# GRID FAILURE PROTECTION SYSTEM

A Project Report Submitted

In Partial Fulfillment of the Requirement

for the Degree of

## BACHELOR OF TECHNOLOGY

*In*

## ELECTRICAL ENGINEERING

*Submitted By*


**BHEEMSEN BAHARTI - 18722**

**ABHINAV SAURABH MISHRA – 18702**

**AJAY KUMAR - 18704**

*Under the supervision of*

**ER. VIPIN PATEL**

*(Assistant Professor)*

**DEPARTMENT OF ELECTRICAL ENGINEERING**

**INSTITUTE OF ENGINEERING & TECHNOLOGY**

**DR. RAMMANOHAR LOHIA AVADH UNIVERSITY**

**AYODHYA (U.P)**

# UNDERTAKING

We declare that the work presented in this project titled **“Grid Failure Protection System”** submitted to the **Department of Electrical Engineering**, **Institute of Engineering and Technology, Ayodhya** for the award of the **Bachelor of Technology Degree** is my original work. We have given due credit to the original authors/sources for all the words, ideas, diagrams, graphics, computer programs, experiments and result that are not my original contribution.
We affirm that no portion of my work is plagiarized, experiments and results reported in report are not manipulated. In the event of complaint of plagiarism, manipulation of the experiments and results. We shall be fully responsible and answerable.

Signature:

| | | |
|---|---|---|
| Bheemsen Baharti | Abhinav Saurabh Mishra | Ajay Kumar |
| (18722) | (18702) | (18704) |

**Date: August 2022**
**Place: Ayodhya (U.P)**

**Department of Electrical Engineering**
**Institute of Engineering and Technology**
**Dr. RAMMANOHAR LOHIA AVADH UNIVERSITY**
**AYODHYA (U.P)- 224001**

# CERTIFICATE

This is to certify that **Bheemsen Baharti (18722), Abhinav Saurabh Mishra (18702), Ajay kumar (18704),** has carried out the project work presented in this report entitled **"Grid Failure Protection System"** for the award of degree of **Bachelor of Technology** in **Electrical Engineering** (Session 2018-2022) from **Institute of Engineering and Technology, Dr. Rammanohar Lohia Avadh University, Ayodhya** under our supervision. The report embodies result of original work and studies are carried out by student himself. The work is the result of candidate's own efforts and has not been submitted elsewhere for the award of any other degree.

**SUPERVISOR**

**Er. Vipin Patel**

**(Assistant Professor)**

**<u>APPROVAL FOR SUBMISSION</u>**

| | | |
|---|---|---|
| **Signature** | **Signature** | **Signature** |
| **Er. Vipin Patel** | **Dr. Ankit Shrivastava** | **of** |
| (Assistant Professor) | (Assistant Professor & HOD) | **External Examiner** |
| Department of Electrical Engineering | Department of Electrical Engineering | |

**Date: August 2022**

**Place: Ayodhya (U.P)**

## ACKNOWLEDGEMENT

On submission of our project entitled **"Grid Failure Protection System"** we would like to extend my gratitude and sincere thanks to our parents for their continuous support and encouragement.

We would like to thank our supervisor **Er. Vipin Patel (Assistant Professor)**, Department of Electrical Engineering for their constant motivation and guidance during the course of our work. we truly appreciate and value their esteemed guidance and encouragement from the beginning to the end. Their knowledge and company at the time of crisis would be remembered lifelong.

We are very thankful to **Dr. Ankit Srivastava (Assistant Professor & HOD)** Electrical Engineering for providing us much needed facility and support.

We would like to express special thanks to **Prof. Ramapati Mishra (Director, IET Dr. RLAU, Ayodhya)** for providing such innovative environment.

We would like to thank to all technical and office staff for their cooperation and support. At last but not least, Acknowledge our friends for their contribution in the completion of the work.

**BHEEMSEN BAHARTI (18722)**

**ABHINAV SAURABH MISHRA (18702)**

**AJAY KUMAR (18704)**

# ABSTRACT

This project involves the concept of an grid failure system. The grid failure functioning is controlled by the micro-controller. When the first voltage fails to come, the first voltage output are off and again second voltage are off then second output voltage off. However, if the Mains voltage is coming as desired, the temperature takes place. The microcontroller itself when temperature increases then automatically voltage off.

Earlier, frequency was generated in an analog way, using temperature sensing device, this caused unstablity in thermal generation. However, thermal generation using micro- controller is very reliable.

Grid failure system automatically turn off when temperature increases 45&55. This could be used to substation power system. Since this time I have been amazed at the uses a grid failure system can have. Here are just a few of the uses I have found for substation power system.

# CONTENT

# LIST OF FIGURES

# CHAPTER-1

## INTRODUCTION

We know that in today’s time there is a big problem regarding failure of our grid(power distribution system) when a grid fails the electricity of the whole area get disconnected for days so it is a big problem to be solved that how to protect our grid before failure. Keeping this point in our mind we are trying to develop a system which can turn our grid of when dangerous condition occurs.

Sensing these two conditions we regulate all our decisions suppose if the transformer temperature is less than a particular level then a indication is provided and even if temperature exceeds a particular level then also a indication is provided if the problem is not resolved then condition keeps on going down so the power supply from the grid disconnected and let the grid getting cooled when normal temperature is attained then grid again starts functioning. And if grid voltage is increased above a particular level then that phase of grid will be cut off. If phase voltage of grid is decreased below a particular level then that phase of grid will be cut off. If phase voltage of grid limits then that phase of grid will be on.

PLATFORM

## **1.1 Hardware requirements**:

**1)** Atmega328 microcontroller
**2)** Power Supply(9v dc adaptor)
**3)** Resistors
**4)** Capacitors
**5)** Transistors
**6)** LEDS
**7)** Connectors(wire)
**8)** Relays
**9)** Liquid crystal display
**10)**Temperature sensor
**11)**Socket
**12)**Plug pin
**13)**Holder

## **1.2 Software requirements**

- **INFONICS*:***

  Serial Programmer Software Hex file editor

- **MPLAB IDE v7.00*:***

  Source code EditionAssembler

## **1.3 Aim of the project**

This system is Atmega328p micro controller based project as PIC has in built ADC, analog to digital converter so this ADC conversion is the basic principle of our project.

