empty, and needs to be programmed with code to be usable in a circuit. For the purpose, a wide range of simple programmer hardware docs and software.

Memory word is the same width as each device instruction. The data memory (RAM) contains 68 bytes. Data EEPROM is 64 bytes. There are also 13 I/O pins that are user-configured on a pin-to-pin basis. Somepins are multiplexed with other device functions.

These functions include:

- External interrupts.
- Change on PORTB interrupts.
- TimerO clock input.

2.6.1 Memory Organization

There are two memory blocks in the PIC16F84A.These are the program memory and the data memory. Each block has its own bus, so that access to each block can occur during the same oscillator cycle. The data memory can further be broken down into the general purpose RAM and the Special Function Registers (SFRs). The operations of the SFRs that control the "core" are described here. The SFRs used to control the peripheral modules are described in the section discussing each individual peripheral module.

The data memory area also contains the data EPROM memory. This memory is not directly mapped into the data memory, but is indirectly mapped. That is, an indirect address pointer specifies the address of the data EEPROM memory to read/write. The 64 bytes of data EEPROM memory have the address range Oh-3Fh.

2.6.2 Program Memory Organization

The PIC 16FXX has a 13-bit program counter capable of addressing an SK x 14 program memory space. For the PIC16F84A, the first lK x 14 (OOOOh-03FFh) are physically implemented (Figure 2-1). Accessing a location above the physically implemented address will cause a wraparound. For example, for locations 20h, 420h, 820h, C20h, 1020h, 1420h, 1820h, and 1C20h, the instruction will be the same. The RESET vector is at 0000h and the interrupt vector is at 0004h.

2.6.3 Data Memory Organization

The data memory is partitioned into two areas. The first is the Special Function Registers (SFR) area, while the second is the General Purpose Registers (GPR) area. The SFRs control the operation of the device. Portions of data memory are banked. This is for both the SFR area and the GPR area. The GPR area is banked to allow greater than 116 bytes of general purpose RAM. The banked areas of the SFR are for the regist~!_~şP... control the peripheral functions. Banking requires the use of control bits for~ ank selection.

These control bits are located in the STATUS Register. Figure 2-2 shows the data memory map organization. Instructions MOVWF and MOVF can move values from the W register to any location in the register file ("F"), and vice-versa. The entire data memory can be accessed either directly using the absolute address of each register file or indirectly through the File Select Register (FSR) (Section 2.5). Indirect addressing uses the present value of the RPO bit for access into the banked areas of data memory. Data memory is partitioned into two banks which contain the general purpose registers and the special function registers. Bank 0 is selected by clearing the RPO bit (STATUS<5>). Setting the RPO bit selects Bank. Each Bank extends up to 7Fh (128 bytes). The first twelve locations of each Bank are reserved for the Special Function Registers. The remainders are General Purpose Registers, implemented as static RAM.

2.6.4 18-pin Enhanced FLASH/EEPROM 8-Bit Microcontroller

- Only 35 single word instructions to learn.
- All instructions single-cycle except for program branches which are two-cycle.
- Operating speed: DC - 20 MHz clock input DC - 200 ns instruction cycle.
- 1024 words of program memory.
- 68 bytes of data RAM.
- 64 bytes of data EEPROM.
- 14-bit wide instruction words.
- 8-bit wide data bytes.
- 15 Special Function Hardware registers.
- Eight-level deep hardware stack.
- Direct, indirect and relative addressing modes.

2.6.5 DC/AC Characteristic of Pic16F84A

The graphs provided in this section are for design guidance and are not tested. In some graphs, the data presented are outside specified operating range (i.e., outside specified VDD range). This is for information only and devices are ensured to operate properly only within the specified range. The data presented in this section is a statistical summary of data collected on units from different lots over a period of time and matrix samples. 'Typical' represents the mean of the distribution at 25°C. 'Max' or 'Min' represents (mean+ 3s) or (mean - 3s), respectively, where sis a standard deviation over the whole temperature range.

2.6.6 FLASH/EEPROM Technology:

• Low power, high speed technology.

• Fully static design.

• Wide operating voltage range:

- Commercial: 2.0V to 5.5V.
- Industrial: 2.0V to 5.5V.

• Low power consumption:

- < I mA typical at 5V, 4 Mllz,
- 15 mA typical at 2V, 32 kHz.
- < 0.5 mA typical standby current at 2V.

