A

PROJECT REPORT ON

"MEDIA PLAYER FOR NATIONAL SONG"

This is Submitted to the JNTUK, Kakinada for the award of the degree.

BACHELOR OF TECHNOLOGY

IN

ELECTRONICS AND COMMUNICATION ENGINEERING

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DECLARATION

The project work entitled "MEDIA PLAYER FOR NATIONAL SONG" which is submitted by us in partial fulfillment of the requirement for the award of degree **Bachelor of Technology in Electronics and communication Engineering at Newton's Institute of Science and Technology, Jawaharlal Nehru Technological University Kakinada** comprises only our original work and due acknowledgement has been made in the text to all other materials used. We also declare that this thesis work is the result of our sincere efforts and that it has not been submitted to any other universities for the award of the degree or any diploma.

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CERTIFICATE

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INDEX

ABSTRACT

CHAPTER-1
EMBEDED SYSTEM

CHAPTER 2
INTRODUCTION TO PROJECT

CHAPTER-3
ARDUINO UNO

CHAPTER 4
HARDWARE COMPONENTS

CHAPTER-5
SOFTWARE

CHAPTER- 6
RESULTS

CHAPTER- 7
CONCLUSION AND FUTURE SCOPE

REFERENCE

ABSTRACT

In recent technologies media players developed very rapidly but up till today it's not possible to watch the text of that voice. It is needed to fetch a special file to show the word according to the voice. The paper contains a new concept of Audio Media player which does not need any external file fetching to show the corresponding lyrics for regarding audio. This software is purposed to convert the audio in to the text so that user can easy go with the voice without having any other special file fetching with the media file. The software is attached with a microphone, which is used as audio input for this media player and then a speech processing platform based on the MATLAB.

CHAPTER 1

EMBEDDED SYSTEMS

1.1. INTRODUCTION TO EMBEDDED SYSTEMS

An embedded system is a special-purpose computer system designed to perform one or a few dedicated functions, sometimes with real-time computing constraints. It is usually embedded as part of a complete device including hardware and mechanical parts. In contrast, a general-purpose computer, such as a personal computer, can do many different tasks depending on programming. Embedded systems have become very important today as they control many of the common devices we use.

Since the embedded system is dedicated to specific tasks, design engineers can optimize it, reducing the size and cost of the product, or increasing the reliability and performance. Some embedded systems are mass-produced, benefiting from economies of scale.

Physically embedded systems range from portable devices such as digital watches and MP3 players, to large stationary installations like traffic lights, factory controllers, or the systems controlling nuclear power plants. Complexity varies from low, with a single microcontroller chip, to very high with multiple units, peripherals and networks mounted inside a large chassis or enclosure.

In general, "embedded system" is not an exactly defined term, as many systems have some element of programmability. For example, Handheld computers share some elements with embedded systems — such as the operating systems and microprocessors which power them — but are not truly embedded systems, because they allow different applications to be load and peripherals to be connected.

An embedded system is some combination of computer hardware and software, either fixed in capability or programmable, that is specifically designed for a particular kind of application device. Industrial machines, automobiles, medical equipment, cameras, household appliances, airplanes, vending machines, and toys (as well as the more obvious cellular phone and PDA) are among the myriad possible hosts of an embedded system. Embedded systems that are programmable are provided with a programming interface, and embedded systems programming is a specialized occupation. Certain operating systems or language platforms are tailored for the embedded market, such as Embedded Java and Windows XP Embedded. However, some low-end consumer products use very inexpensive microprocessors and limited storage, with the application and operating system both part of a single program. The program

is written permanently into the system's memory in this case, rather than being loaded into RAM (random access memory), as programs on a personal computer are.

1.2. CHARACTERISTIC OF EMBEDDED SYSTEM

- Speed (bytes/sec): Should be high speed
- Power (watts): Low power dissipation
- Size and weight: As far as possible small in size and low weight
- Accuracy (%error): Must be very accurate
- Adaptability: High adaptability and accessibility
- Reliability: Must be reliable over a long period of time

1.3. APPLICATIONS OF EMBEDDED SYSTEMS

We are living in the Embedded World. You are surrounded with many embedded products and your daily life largely depends on the proper functioning of these gadgets. Television, Radio, CD player of your living room, Washing Machine or Microwave Oven in your kitchen, Card readers, Access Controllers, Palm devices of your work space enable you to do many of your tasks very effectively. Apart from all these, many controllers embedded in your car take care of car operations between the bumpers and most of the times you tend to ignore all these controllers.

- **Robotics:** industrial robots, machine tools, Robocop soccer robots
- **Automotive:** cars, trucks, trains
- **Aviation:** airplanes, helicopters
- Home and Building Automation
- **Aerospace:** rockets, satellites
- **Energy systems:** windmills, nuclear plants
- **Medical systems:** prostheses, revalidation machine.

1.4. MICROCONTROLLER VERSUS MICROPROCESSOR

What is the difference between a Microprocessor and Microcontroller? By microprocessor is meant the general purpose Microprocessors such as Intel's X86 family (8086, 80286, 80386, 80486, and the Pentium) or Motorola's 680X0 family (68000, 68010, 68020,

68030, 68040, etc). These microprocessors contain no RAM, no ROM, and no I/O ports on the chip itself. For this reason, they are commonly referred to as general-purpose Microprocessors.

A system designer using a general-purpose microprocessor such as the Pentium or the 68040 must add RAM, ROM, I/O ports, and timers externally to make them functional. Although the addition of external RAM, ROM, and I/O ports makes these systems bulkier and much more expensive, they have the advantage of versatility such that the designer can decide on the amount of RAM, ROM and I/O ports needed to fit the task at hand. This is not the case with Microcontrollers.

A Microcontroller has a CPU (a microprocessor) in addition to a fixed amount of RAM, ROM, I/O ports, and a timer all on a single chip. In other words, the processor, the RAM, ROM, I/O ports and the timer are all embedded together on one chip; therefore, the designer cannot add any external memory, I/O ports, or timer to it. The fixed amount of on-chip ROM, RAM, and number of I/O ports in Microcontrollers makes them ideal for many applications in which cost and space are critical.