Since this project involves measuring the voltage and temperature and monitoring the level of coolant and taking the required decisions according to that.

Our main aim is to protect the grid from failure so keeping this in mind we have designed our project.

Also we are using buzzer for alarming the hazardous condition and relay works as an electrical switch so we make the transformer on or off by usingrelay as a switch.

And relay is further made on or off by using the transformer as a switch weare using in our circuit diagram NPN transistor.

The property of NPN transistor is when base is high then collector andemitter short and transistor gets on

And if base is low then collector and emitter get open and transistor gets off.

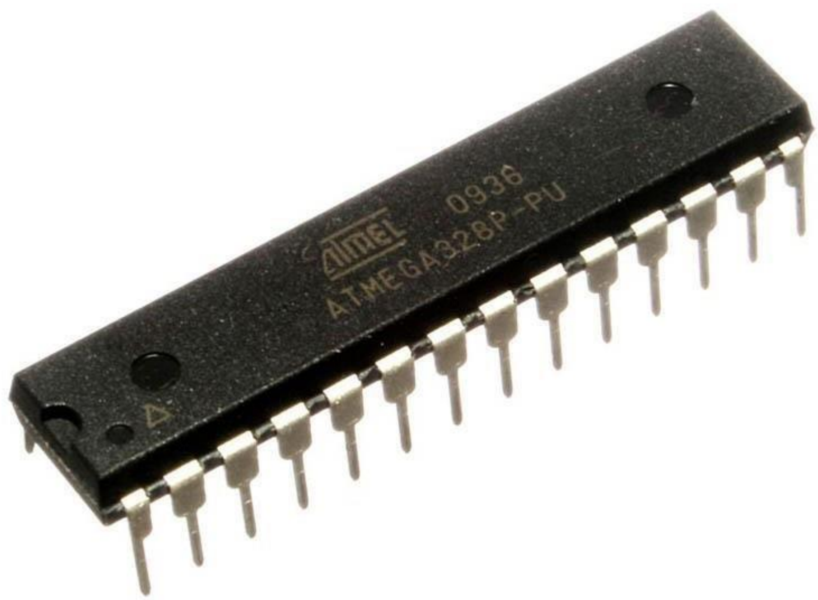



Fig 1.1 ATMEGA 328 Microcontroller

## 1.4 POWER SUPPLY SECTION

**Consists of:**

**(a)RLMT Connector:** It is a connector used to connect the Stepdown transformer to the bridge rectifier.

**(b)Bridge Rectifier:** It is a full wave rectifier used to convert ac into dc 9-15v ac made by transformer is converted into dc with the help of rectifier.

**(c)Capacitor:** It is an electrolytic capacitor of rating 1000M/35V used for filtering to give the peak dc.Capacitor is the component used to pass the ac and block the dc.It is again an electrolytic capacitor 10M/65v used for filteringto give pure dc.It is an ceramic capacitor used to remove the spikes generated when frequency is high so
the output of supply section is 5v regulated dc.

**(d)Regulator:** LM7805 is used to give a fixed 5v regulated supply.

# CHAPTER-2

# MICROCONTROLLER

## 2.1MICROCONTROLLER SECTION

Requires three connections to be successfully done for it's operation to begin.

**(a)9v supply:** This 9v supply is required for the controller to get start which is provided from the power supply section. This supply is provided.

**(b)Crystal Oscillator:** A crystal oscillator of 4 Mz. The crystal oscillator works on piezoelectric effect The clock generated is used to determine the processing speed of the controller. Two capacitors are also connected one end with the oscillatorwhile the other end is connected with the ground. As it is recommended in the book to connect two ceramic capacitorof 20 pf—40pf to stabilize the clock generated.

**(c)Reset section**:It consists of an rc network consisting of.1M/35V capacitor and one resistance of 1k. This section is used to reset the controller connection

## 2.1 LCD (LIQUID CRYSTAL DISPLAY)

1. MICROCONTROLLER BASED LCD DISPLAY ,this project is an embedded project . Embedded is the combination of software and hardware before designing any embedded project it is the first step to design the proper hardware for the desired application. Here we are interfacing the LCD, LIQUID CRYSTAL DISPLAY with the Microcontroller, we are using ATMEL series 51 controller 89c51 controller. It is a 40 pin IC, the first step while designing hardware is to design the required power supply as the controller operates on +5 v supply so first we have to design the regulated supply with the help of transformer, regulator and filtering capacitor.
2. Next step is the necessary connections of the controller like reset and thecrystal oscillator for resetting and speed respectively.

3. Then comes the LCD interfacing ,we are using 16x2 LCD for display, pin no. 7 to 14 are the data lines of the LCD which has to be interfaced with the microcontroller input/output pins. Port p0 has been used for the interfacingof data lines.

4. Since the display becomes very easy when we use microcontroller hence wehave made this project and we have tried to show different display used

Fig 2.1 microcontroller

**Controller board**: A special type of expansion board that contains a controller for a peripheral device. When you attach new devices, such as a disk drive or graphics monitor, to a computer, you often need to add a controller.

## 2.2 Manufacturing

### (a)Patterning

The vast majority of printed circuit boards are made by adhering a layer of copper over the entire substrate, sometimes on both sides, (creating a "blank PCB") then removing unwanted copper after applying a temporary mask (eg. by etching***),***

leaving only the desired copper traces. A few PCBs are made by *adding* traces to the bare substrate (or a substrate with a very thin layer of copper) usually by a complex process of multiple electroplating steps.
There are three common "subtractive" methods (methods that remove copper) used for the production of printed circuit boards:

1. **Silk screen printing** uses etch-resistant inks to protect the copper foil. Subsequent etching removes the unwanted copper. Alternatively, the ink may be conductive, printed on a blank (non-conductive) board. The latter technique is also used in the manufacture of hybrid circuits.
2. **Photoengraving** uses a photomask and chemical etching to remove the copper foil from the substrate. The photomask is usually prepared with a photoplotter from data produced by a technician using CAM, or computer-aided manufacturing software. Laser-printed transparencies are typically employed for photo tools; however, direct laser imaging techniques are being employed to replace photo tools for high-resolution requirements.

### (b) Steps involved in making PCB

1.Prepare the layout of the circuit (positive).

2.Cut the photo film (slightly bigger) of the size of the layout.