2.7 IC 78L05

This chip is the easy way to make a 5 Volt stabilized power supply. This is a generic component, which means that the component you buy can be from any manufacturer that produces this component. There can be small variations is the exact specifications.

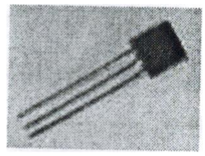


Figure 2.9 IC 78L05

This is the smaller and cheaper version of the 7805, for up to 100 mA.

Table 2.3 Description for IC78L05

Code	IC-78L05-T092
Description	5V regulator, 100 mA

CHAPTER3

MANNER OF HARDWARE

3.1 Overview

This chapter will show information about LED flasher, and modifications made to it. Also it will include the components of this project. We will some explanation of most important ones, in addition to some applications of this kind of alarms in general.

3.2 Components of project (LED flasher)

In chapter two we were explained the component which we use it in this project and we explained it in general, But In this section we will explain it's by its value and the type of each component which is used.

- Rl-R5 lOKO
- R6-R13 5600
- rcl PIC16F84A
- IC2 78L05
- RESONATOR 10MHz
- Cl 100 μF
- C2 O.IF
- C3 O.IF
- DIODE Light Emitting Diode (LED)
- SWITHE ON/OFF Bottom

3.3 LED flasher circuit

In this part we will show the circuit and description of the most important component of circuit LED flasher which is shown in the figure (3 .1) .

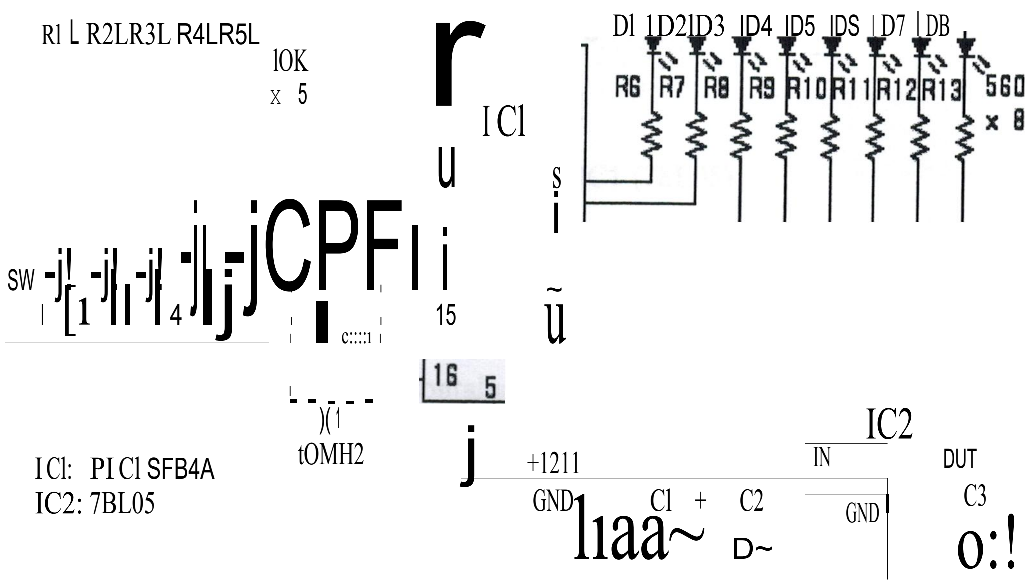


Figure 3.1 Circuit of LED flasher

The circuit shown above has four important components the first of them is the IC2 (78L05) which is the device of the circuit that reduce the input voltage, the second is the switch which is work as a controller to control the IC2, the third device is IC2 (PIC19F84A) it work as the program which is found in it, and the LEDs it is the output of circuit it is connect to the IC2 and it is operate as the program which is in the IC2.

3.3.1 IC2 (78L05)

This chip is the easy way to make a 5 Volt stabilized power supply see figure (3.2). This is a generic component, which means that the component you buy can be from any manufacturer that produces this component. There can be small variations is the exact specifications. This is the smaller and cheaper version of the 7805, and the maximum output of current is 100 mA.