In many applications, for example a TV remote control, there is no need for the computing power of a 486 or even an 8086 microprocessor. These applications most often require some I/O operations to read signals and turn on and off certain bits

1.5. MICROCONTROLLERS FOR EMBEDDED SYSTEMS

In the Literature discussing microprocessors, we often see the term Embedded System. Microprocessors and Microcontrollers are widely used in embedded system products. An embedded system product uses a microprocessor (or Microcontroller) to do one task only. A printer is an example of embedded system since the processor inside it performs one task only; namely getting the data and printing it. Contrast this with a Pentium based PC. A PC can be used for any number of applications such as word processor, print-server, bank teller terminal, Video game, network server, or Internet terminal. Software for a variety of applications can be loaded and run. Of course the reason a pc can perform myriad tasks is that it has RAM memory and an operating system that loads the application software into RAM memory and lets the CPU run it.

. In this robot as the fire sensor senses the fire, it senses the signal to microcontroller. In an Embedded system, there is only one application software that is typically burned into ROM. An x86 PC contains or is connected to various embedded products such as keyboard, printer, modem, disk controller, sound card, CD-ROM drives, mouse, and so on. Each one of these peripherals has a Microcontroller inside it that performs only one task.

CHAPTER 2

INTRODUCTION TO PROJECT

2.1. INTRODUCTION

In this project we will show you how you can make an Arduino Touch Screen MP3 Music Player and Alarm Clock. If we enter the Music Player we can start playing the music by pressing the big Play button in the middle of the screen. Right beside it, there are two more buttons, for playing the previous or the next song. On the other hand, if we enter the Alarm Clock we can set an alarm by using the two buttons for setting the hours and the minutes. When the alarm will be activated, a song will start playing at a higher volume, and it will keep playing until we press the "Dismiss" button.

The Mini MP3 Module is a small and low cost MP3 module with an simplified output directly to the speaker. The module can be used as a stand-alone module with attached battery, speaker and push buttons or used in combination with an Arduino or any other microcontroller with RX/TX capabilities. It is perfectly integrates hard decoding module, which supports common audio formats such as MP3, WAV and WMA.

This project we will be building a simple mp3 player which will have 3 buttons, The rst button will be used to Play/Pause the music currently being played, while the second one will be used to load the next song (the next button) and the last one will be used to load the previous song (the previous button. it also supports TF card with FAT16, FAT32 le system. Through a simple serial port, you can play the designated music without any other tedious underlying operations.

2.2. BLOCK DIAGRAM

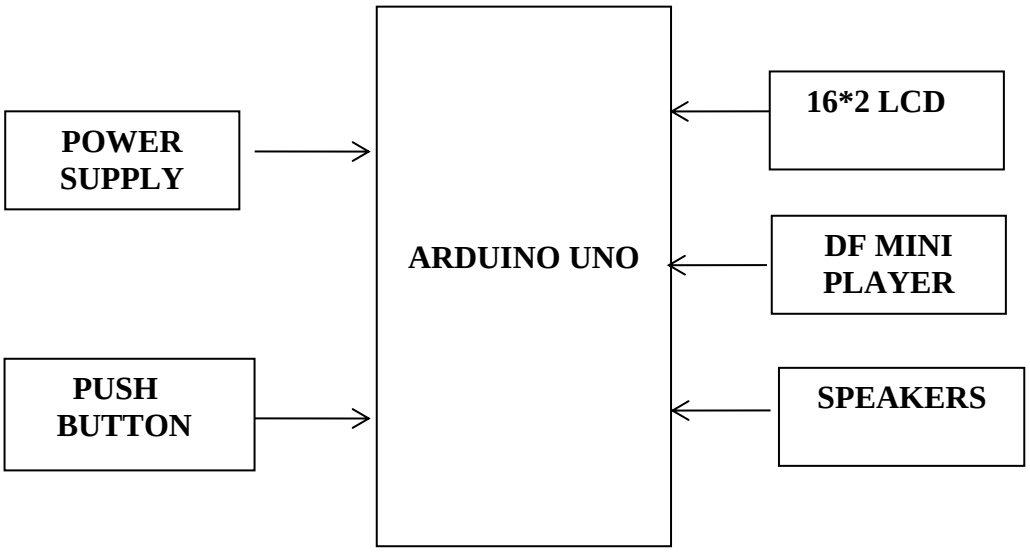


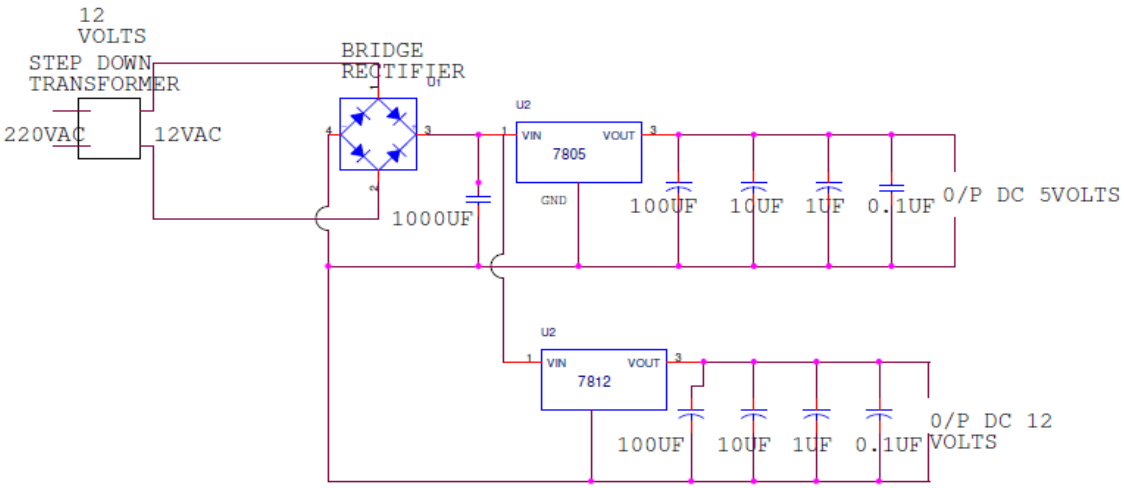
Figure.2.1. Block Diagram of MEDIA PLAYER

2.3. POWER SUPPLY

Power supply is a reference to a source of electrical power. A device or system that supplies electrical or other types of energy to an output load or group of loads is called a power supply unit or PSU. The term is most commonly applied to electrical energy supplies, less often to mechanical ones, and rarely to others

This power supply section is required to convert AC signal to DC signal and also to reduce the amplitude of the signal. The available voltage signal from the mains is 230V/50Hz which is an AC voltage, but the required is DC voltage (no frequency) with the amplitude of +5V and +12V for various applications.