3.Place the layout in the photo printer machine with the photo film above it. Make sure that the bromide (dark) side of the film is in contact with the layout.

4.Switch on the machine by pressing the push button for 5 sec.

5.Dip the film in the solution prepared (developer) by mixing the chemicals A & B in equal quantities in water.

6.Now clean the film by placing it in the tray containing water for 1 min.

7.After this, dip the film in the fixer solution for 1 min. now the negative of the circuit is ready.

7. Now wash it under the flowing water.

8. Dry the negative in the photo cure machine.

9. Take the PCB board of the size of the layout and clean it with steel wool to make the surface smooth.
10. Now dip the PCB in the liquid photoresist, with the help of dip coatmachine.
11. Now clip the PCB next to the negative in the photo cure machine, dryingfor approximate 10-12 minute.
12. Now place the negative on the top of the PCB in the UV machine, set thetimer for about 2.5 minute and switch on the UV light at the top.
13. Take the LPR developer in a container and rigorously move the PCB init.
14. After this, wash it with water very gently.
15. Then apply LPR dye on it with the help of a dropper so that it iscompletely covered by it.
16. Now clamp the PCB in the etching machine that contains ferric chloridesolution for about 10 minutes.
17. After etching, wash the PCB with water, wipe it a dry cloth softly.
18. Finally rub the PCB with a steel wool, and the PCB is ready.

# CHAPTER-3

## SOFTWARE SPECIFICATION

### 3.1 Prog-Studio 6 software v6.09

A side from basic functions such as the reading, programming, comparison copying and erasure of chips in the Batronix programming devices, the Prog-Studio 6 software offers numerous other functions. The Hex/ASCII editor gives you many options for working with the component contents, and the MC editor integrates a comprehensive compiler/assembler/debugger for developers of microcontroller applications.

### 3.2 Areas of use

- Updating of memory chips (Eproms/Flash) for motherboards, telephone installations, game consoles, motor control systems, automatons, etc.
- Reading in and altering data on existing memory chips for, e.g., chip tuning
- Development and production of applications with memory chips
- Development of microcontroller applications
- Learning microcontroller programming

### 3.3 Capacitor

A **capacitor** or **condenser** is a passive electronic component consisting of apair of conductors separated by a dielectric (insulator).

When a potential difference (voltage) exists across the conductors, an electric field is present in the dielectric. This field stores energy and produces a mechanical force between the conductors. The effect is greatest when there is a narrow separation between large areas of conductor, hence capacitor conductors are often called plates.

An ideal capacitor is characterized by a single constant value, capacitance, which is measured in farads. This is the ratio of the electric charge on each conductor to the potential difference between them. In practice, the dielectric between the plates passes a small amount of leakage current. The conductors and leads introduce an equivalent series resistance and the dielectric has an electric field strength limit resulting in a breakdown voltage

Capacitors are widely used in electronic circuits to block the flow of direct current while allowing alternating current to pass, to filter out interference, to smooth the output of power supplies, and for many other purposes. They are used in resonant circuits in radio frequency equipment to select particular frequencies from a signal with many frequencies.

Fig 3.1 Capacitors

**Theory of operation**

4

Main article: Capacitance

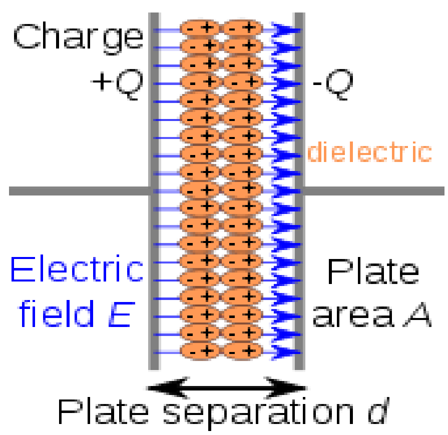



Fig 3.2 Parallel plate capacitor

Charge separation in a parallel-plate capacitor causes an internal electric field. A dielectric (orange) reduces the field and increaseas.

A capacitor consists of two conductors separated by a non-conductive region The non-conductive substance is called the dielectric medium, although this may also mean a vacuum or a semiconductor depletion region chemically identical to the conductors. A capacitor is assumed to be self-contained and isolated, with no net electric charge and no influence from an external electric field. The conductors thus contain equal and opposite charges on their facing surfaces, and the dielectric contains an electric field. The capacitor is a reasonably general model for electric fields within electric circuits.

An ideal capacitor is wholly characterized by a constant capacitance *C*, defined as the ratio of charge ±*Q* on each conductor to the voltage *V* between them

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

Sometimes charge buildup affects the mechanics of the capacitor, causing the capacitance to vary. In this case, capacitance is defined in terms of incremental changes:

$$C = \frac{\mathrm{d}q}{\mathrm{d}v}$$

In SI units, a capacitance of one farad means that one coulomb of charge on each conductor causes a voltage of one volt across the device.

## 3.4 Energy storage

Work must be done by an external influence to move charge between the conductors in a capacitor. When the external influence is removed, the charge separation persists and energy is stored in the electric field. If charge is later allowed to return to its equilibrium position, the energy is released. The work done in establishing the electric field, and hence the amount of energy stored, is given by:

$$W = \int_{q=0}^{Q} V \mathrm{d}q = \int_{q=0}^{Q} \frac{q}{C} \mathrm{d}q = \frac{1}{2} \frac{Q^2}{C} = \frac{1}{2} C V^2 = \frac{1}{2} V Q.$$

The current $i(t)$ through a component in an electric circuit is defined as the rate of change of the charge $q(t)$ that has passed through it. Physical charges cannot pass through the dielectric layer of a capacitor, but rather build up in equal and opposite quantities on the electrodes: as each electron accumulates on the negative plate, one leaves the positive plate. Thus the accumulated charge on the electrodes is equal to the integral of the current, as well as being proportional to the voltage (as discussed above). As with any antiderivative, a constant of integration is added to represent the initial voltage $v(t_0)$. This is the integral form of the capacitor equation,

$$v(t) = \frac{q(t)}{C} = \frac{1}{C} \int_{t_0}^{t} i(\tau) \mathrm{d}\tau + v(t_0)$$

.