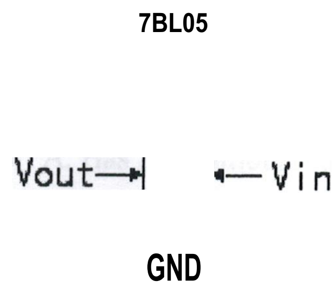


Figure 3.2 Diagram of IC1 (78L05)

3.3.2 Pic16F84A

This it is possible to use clock frequency up to 20 MHz. The circuit this time, I am using 10-MHz resonator. This device contains specific information for, the operation of the PIC16F84A device. Additional Information may be found in the PICmicro. The program memory contains 1K words, which translates to 1024 instructions, since each 14-bit program.

Memory word is the same width as each device instruction. The data memory (RAM) contains 68 bytes. Data EEPROM is 64 bytes. There are also 13 1/0 pins that are user-configured on a pin-to-pin basis. Some pins are multiplexed with other device functions.

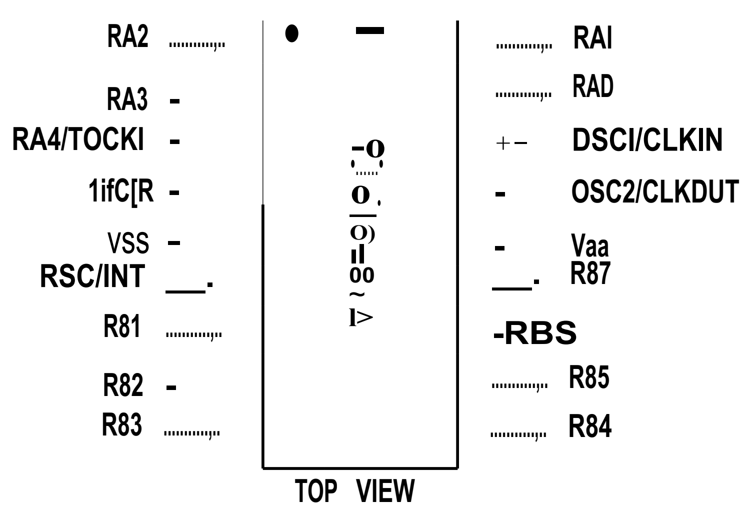


Figure 3.3 IC2 PIC16F84A

Pins on PIC16F84 microcontroller have the following meaning as on in figure (3.3):

- Pin no.1 RA2 Second pin on port A. Has no additional function
- Pin no.2 RA3 Third pin on port A. Has no additional function.
- Pin no.3 RA4 Fourth pin on port A. TOCKl which functions as a timer is also found on this pin
- Pin no.4 MCLR Reset input and Vpp programming voltage of a microcontroller
- Pin no.5 Vss Ground of power supply.
- Pin no.6 RBO Zero pin on port B. Interrupt input is an additional function.
- Pin no.7 RBl First pin on port B. No additional function.
- Pin no.8 RB2 Second pin on port B. No additional function.
- Pin no.9 RB3 Third pin on port B. No additional function.
- Pin no.10 RB4 Fourth pin on port B. No additional function.
- Pin no.11 RB5 Fifth pin on port B. No additional function.
- Pin no.12 RB6 Sixth pin on port B. 'Clock' line in program mode.
- Pin no.13 RB7 Seventh pin on port B. 'Data' line in program mode.
- Pin no.14 Vdd Positive power supply pole.
- Pin no.15 OSC2 Pin assigned for connecting with an oscillator
- Pin no.16 OSC1 Pin assigned for connecting with an oscillator
- Pin no.17 RA2 Second pin on port A. No additional function
- Pin no.18 RAl First pin on port A. No additional function.

3.3.3 Light Emitting Diode (LED)

LED are semiconductor devices. Like transistors, and other diodes, LED is made out of silicon. What makes an LED give off light are the small amounts of chemical impurities that are added to the silicon, such as gallium, arsenide, indium, and nitride.

When current passes through the LED, it emits photons as a byproduct. Normal light bulbs produce light by heating a metal filament until its white hot. Because LED produce photons directly and not via heat, this is far more efficient than incandescent bulb.

Not long ago LED were only bright enough to be used as indicators on dashboards or electronic equipment. But recent advances have made LED bright enough to rival traditional lighting technologies. Modem LED can replace incandescent bulbs in almost any application.