In this section we have Transformer, Bridge rectifier, are connected serially and voltage regulators for +5V and +12V (7805 and 7812) via a capacitor (1000µF) in parallel are connected parallel as shown in the circuit diagram below. Each voltage regulator output is again is connected to the capacitors of values (100µF, 10µF, 1 µF, 0.1 µF) are connected parallel through which the corresponding output (+5V or +12V) are taken into consideration.



Circuit Explanation

1) Transformer

A transformer is a device that transfers electrical energy from one circuit to another through inductively coupled electrical conductors. A changing current in the first circuit (the primary) creates a changing magnetic field; in turn, this magnetic field induces a changing voltage in the second circuit (the secondary). By adding a load to the secondary circuit, one can make current flow in the transformer, thus transferring energy from one circuit to the other.

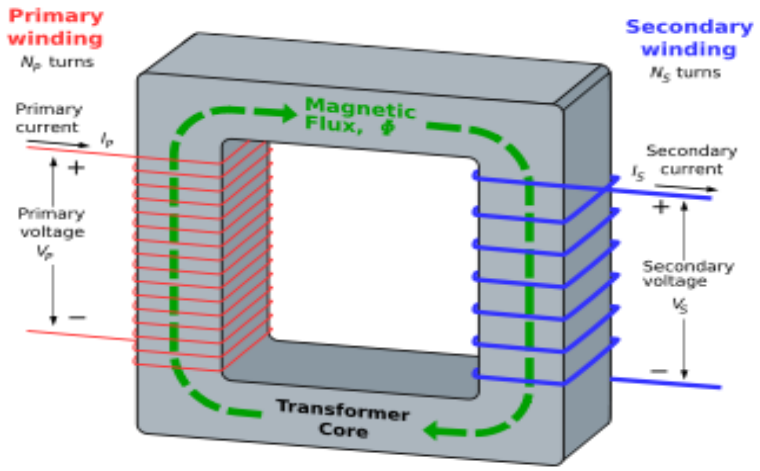
The secondary induced voltage V_S, of an ideal transformer, is scaled from the primary V_P by a factor equal to the ratio of the number of turns of wire in their respective windings:

$$\frac{V_S}{V_P} = \frac{N_S}{N_P}$$

Basic principle

The transformer is based on two principles: firstly, that an electric current can produce a magnetic field (electromagnetism) and secondly that a changing magnetic field within a coil of wire induces a voltage across the ends of the coil (electromagnetic induction). By changing the current in the primary coil, it changes the strength of its magnetic field; since the changing magnetic field extends into the secondary coil, a voltage is induced across the secondary.

A simplified transformer design is shown below. A current passing through the primary coil creates a magnetic field. The primary and secondary coils are wrapped around a core of very high magnetic permeability, such as iron; this ensures that most of the magnetic field lines produced by the primary current are within the iron and pass through the secondary coil as well as the primary coil.



An ideal step-down transformer showing magnetic flux in the core

Induction law

The voltage induced across the secondary coil may be calculated from Faraday's law of induction, which states that:

$$V_S = N_S \frac{\mathrm{d}\Phi}{\mathrm{d}t}$$

Where V_S is the instantaneous voltage, N_S is the number of turns in the secondary coil and Φ equals the magnetic flux through one turn of the coil. If the turns of the coil are oriented perpendicular to the magnetic field lines, the flux is the product of the magnetic.

The area is constant, being equal to the cross-sectional area of the transformer core, whereas the magnetic field varies with time according to the excitation of the primary. Since the same magnetic flux passes through both the primary and secondary coils in an ideal transformer, the instantaneous voltage across the primary winding equals

$$V_P = N_P \frac{\mathrm{d}\Phi}{\mathrm{d}t}$$

Taking the ratio of the two equations for V_S and V_P gives the basic equation for stepping up or stepping down the voltage

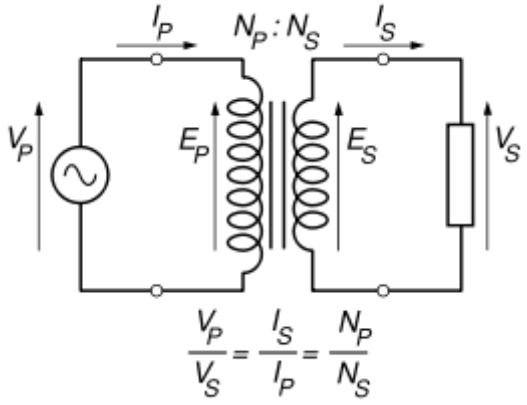
$$\frac{V_S}{V_P} = \frac{N_S}{N_P}$$

Ideal power equation

If the secondary coil is attached to a load that allows current to flow, electrical power is transmitted from the primary circuit to the secondary circuit. Ideally, the transformer is perfectly efficient; all the incoming energy is transformed from the primary circuit to the magnetic field and into the secondary circuit. If this condition is met, the incoming electric power must equal the outgoing power.

$P_{\text{incoming}} = I_P V_P = P_{\text{outgoing}} = I_S V_S$ giving the ideal transformer equation

$$\frac{V_S}{V_P} = \frac{N_S}{N_P} = \frac{I_P}{I_S}$$



$P_{in\text{-}coming} = I_P V_P = P_{out\text{-}going} = I_S V_S$ giving the ideal transformer equation

$$\frac{V_S}{V_P} = \frac{N_S}{N_P} = \frac{I_P}{I_S}$$

If the voltage is increased (stepped up) ($V_S > V_P$), then the current is decreased (stepped down) ($I_S < I_P$) by the same factor. Transformers are efficient so this formula is a reasonable approximation.

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The impedance in one circuit is transformed by the *square* of the turns ratio. For example, if an impedance Z_S is attached across the terminals of the secondary coil, it appears to the primary circuit to have an impedance of

$$Z_S \left(\frac{N_P}{N_S}\right)^2$$

This relationship is reciprocal, so that the impedance Z_P of the primary circuit appears to the secondary to be

$$Z_P \left(\frac{N_S}{N_P}\right)^2$$

Detailed operation

The simplified description above neglects several practical factors, in particular the primary current required to establish a magnetic field in the core, and the contribution to the field due to current in the secondary circuit.