Taking the derivative of this, and multiplying by $C$, yields the derivative form,[12]

$$i(t) = \frac{\mathrm{d}q(t)}{\mathrm{d}t} = C \frac{\mathrm{d}v(t)}{\mathrm{d}t}.$$

The dual of the capacitor is the inductor, which stores energy in the magnetic field rather than the electric field. Its current-voltage relation is obtained by exchanging current and voltage in the capacitor equations and replacing $C$ with the inductance $L$.

**DC circuits**

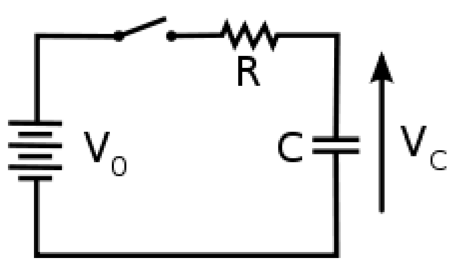



Fig 3.3 Dc Circuit

A series circuit containing only a resistor, a capacitor, a switch and a constant DC source of voltage $V_0$ is known as a *charging circuit*. If the capacitor is initially uncharged while the switch is open, and the switch is closed at $t = 0$,

it follows from Kirchhoff's voltage law that

$$V_0 = v_{\text{resistor}}(t) + v_{\text{capacitor}}(t) = i(t)R + \frac{1}{C}\int_0^t i(\tau)\mathrm{d}\tau.$$

Taking the derivative and multiplying by $C$, gives a first-order differential equation,

$$RC\frac{\mathrm{d}i(t)}{\mathrm{d}t} + i(t) = 0.$$

At $t = 0$, the voltage across the capacitor is zero and the voltage across the resistor is $V_0$. The initial current is then $i\,(0) = V_0\,/R$. With this assumption, the differential equation yields

$$i(t) = \frac{V_0}{R}e^{-t/\tau_0}$$
$$v(t) = V_0\left(1 - e^{-t/\tau_0}\right),$$

where $\tau_0 = RC$ is the *time constant* of the system.

As the capacitor reaches equilibrium with the source voltage, the voltage across the resistor and the current through the entire circuit decay exponentially. The case of *discharging* a charged capacitor likewise demonstrates exponential decay, but with the initial capacitor voltage replacing $V_0$ and the final voltage being zero.

## 3.5 RESISTOR

Resistors are used to limit the value of current in a circuit. Resistors offer opposition to the flow of current. They are expressed in ohms for which the symbol is '$\Omega$'. Resistors are broadly classified as

(1) Fixed Resistors

(2) Variable Resistors

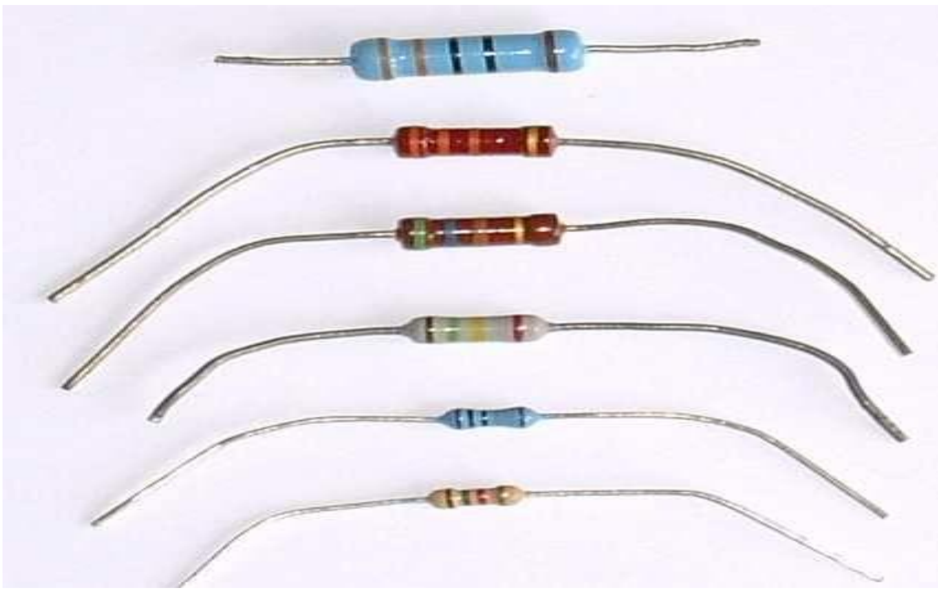
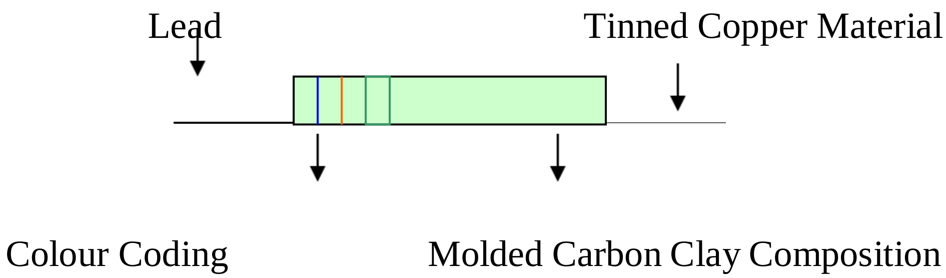


**Fig 3.4 Resisters**

### (a) Fixed Resistors:

The most common of low wattage, fixed type resistors is the molded-carbon composition resistor. The resistive material is of carbon clay composition. The leads are made of tinned copper. Resistors of this type.

The relative size of all fixed resistors changes with the wattage rating. Another variety of carbon composition resistors is the metalized type. It is made by deposition a homogeneous film of pure carbon over a glass, ceramic or other insulating core. This type of film-resistor is sometimes called the precision type, since it can be obtained with an accuracy of ±1%.