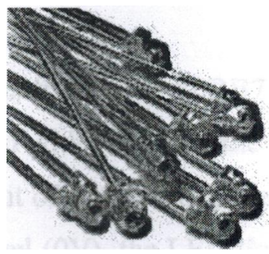


Figure 3.4 Light Emitting Diode

3.3.4 Switch

This is the switch to select the blinking pattern of LEDs. It is printed board mounting type and non lock types, the figure (3.5) show the connection of the switch in the circuit.

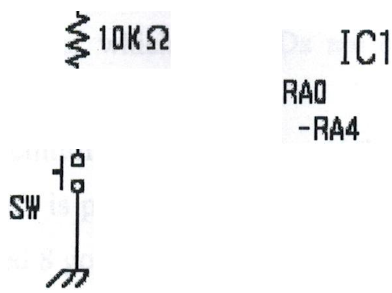


Figure 3.5 Construction the switch in the circuit

3.4 Working Principle of the Circuit

Switch -In the circuit five pins there are connecting as from RAO to RA4 are used as the input pin. These pins are pull- uped with 10K ohm resisters. So, when a switch isn't pushed, the input becomes Height level (+5V). And when a switch is pushed, it will become Low level (OV). When the switch closes, the chattering occurs. The chattering is the phenomenon which occurs with the bound of the point of contact. The opening and shutting of a point of contact is repeated in short time. When the software detects that the switch is closed once, the blink processing of LEDs are executed in the time which is longer than the chattering.

LED control circuits, eight pins from RBO to RB7 are used for the output pin. The anode side of the LED is connected with +5 V and the cathode side is controlled by PIC via the resistor. So, when the output of PIC is Height level (+5V), the LED goes out and when the output of PIC is Low level (OV), the LED lights up. We using high brightness type LED to make a current flow little.

Power supply circuit 3 terminal regulator is used to get +5V output from + 11V power in. Because it is suppressing the current of the LED to become 100 ınA. We are use resonator as Clock generator circuit.

3.5 Result

In the circuit which showings in figure (3.1) the switches and IC2 play very important alternation to control the manner which the LEDs are operating. Every switch has a manner to operate the LEDs.

There are 8 LED's (light emitting diodes) numbered from 1 to 8 and 5 switches in the circuit. When the first switch is pressed, led number 8 goes on for 100 mille seconds. Led 7 goes on the moment led 8 goes off and it stays on for 100 mille seconds as well. In short, the first switch makes each led go on, with the other leds off, for 100 mille seconds. The function of the second switch is to make each led go on for 100 mille seconds with the other leds off, the order in which the leds go on is exactly the opposite of switch 1, that is it starts from led 1 and goes all the way to led 8. When the third switch is turned on, each pair of leds go on at the same time starting from leds 1 and 8.

The pairs are arranged as follows: leds 1 and 8, 2 and 7, 3 and 6, 4 and 5. The process is reversed once we reach the last pair of leds that is (leds 4 and 5). There are 14 outpl3tS displayed one after the other when switch 4 goes on. The first output is led8 lighting alone, the second is led7. The manner in which the outputs are displayed is as follows:

- led8
- led7
- led 8 and led 6
- led 7 and led 5
- led 8, led6 and led4
- led 7, led5 and led3
- led8, led6, led4, led2
- led7, led5, led3, ledl
- led2, led4, led6
- ledl, led3, led5
- led2, led4
- ledl, led3
- led2
- ledl.

As noticed above, even and odd numbered leds are on at different times. There is no way for an odd numbered led to be on when an even numbered led is on and vice versa.

Switch 5 makes the circuit act like a typical flasher. That is all the leds go on at the same time for 1 second then they go off for another 1 second and so fourth.

The ICP16F84A is the most important element in this circuit, the program it contains is the program responsible for controlling and displaying the outputs.

CONCLOUSION

In this project we can see the development in electricty and also in the electronic devices , which we can a creat a simple curcuit that can use it in our life . This project is intended to make the topic of LEDs flasher which is sustain by the PIC and design the circuit of its understandable, there are different functions to control the manner or the way which the LEDs can flashing.

Their are a new technolgy can creat at the future that is small size of powerful light emission, extreme reliability, low energy requirement and long life span support the widely held view that LEDs are 'the technology of the future for automotive lighting.' In fact, some manufacturers go so far as to predict that the incandescent bulb is headed for extinction.

There are many application of used LEDs flasher as indictors light such restroom, ring phone, video equipment, battery charge, telephones, digital cameras, appliances, clock, electronic toys, and we also see it in car as LEDs break light

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