Models of an ideal transformer typically assume a core of negligible reluctance with two windings of zero resistance. When a voltage is applied to the primary winding, a small current flows, driving flux around the magnetic circuit of the core. The current required to create the flux is termed the magnetizing current; since the ideal core has been assumed to have near-zero reluctance, the magnetizing current is negligible, although still required to create the magnetic field.

The changing magnetic field induces an electromotive force (EMF) across each winding. Since the ideal windings have no impedance, they have no associated voltage drop, and so the voltages V_P and V_S measured at the terminals of the transformer, are equal to the corresponding EMFs. The primary EMF, acting

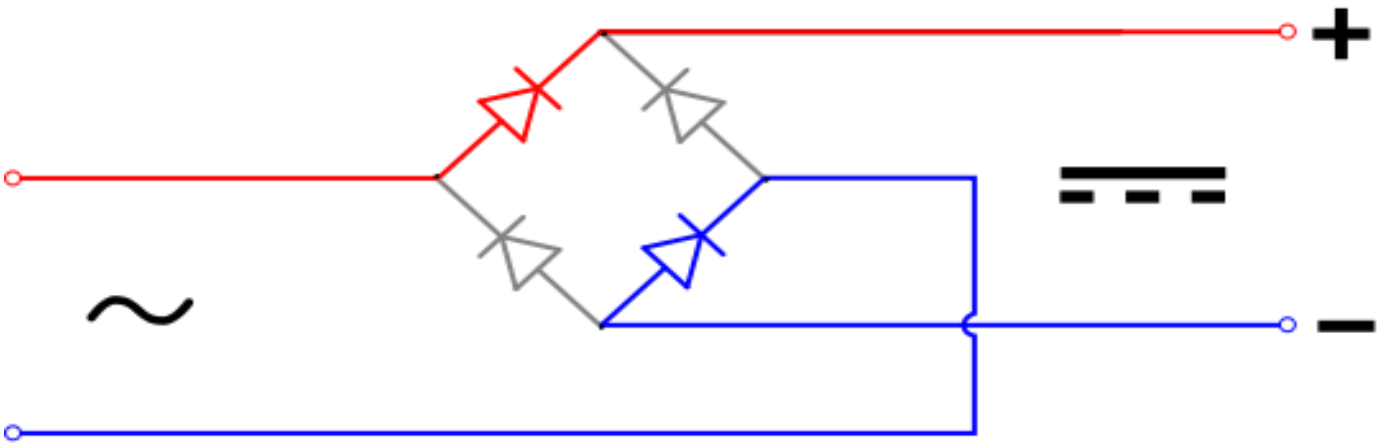
as it does in opposition to the primary voltage, is sometimes termed the "back EMF". This is due to Lenz's law which states that the induction of EMF would always be such that it will oppose development of any such change in magnetic field.

2. Bridge Rectifier

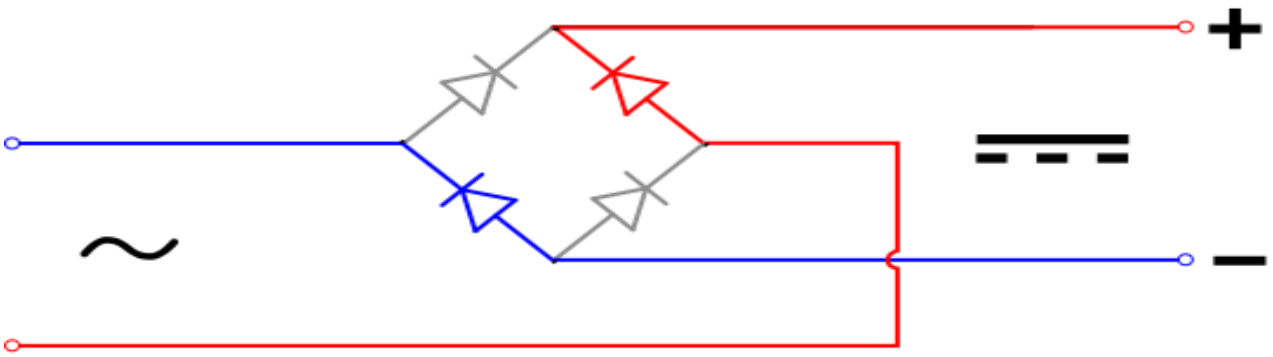
A diode bridge or bridge rectifier is an arrangement of four diodes in a bridge configuration that provides the same polarity of output voltage for any polarity of input voltage. When used in its most common application, for conversion of alternating current (AC) input into direct current (DC) output, it is known as a bridge rectifier. A bridge rectifier provides full-wave rectification from a two-wire AC input, resulting in lower cost and weight as compared to a center-tapped transformer design, but has two diode drops rather than one, thus exhibiting reduced efficiency over a center-tapped design for the same output voltage.

Basic Operation

When the input connected at the left corner of the diamond is positive with respect to the one connected at the right hand corner, current flows to the right along the upper colored path to the output, and returns to the input supply via the lower one.

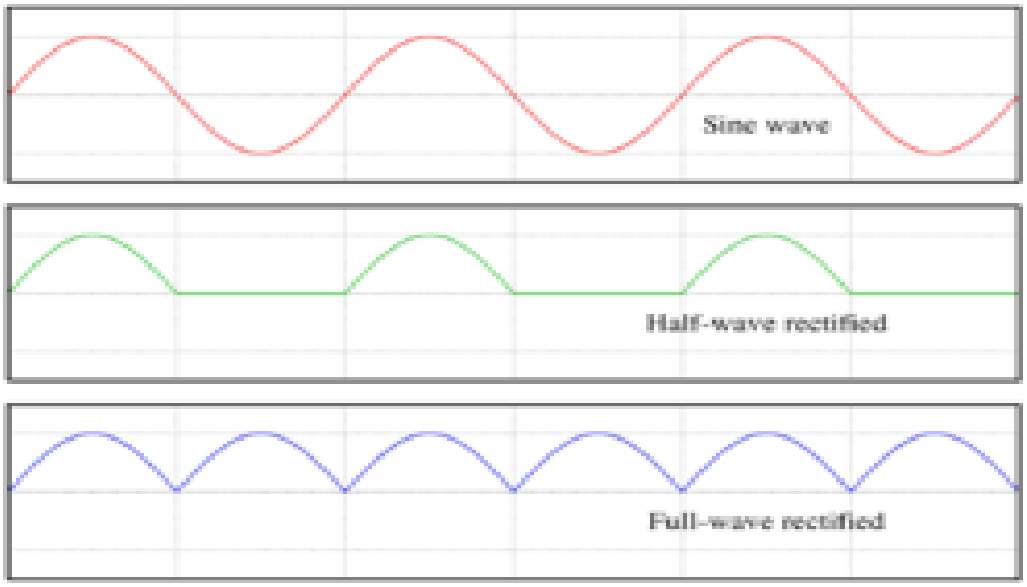


When the right hand corner is positive relative to the left hand corner, current flows along the upper colored path and returns to the supply via the lower colored path.