Fixed Resistor

**(b) A Wire Wound Resistor:**

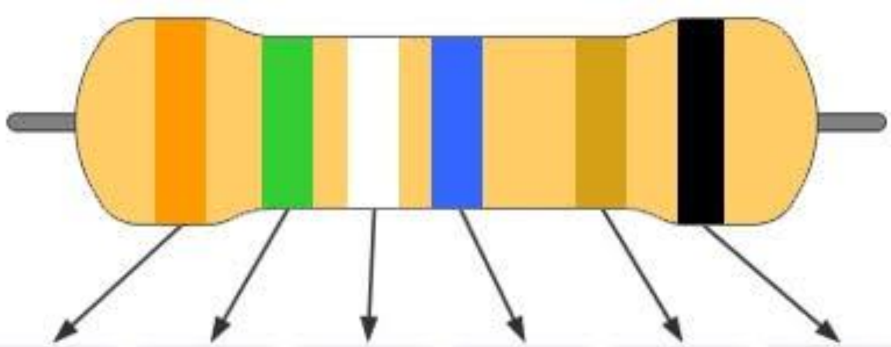
It uses a length of resistance wire, such as nichrome. This wire is wounded on to a round hollow porcelain core. The ends of the winding are attached to these metal pieces inserted in the core. Tinned copper wire leads are attached to these metal pieces. This assembly is coated with an enamel coating powdered glass. This coating is very smooth and gives mechanical protection to winding. Commonly available wire wound resistors have resistance values ranging from 1Ω to 100KΩ, and wattage rating up to about 200W.

**(c) Coding Of Resistor**

Some resistors are large enough in size to have their resistance printed on the body. However there are some resistors that are too small in size to have numbers printed on them. Therefore, a system of colour coding is used to indicate their values. For fixed, moulded composition resistor four colour bands are printed on one end of the outer casing. The colour bands are always read left to right from the end that has the bands closest to it.

The first and second band represents the first and second significant digits, of the resistance value. The third band is for the number of zeros that follow the second digit. In case the third band is gold or silver, it represents a multiplying factor of 0.1to 0.01. The fourth band represents the manufacture's tolerance

**RESISTOR COLOUR CHART**



| | 1st digit | 2nd digit | 3rd digit | multiply | tolerance | TCR (ppm/K) |
|---|---|---|---|---|---|---|
| Black | 0 | 0 | 0 | 1 | 1% (F) | 100 |
| Brown | 1 | 1 | 1 | 10 | 2% (G) | 50 |
| Red | 2 | 2 | 2 | 100 | | 15 |
| Orange | 3 | 3 | 3 | 1K | | 25 |
| Yellow | 4 | 4 | 4 | 10K | | |
| Green | 5 | 5 | 5 | 100K | 0.5% (D) | |
| Blue | 6 | 6 | 6 | 1M | 0.25% (C) | 10 |
| Violet | 7 | 7 | 7 | 10M | 0.1% (B) | 5 |
| Gray | 8 | 8 | 8 | 100M | 0.05% (A) | |
| White | 9 | 9 | 9 | 1G | | |
| Gold | | | | 0.1 | 5% (J) | |
| Silver | | | | 0.01 | 10% (K) | |
| None | | | | | 20% (M) | |

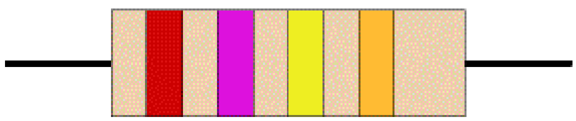
**For example**, if a resistor has a colour band sequence: yellow, violet, orange and green

Then its range will be—

Yellow=4, violet=7, orange=$10^3$, gold=±5% =47KΩ ±5% =2.35KΩ

**Most resistors have 4 bands:**

- The first band gives the first digit.
- The second band gives the second digit.
- The third band indicates the number of zeros.
- The fourth band is used to show the tolerance (precision) of the resistor.



This resistor has red (2), violet (7), yellow (4 zeros) and gold bands. So its value is 270000 Ω = 270 kΩ.
The standard colour code cannot show values of less than 10 Ω. To show these small values two special colours are used for the third band: gold, which means × 0.1 and silver which means × 0.01. The first and second bands represent the digits as normal.

**For example:**

red, violet, gold bands represent 27 × 0.1 = 2.7 Ω
blue, green, silver bands represent 56 × 0.01 = 0.56Ω

The fourth band of the colour code shows the tolerance of a resistor. Tolerance is the precision of the resistor and it is given as a percentage. For example; a 390Ω resistor with a tolerance of ±10% will have a value within 10% of 390Ω, between 390 - 39 = 351 Ω and 390 + 39 = 429 Ω (39 is 10% of 390).

A special colour code is used for the fourth band tolerance: silver ±10%, gold ±5% red ±2%, brown ±1%. If no fourth band is shown the tolerance is ±20%.

## 3.6 VARIABLE RESISTOR:

In electronic circuits, sometimes it becomes necessary to adjust the values of currents and voltages. For n example it is often desired to change the volume of sound, the brightness of a television picture etc. Such adjustments can be done by using variable resistors.

Although the variable resistors are usually called rheostats in other applications, the smaller variable resistors commonly used in electronic circuits are called potentiometers.

Resistor shorthand:

Resistor values are often written on circuit diagrams using a code system which avoids using a decimal point because it is easy to miss the small dot. Instead the letters R, K and M are used in place of the decimal point. To read the code: replace the letter with a decimal point, then multiply the value by 1000 if the letter was K, or 1000000 if the letter was M. The letter R means multiply by 1.

For example:

560R means 560 Ω
2K7 means 2.7 kΩ = 2700 Ω
39K means 39 kΩ
1M0 means 1.0 MΩ = 1000 kΩ

## 3.7 High power Resistors:-

Electrical energy is converted to heat when current flows through a resistor. Usually the effect is negligible, but if the resistance is low (or the voltage across the resistor high) a large current may pass making the resistor become noticeably warm. The resistor must be able to withstand the heating effect and resistors have power ratings to show this.

Power ratings of resistors are rarely quoted in parts lists because for most circuits the standard power ratings of 0.25W or 0.5W are suitable. For the rare cases where a higher power is required it should be clearly specified in the parts list, these will be circuits using low value resistors (less than about 300Ω) or high voltages (more than 15V).

The power, P, developed in a resistor is given by:

$P = I^2 \times R$

or

$P = V^2 / R$ where: P = power developed in the resistor in watts (W)

I =current through the resistor in amps (A)

R = resistance of the resistor in ohms (R )

V = voltage across the resistor in volts (V)

**Examples:**

- A 470 resistor with 10V across it, needs a power rating $P = V^2/R = 10^2/470$ ,0.21W. *In this case a standard 0.25W resistor would be suitable.*
- A 27 resistor with 10V across it, needs a power rating $P = V^2/R = 10^2/27 = 3.7$W. A high power resistor with a rating of 5W would be suitable.

CHAPTER-4

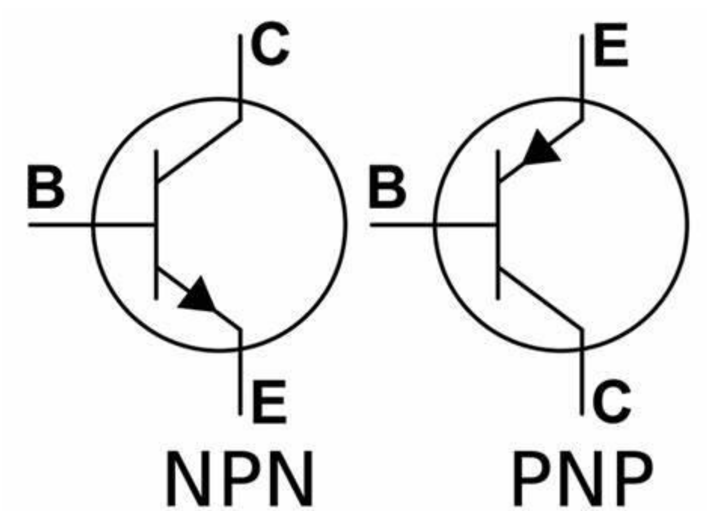
# TRANSISTOR

## 4.1TRANSISTORS

A transistor is an active device. It consists of two PN junctions formed by sandwiching either p-type or n-type semiconductor between a pair of opposite types.

There are two types of transistor:

1. n-p-n transistor
2. p-n-p transistor



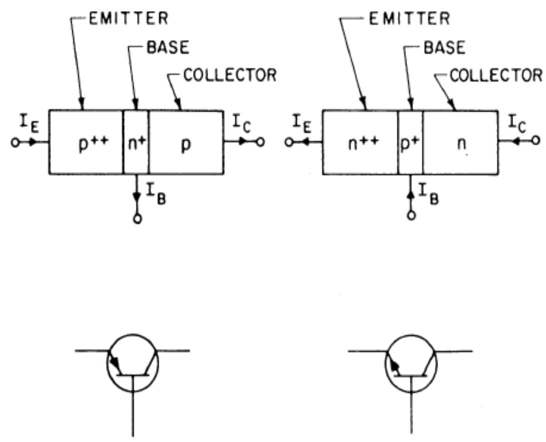

An n-p-n transistor is composed of two n-type semiconductors separated by a thin section of p-type. However a p-n-p type semiconductor is formed by two p-sections separated by a thin section of n-type.

Transistor has two pn junctions one junction is forward biased and other is reversed biased. The forward junction has a low resistance path whereas areverse biased junction has a high resistance path.

The weak signal is introduced in the low resistance circuit and output is taken from the high resistance circuit. Therefore a transistor transfers asignal from a low resistance to high resistor.

Transistor has three sections of doped semiconductors. The section on oneside is emitter and section on the opposite side is collector. The middle section is base.

(a) Emitter **:** The section on one side that supplies charge carriers is called emitter. The emitter is always forward biased w.r.t. base.




(b) Collector **:** The section on the other side that collects the charge is called collector. The collector is always reversed biased.

(c) Base : The middle section which forms two pn-junctions between theemitter and collector is called base.

A transistor raises the strength of a weak signal and thus acts as an amplifier. The weak signal is applied between emitter-base junction and output is takenacross the load Rc connected in the collector circuit. The collector current flowing through a high load resistance Rc produces a large voltage across it. Thus a weak signal applied in the input appears in the amplified form in the collector circuit.

## 4.2 Heat sink

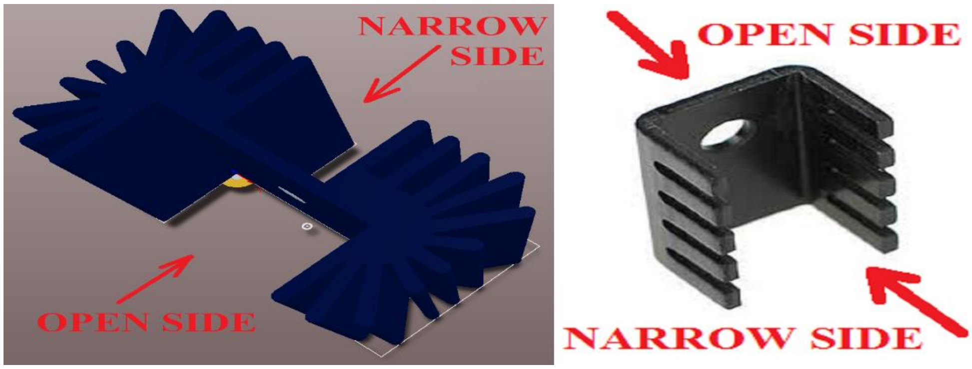



**Fig 4.1 Heat sink**

Waste heat is produced in transistors due to the current flowing through them. Heat sinks are needed for power transistors because they pass large currents. If you find that a transistor is becoming too hot to touch it certainly needs a heat sink! The heat sink helps to dissipate (remove) the heat by transferring it to the surrounding air.

## 4.3CONNECTORS

Connectors are basically used for interface between two. Here we use connectors for having interface between PCB and 8051 Microprocessor Kit.

There are two types of connectors they are male and female. The one, whichis with pins inside, is female and other is male.
These connectors are having bus wires with them for connection.
For high frequency operation the average circumference of a coaxial cable must be limited to about one wavelength, in order to reduce multimodal propagation and eliminate erratic reflection coefficients, power losses, and signal distortion. The standardization of coaxial connectors during World War II was mandatory for microwave operation to maintain a low reflection coefficient or a low voltage standing wave

**Seven types of microwave coaxial connectors are as follows:**

1. APC-3.5
2. APC-7
3. BNC
4. SMA
5. SMC
6. TNC
7. Type N

## 4.4LED (LIGHT EMITTING DIODE)

A junction diode, such as LED, can emit light or exhibit electro luminescence. Electro luminescence is obtained by injecting minority carriers into the region of a pn junction where radiative transition takes place. In radiative transition, there is a transition of electron from the conduction band to the valence band, which is made possibly by emission of a photon. Thus, emitted light comes from the hole electron recombination.