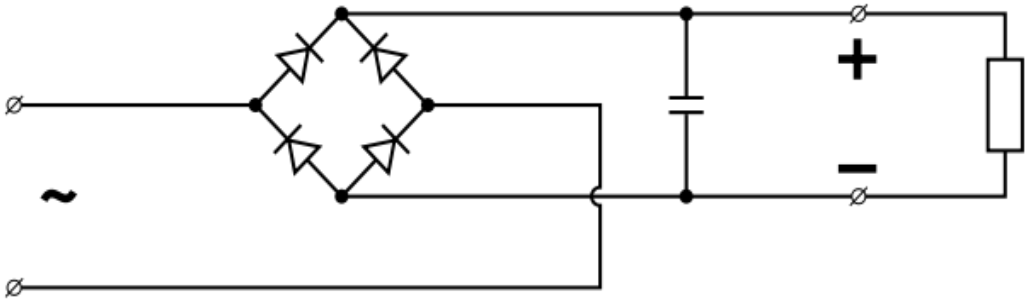
In each case, the upper right output remains positive with respect to the lower right one. Since this is true whether the input is AC or DC, this circuit not only produces DC power when supplied with AC power: it also can provide what is sometimes called "reverse polarity protection". That is, it permits normal functioning when batteries are installed backwards or DC input-power supply wiring "has its wires crossed" (and protects the circuitry it powers against damage that might occur without this circuit in place).

Prior to availability of integrated electronics, such a bridge rectifier was always constructed from discrete components. Since about 1950, a single four-terminal component containing the four diodes connected in the bridge configuration became a standard commercial component and is now available with various voltage and current ratings.



Output smoothing (Using Capacitor)

For many applications, especially with single phase AC where the full-wave bridge serves to convert an AC input into a DC output, the addition of a capacitor may be important because the bridge alone supplies an output voltage of fixed polarity but pulsating magnitude (see diagram above).



The function of this capacitor, known as a reservoir capacitor (aka smoothing capacitor) is to lessen the variation in (or 'smooth') the rectified AC output voltage waveform from the bridge. One explanation of 'smoothing' is that the capacitor provides a low impedance path to the AC component of the output, reducing the AC voltage across, and AC current through, the resistive load. In less technical terms, any drop in the output voltage and current of the bridge tends to be cancelled by loss of charge in the capacitor.

This charge flows out as additional current through the load. Thus the change of load current and voltage is reduced relative to what would occur without the capacitor. Increases of voltage correspondingly store excess charge in the capacitor, thus moderating the change in output voltage / current. Also see rectifier output smoothing.

The simplified circuit shown has a well deserved reputation for being dangerous, because, in some applications, the capacitor can retain a *lethal* charge after the AC power source is removed. If supplying a dangerous voltage, a practical circuit should include a reliable way to safely discharge the capacitor. If the normal load can not be guaranteed to perform this function, perhaps because it can be disconnected, the circuit should include a bleeder resistor connected as close as practical across the capacitor. This resistor should consume a current large enough to discharge the capacitor in a reasonable time, but small enough to avoid unnecessary power waste.

Because a bleeder sets a minimum current drain, the regulation of the circuit, defined as percentage voltage change from minimum to maximum load, is improved. However in many cases the improvement is of insignificant magnitude.

The capacitor and the load resistance have a typical time constant $\tau = RC$ where C and R are the capacitance and load resistance respectively. As long as the load resistor is large enough so that this time constant is much longer than the time of one ripple cycle, the above configuration will produce a smoothed DC voltage across the load.

In some designs, a series resistor at the load side of the capacitor is added. The smoothing can then be improved by adding additional stages of capacitor–resistor pairs, often done only for sub-supplies to critical high-gain circuits that tend to be sensitive to supply voltage noise.

The idealized waveforms shown above are seen for both voltage and current when the load on the bridge is resistive. When the load includes a smoothing capacitor, both the voltage and the current waveforms will be greatly changed. While the voltage is smoothed, as described above, current will flow through the bridge only during the time when the input voltage is greater than the capacitor voltage. For example, if the load draws an average current of n Amps, and the diodes conduct for 10% of the time, the average diode current during conduction must be 10n Amps. This non-sinusoidal current leads to harmonic distortion and a poor power factor in the AC supply.

In a practical circuit, when a capacitor is directly connected to the output of a bridge, the bridge diodes must be sized to withstand the current surge that occurs when the power is turned on at the peak of the AC voltage and the capacitor is fully discharged. Sometimes a small series resistor is included before the capacitor to limit this current, though in most applications the power supply transformer's resistance is already sufficient.

Output can also be smoothed using a choke and second capacitor. The choke tends to keep the current (rather than the voltage) more constant. Due to the relatively high cost of an effective choke compared to a resistor and capacitor this is not employed in modern equipment.

Some early console radios created the speaker's constant field with the current from the high voltage ("B +") power supply, which was then routed to the consuming circuits, (permanent magnets were considered too weak for good performance) to create the speaker's constant magnetic field. The speaker field coil thus performed 2 jobs in one: it acted as a choke, filtering the power supply, and it produced the magnetic field to operate the speaker.