What is required is that electrons should make a transition from higher energy level to lower energy level releasing photon of wavelength corresponding to the energy difference associated with this transition. In LED the supply of high-energy electron is provided by forward biasing the diode, thus injecting electrons into the n-region and holes into p-region.

The pn junction of LED is made from heavily doped material. On forward bias condition, majority carriers from both sides of the junction cross the potential barrier and enter the opposite side where they are then minority carrier and cause local minority carrier population to be larger than

This is termed as minority injection. These excess minority carrier diffuse away from the junction and recombine with majority carriers.

In LED, every injected electron takes part in a radiative recombination and hence gives rise to an emitted photon. Under reverse bias no carrier injection takes place and consequently no photon is emitted. For direct transition from conduction band to valence band the emission wavelength.

In practice, every electron does not take part in radiative recombination and hence, the efficiency of the device may be described in terms of the quantum efficiency which is defined as the rate of emission of photons divided by the rate of supply of electrons. The number of radiative recombination, that takeplace, is usually proportional to the carrier injection rate and hence to the total current flowing.

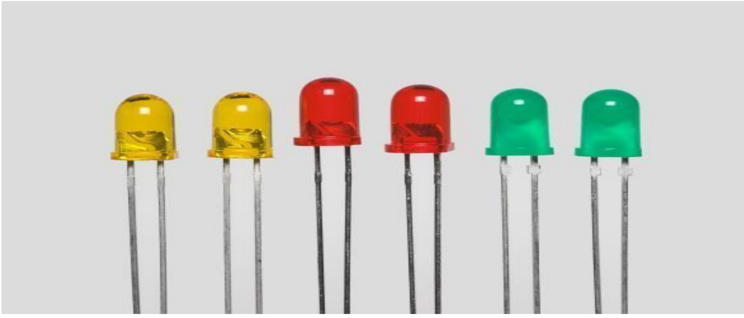


Fig 4.2 LED

## LED Materials:

One of the first materials used for LED is GaAs. This is a direct band gap material, i.e., it exhibits very high probability of direct transition of electron from conduction band to valence band. GaAs has E= 1.44 eV. This works in the infrared region.

GaP and GaAsP are higher band gap materials. Gallium phosphide is an indirect band gap semiconductor and has poor efficiency because band to band transitions are not normally observed.

Gallium Arsenide Phosphide is a tertiary alloy. This material has a specialfeature in that it changes from being direct band gap material.

Blue LEDs are of recent origin. The wide band gap materials such as GaNare one of the most promising LEDs for blue and green emission. InfraredLEDs are suitable for optical coupler applications.

## ADVANTAGES OF LEDs:

Low operating voltage, current, and power consumption makes Leds compatible with electronic drive circuits. This also makes easier interfacing as compared to filament incandescent and electric discharge lamps.

1. The rugged, sealed packages developed for LEDs exhibit high resistance to mechanical shock and vibration and allow LEDs to be used in severe environmental conditions where other light sources would fail.
2. LED fabrication from solid-state materials ensures a longer operating lifetime, thereby improving overall reliability and lowering maintenance costs of the equipment in which they are installed.
3. The range of available LED colours-from red to orange, yellow, and green-provides the designer with added versatility.
4. LEDs have low inherent noise levels and also high immunity to externally generated noise.
5. Circuit response of LEDs is fast and stable, without surge currents orthe prior “warm-up”, period required by filament light sources.
6. LEDs exhibit linearity of radiant power output with forward current over a wide range.

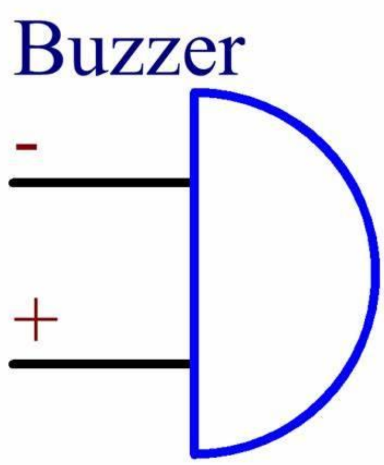
**LEDs have certain limitations such as:**

1. Temperature dependence of radiant output power and wave length.
2. Sensitivity to damages by over voltage or over current.
3. Theoretical overall efficiency is not achieved except in special cooled or pulsed conditions.

## 4.5Buzzer:-

It is an electronic signaling device which produces buzzing sound. It is commonly used in automobiles, phone alarm systems and household appliances. Buzzers work in the same manner as an alarm works. They are generally equipped with sensors or switches connected to a control unit and the control unit illuminates a light on the appropriate button or control panel, and sound a warning in the form of a continuous or intermittent buzzing or beeping sound.

The word "buzzer" comes from the rasping noise that buzzers made when they were electromechanical devices, operated from stepped-down AC line voltage at 50 or 60 cycles.
Typical uses of buzzers and beepers include alarms, timers and confirmation of user input such as a mouse click or keystroke.




Symbol of Buzzer

## Types of Buzzers

The different types of buzzers are electric buzzers, electronic buzzers, mechanical buzzers, electromechanical, magnetic buzzers, piezoelectric buzzers and piezo buzzers.

### (a) Electric buzzers-

An basic model of electric buzzer usually consists of simple circuit components such as resistors, a capacitor and 555 timer IC or an integrated circuit with a range of timer and multi-vibrator functions. It works through small bits of electricity vibrating together which causes sound.

Fig. 4.3 Electric Buzzer

### (b) Electronic buzzers –

An electronic buzzer comprises an acoustic vibrator comprised of a circular metal plate having its entire periphery rigidly secured to a support, and a piezoelectric element adhered to one face of the metal plate. A driving circuit applies electric driving signals to the vibrator to vibrationally drive it at a 1/N multiple of its natural frequency, where N is an integer, so that the vibrator emits an audible buzzing sound. The metal plate is preferably mounted to undergo vibration in a natural vibration mode having only one nodal circle. The drive circuit includes an inductor connected in a closed loop with the vibrator, which functions as a capacitor, and the circuit applies signals at a selectively variable frequency to the closed loop to accordingly vary the inductance of the inductor to thereby vary the period of oscillation of the acoustic vibrator and the resultant frequency of the buzzer

Fig. 4.4 Electronic Buzzer

**(c) Mechanical Buzzer-**

A joy buzzer is an example of a purely mechanical buzzer

Fig 4.5 Mechanical Buzzer

A piezo buzzer is made from two conductors that are separated by Piezo crystals. When a voltage is applied to these crystals, they push on one conductor and pull on the other. The result of this push and pull is a sound wave. These buzzers can be used for many things, like signaling when a period of time is up or making a sound when a particular button has been pushed. The process can also be reversed to use as a guitar pickup. When a sound wave is passed, they create an electric signal that is passed on to an audio amplifier.

Piezo buzzers are small electronic devices that emit sounds when driven by low voltages and currents. They are also called piezoelectric buzzers. They usually have two electrodes and a diaphragm. The diaphragm is made from ametal plate and piezoelectric material such as a ceramic.

**(d) Magnetic Buzzers:-**

Magnetic buzzers are magnetic audible signal devices with built-in oscillating circuits.
The construction combines an oscillation circuit unit with a detection coil, a drive coil and a magnetic transducer.

diodes and other small devices act as circuit devices for driving sound generators. With the application of voltage, current flows to the drive coil on primary side and to the detection coil on the secondary side. The amplification circuit, including the transistor and the feedback circuit, causes vibration. The oscillation current excites the coil and the unit generates an AC magnetic field corresponding to an oscillation frequency. This AC magnetic field magnetizes the yoke comprising the magnetic circuit. The oscillation from the intermittent magnetization prompts the vibration diaphragm to vibrate up and down, generating buzzer sounds through the resonator.

Fig 4.6 Magnetic Buzzer

**Circuit of buzzer –**

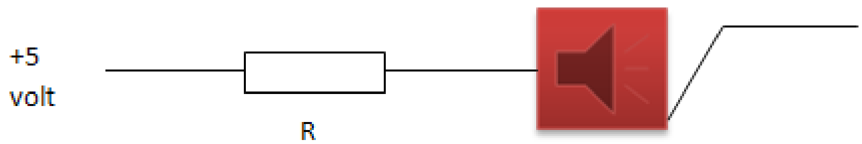



Fig: Circuit of Buzzer used

**Role of buzzer in this project**

Buzzer in this system gives the beep when car moves inside cutting the infrared light. Basically it generates the signal to indicate that car has entered in the parking space.

CHAPTER-5

# DIODE

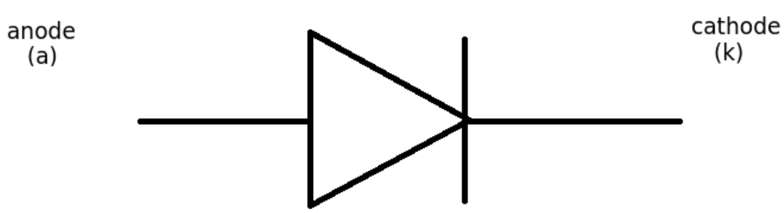
## 5.1 DIODE

### (a) ACTIVE COMPONENT-

Active component are those component for not any other component are used its operation. I used in this project only function diode, these component description are described as bellow.

### (b) SEMICONDUCTOR DIODE-

A PN junctions is known as a semiconductor or crystal diode.A crystal diodehas two terminal when it is connected in a circuit one thing is decide is weather a diode is forward or reversed biased. There is a easy rule to ascertain it. If the external CKT is trying to push the conventional current in the direction of error, the diode is forward biased. One the other hand if the conventional current is trying is trying to flow opposite the error head, the diode is reversed biased putting in simple wave.

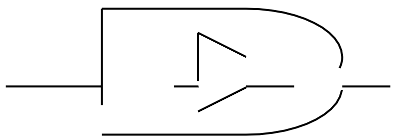



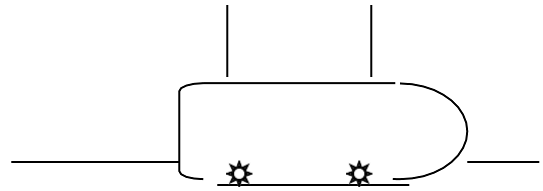
1. If arrowhead of diode symbol is positive W.R.T Bar of the symbol, the diode is forward biased.
2. The arrowhead of diode symbol is negative W.R.T bar , the diodeis the reverse bias.

When we used crystal diode it is often necessary toknow that which end is arrowhead

and which end is bar. so following method are available.

Some manufactures actually point the symbol on the body of the diode e. g By127 by 11 4 crystal diode manufacture by b e b.

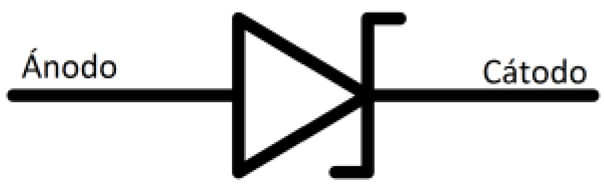




2. Sometimes red and blue marks are on the body of the crystal diode. Red mark do not arrow where's blue mark indicates bar e .g oa80 crystal diode.

**<u>5.2</u> <u>ZENER DIODE</u>-**

It has been already discussed that when the reverse bias on a crystal diode is increased a critical voltage, called break down voltage. The break down or zener voltage depends upon the amount of doping. If the diode is heavily doped depletion layer will be thin and consequently the break down of he junction will occur at a lower reverse voltage. On the other hand, a lightly doped diode has a higher break down voltage, it is called zener diode.




A properly doped crystal diode, which has a sharped break down voltage, is known as a ze~~nor diode.~~

# CONCLUSION

The project was completed successfully with in the given time duration. it was learning experience through which we gained invaluable on hand practical knowledge with project enlightened us on the vastness and unique application of micro controller , which forms the basic framework of our project.

This project gave us the deep understanding of the controller and described us how to use the controller in different ways. This is embedded based project as embedded is the combination of both the software as well as the hardware so this system helped us to clear all our doubts related to basic electronic components

# References


- en.wikipedia.org
- www.batronix.com
- Electronics For You(EFY)
- Microcontroller Programming
  By Julio Sanchez
- Microcontroller Programming: The Microchip PIC
  By Julio Sanchez (Author), Maria P. Canton (Author)
- A hand book on Pure sine wave DC-AC Inverter
  By Samlex America (www.samlexamerica.com)