2) Voltage Regulator

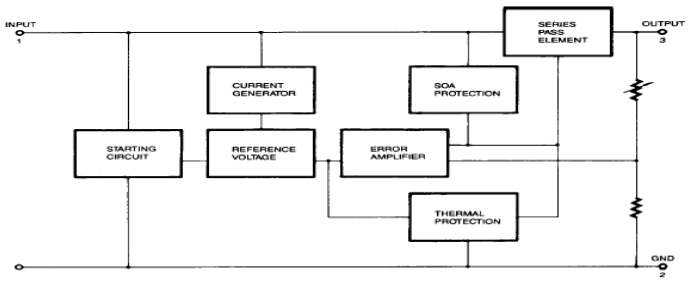
A voltage regulator is an electrical regulator designed to automatically maintain a constant voltage level.

The 78xx (also sometimes known as LM78xx) series of devices is a family of self-contained fixed linear voltage regulator integrated circuits. The 78xx family is a very popular choice for many electronic circuits which require a regulated power supply, due to their ease of use and relative cheapness. When specifying individual ICs within this family, the xx is replaced with a two-digit number, which indicates the output voltage the particular device is designed to provide (for example, the 7805 has a 5 volt output, while

the 7812 produces 12 volts). The 78xx line is positive voltage regulators, meaning that they are designed to produce a voltage that is positive relative to a common ground. There is a related line of 79xx devices which are complementary negative voltage regulators. 78xx and 79xx ICs can be used in combination to provide both positive and negative supply voltages in the same circuit, if necessary.

78xx ICs have three terminals and are most commonly found in the TO220 form factor, although smaller surface-mount and larger TrO3 packages are also available from some manufacturers. These devices typically support an input voltage which can be anywhere from a couple of volts over the intended output voltage, up to a maximum of 35 or 40 volts, and can typically provide up to around 1 or 1.5 amps of current (though smaller or larger packages may have a lower or higher current rating).

Internal Block Digram

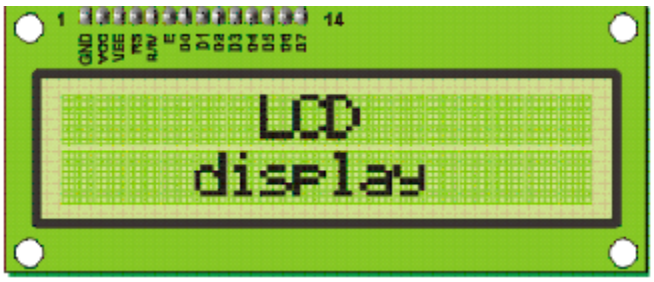


LIQUID CRYSTAL DISPLAY (LCD):

LCD stands for **L**iquid **C**rystal **D**isplay. LCD is finding wide spread use replacing LEDs (seven segment LEDs or other multi segment LEDs) because of the following reasons:

1. The declining prices of LCDs.
2. The ability to display numbers, characters and graphics. This is in contrast to LEDs, which are limited to numbers and a few characters.
3. Incorporation of a refreshing controller into the LCD, thereby relieving the CPU of the task of refreshing the LCD. In contrast, the LED must be refreshed by the CPU to keep displaying the data.
4. Ease of programming for characters and graphics.

These components are “specialized” for being used with the microcontrollers, which means that they cannot be activated by standard IC circuits. They are used for writing different messages on a miniature LCD.



A model described here is for its low price and great possibilities most frequently used in practice. It is based on the HD44780 microcontroller (*Hitachi*) and can display messages in two lines with 16 characters each. It displays all the alphabets, Greek letters, punctuation marks, mathematical symbols etc. In addition, it is possible to display symbols that user makes up on its own.

Automatic shifting message on display (shift left and right), appearance of the pointer, backlight etc. are considered as useful characteristics.

Pins Functions

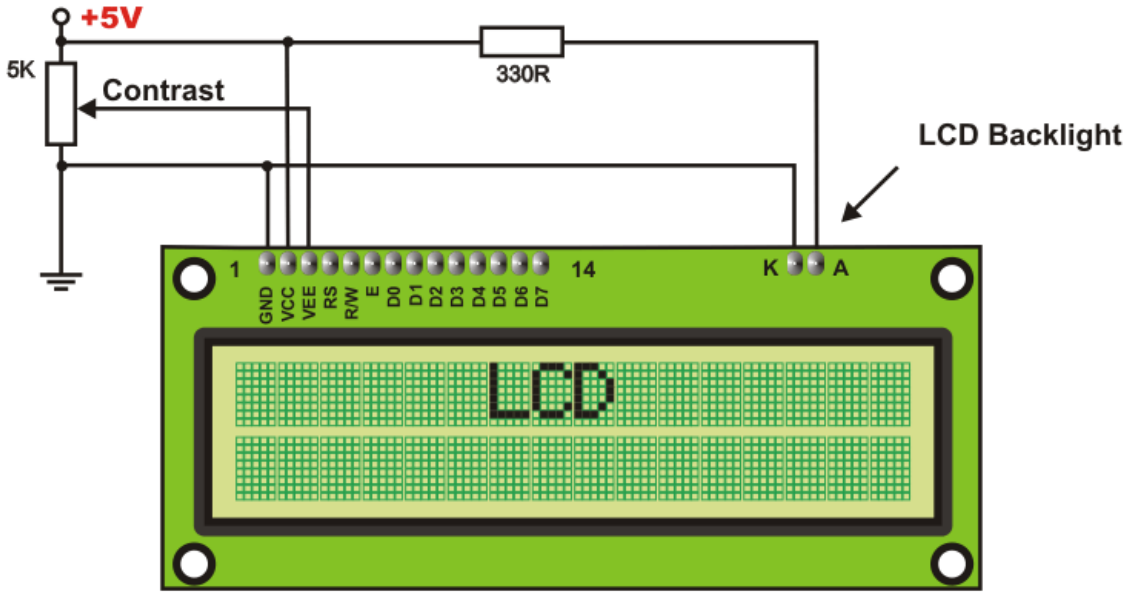
There are pins along one side of the small printed board used for connection to the microcontroller. There are total of 14 pins marked with numbers (16 in case the background light is built in). Their function is described in the table below:

Function	Pin Number	Name	Logic State	Description
Ground	1	Vss	-	0V
Power supply	2	Vdd	-	+5V
Contrast	3	Vee	-	0 – Vdd
Control of operating	4	RS	0 1	D0 – D7 are interpreted as commands D0 – D7 are interpreted as data
Control of operating	4	RS	0 1	D0 – D7 are interpreted as commands D0 – D7 are interpreted as data
	5	R/W	0 1	Write data (from controller to LCD) Read data (from LCD to controller)
	6	E	0 1 From 1 to 0	Access to LCD disabled Normal operating Data/commands are transferred to LCD
Data /	7	D0	0/1	Bit 0 LSB

commands	8	D1	0/1	Bit 1
	9	D2	0/1	Bit 2
	10	D3	0/1	Bit 3
	11	D4	0/1	Bit 4
	12	D5	0/1	Bit 5
	13	D6	0/1	Bit 6
	14	D7	0/1	Bit 7 MSB

LCD screen:

LCD screen consists of two lines with 16 characters each. Each character consists of 5x7 dot matrix. Contrast on display depends on the power supply voltage and whether messages are displayed in one or two lines. For that reason, variable voltage 0-Vdd is applied on pin marked as Vee. Trimmer potentiometer is usually used for that purpose. Some versions of displays have built in backlight (blue or green diodes). When used during operating, a resistor for current limitation should be used (like with any LE diode).



LCD Basic Commands

All data transferred to LCD through outputs D0-D7 will be interpreted as commands or as data, which depends on logic state on pin RS:

RS = 1 - Bits D0 - D7 are addresses of characters that should be displayed. Built in processor addresses built in “map of characters” and displays corresponding symbols. Displaying position is determined by DDRAM address. This address is either previously defined or the address of previously transferred character

is automatically incremented.

RS = 0 - Bits D0 - D7 are commands which determine display mode. List of commands which LCD recognizes are given in the table below:

Command	**RS**	**RW**	**D7**	**D6**	**D5**	**D4**	**D3**	**D2**	**D1**	**D0**	**Execution Time**
Clear display	0	0	0	0	0	0	0	0	0	1	1.64Ms
Cursor home	0	0	0	0	0	0	0	0	1	x	1.64mS
Entry mode set	0	0	0	0	0	0	0	1	I/D	S	40uS
Display on/off control	0	0	0	0	0	0	1	D	U	B	40uS
Cursor/Display Shift	0	0	0	0	0	1	D/C	R/L	x	x	40uS
Function set	0	0	0	0	1	DL	N	F	x	x	40uS
Set CGRAM address	0	0	0	1	CGRAM address						40uS
Set DDRAM address	0	0	1	DDRAM address							40uS
Read “BUSY” flag (BF)	0	1	BF	DDRAM address							-
Write to CGRAM or DDRAM	1	0	D7	D6	D5	D4	D3	D2	D1	D0	40uS
Read from CGRAM or DDRAM	1	1	D7	D6	D5	D4	D3	D2	D1	D0	40uS

I/D 1 = Increment (by 1)

0 = Decrement (by 1)

S 1 = Display shift on

0 = Display shift off

D 1 = Display on

0 = Display off

U 1 = Cursor on

0 = Cursor off

B 1 = Cursor blink on

0 = Cursor blink off

R/L 1 = Shift right

0 = Shift left

DL 1 = 8-bit interface

0 = 4-bit interface

N 1 = Display in two lines

0 = Display in one line

F 1 = Character format 5x10 dots

0 = Character format 5x7 dots

D/C 1 = Display shift

0 = Cursor shift

LCD Connection

Depending on how many lines are used for connection to the microcontroller, there are 8-bit and 4-bit LCD modes. The appropriate mode is determined at the beginning of the process in a phase called “initialization”. In the first case, the data are transferred through outputs D0-D7 as it has been already explained. In case of 4-bit LED mode, for the sake of saving valuable I/O pins of the microcontroller, there

are only 4 higher bits (D4-D7) used for communication, while other may be left unconnected.

Consequently, each data is sent to LCD in two steps: four higher bits are sent first (that normally would be sent through lines D4-D7), four lower bits are sent afterwards. With the help of initialization, LCD will correctly connect and interpret each data received. Besides, with regards to the fact that data are rarely read from LCD (data mainly are transferred from microcontroller to LCD) one more I/O pin may be saved by simple connecting R/W pin to the Ground. Such saving has its price.

Even though message displaying will be normally performed, it will not be possible to read from busy flag since it is not possible to read from display.

LCD Initialization

Once the power supply is turned on, LCD is automatically cleared. This process lasts for approximately 15mS. After that, display is ready to operate. The mode of operating is set by default. This means that:

1. Display is cleared
2. Mode
   DL = 1 Communication through 8-bit interface
   N = 0 Messages are displayed in one line
   F = 0 Character font 5 x 8 dots
3. Display/Cursor on/off
   D = 0 Display off
   U = 0 Cursor off
   B = 0 Cursor blink off
4. Character entry
   ID = 1 Addresses on display are automatically incremented by 1
   S = 0 Display shift off

Automatic reset is mainly performed without any problems. If for any reason power supply voltage does not reach full value in the course of 10mS, display will start perform completely unpredictably.

If voltage supply unit cannot meet this condition or if it is needed to provide completely safe operating, the process of initialization by which a new reset enabling display to operate normally must be applied.

Algorithm according to the initialization is being performed depends on whether connection to the microcontroller is through 4- or 8-bit interface. All left over to be done after that is to give basic commands and of course- to display messages.

DF MINI PLAYER

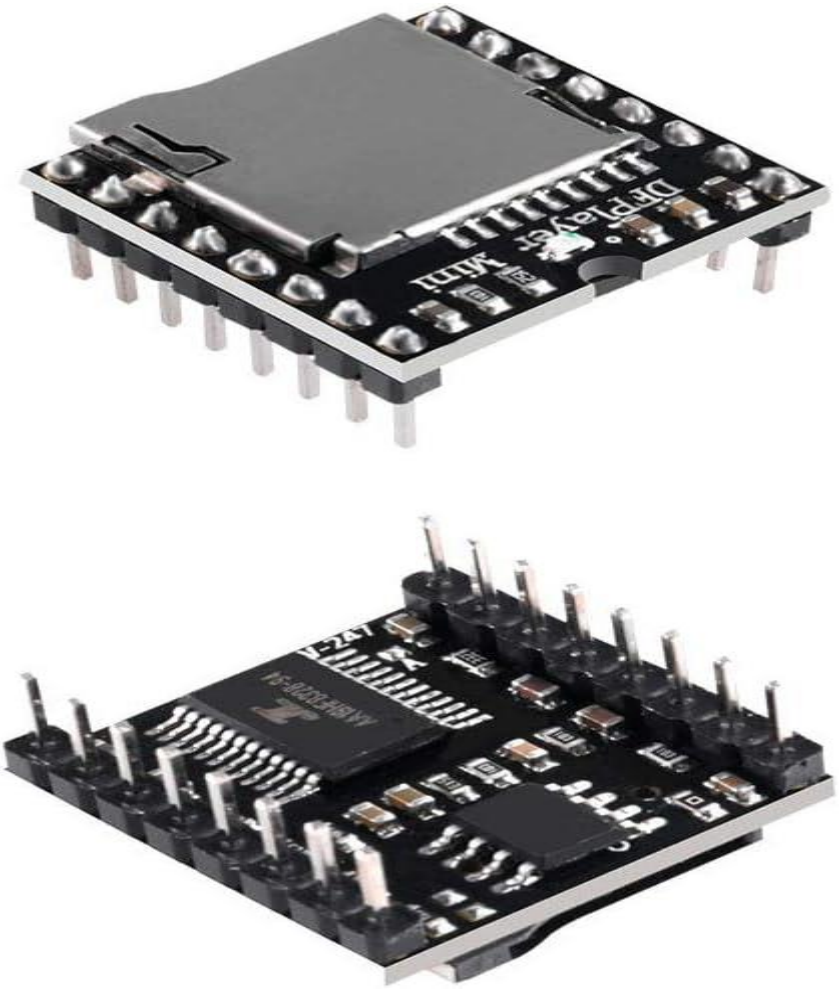


FIG. DF MINI PLAYER

DFPLayer Mini module is a serial MP3 module provides the perfect integrated MP3, WMV hardware decoding. While the software supports TF card driver, supports FAT16, FAT32 file system. Through simple serial commands to specify music playing, as well as how to play music and other functions, without the cumbersome underlying operating, easy to use, stable and reliable are the most important features of this module.

Features

- Support Mp3 and WMV decoding
- Support sampling rate of 8KHz,11.025KHz,12KHz,16KHz,22.05KHz,24KHz,32KHz,44.1KHz,48KHz
- 24-bit DAC output, dynamic range support 90dB, SNR supports 85dB
- Supports FAT16, FAT32 file system, maximum support 32GB TF card
- A variety of control modes, serial mode, AD key control mode

- The broadcast language spots feature, you can pause the background music being played
- Built-in 3W amplifier
- The audio data is sorted by folder; supports up to 100 folders, each folder can be assigned to 1000 songs
- 30 levels volume adjustable, 10 levels EQ adjustable.

Application

- Car navigation voice broadcast
- Road transport inspectors, toll stations voice prompts
- Railway station, bus safety inspection voice prompts
- Electricity, communications, financial business hall voice prompts
- Vehicle into and out of the channel verify that the voice prompts
- The public security border control channel voice prompts
- Multi-channel voice alarm or equipment operating guide voice
- The electric tourist car safe driving voice notices
- Electromechanical equipment failure alarm
- Fire alarm voice prompts
- The automatic broadcast equipment, regular broadcast.

Module Application Instruction

Specification Description

Item	Description
MP3Format	1、Support 11172-3 and ISO13813-3 layer3 audio decoding
	2、Support sampling rate (KHZ):8/11.025/12/16/22.05/24/32/44.1/48
	3、Support Normal、Jazz、Classic、Pop、Rock etc
UART Port	Standard Serial; TTL Level; Baud rate adjustable(default baud rate is 9600)
Working Voltage	DC3.2~5.0V; Type :DC4.2V
Standby Current	20mA
Operating Temperature	-40~+70
Humidity	5% ~95%

Table 2.1 Specification Description

Pin Description

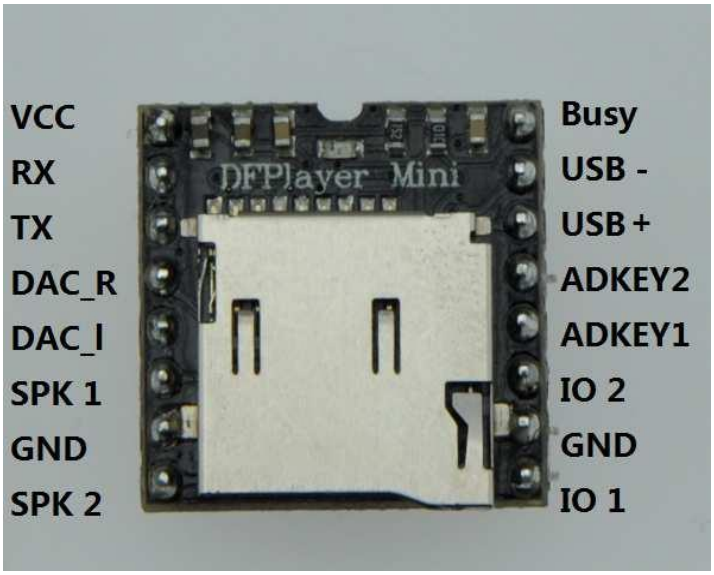


FIG. PIN DESCRIPTION

No	Pin	Description	Note
1	VCC	Input Voltage	DC3.2~5.0V;Type: DC4.2V
2	RX	UART serial input	
3	TX	UART serial output	
4	DAC_R	Audio output right channel	Drive earphone and amplifier
5	DAC_L	Audio output left channel	Drive earphone and amplifier
6	SPK2	Speaker-	Drive speaker less than 3W
7	GND	Ground	Power GND
8	SPK1	Speaker+	Drive speaker less than 3W
9	IO1	Trigger port 1	Short press to play previous（long press to decrease volume）
10	GND	Ground	Power GND
11	IO2	Trigger port 2	Short press to play next（long press to increase volume）
12	ADKEY1	AD Port 1	Trigger play first segment
13	ADKEY2	AD Port 2	Trigger play fifth segment
14	USB+	USB+ DP	USB Port
15	USB-	USB- DM	USB Port
16	BUSY	Playing Status	Low means playing \High means no

Table 2.2 Pin Description

SPEAKERS

An **electrodynamic speaker driver**, often called simply a **speaker driver** when the type is implicit, is an individual transducer that converts an electrical audio signal to sound waves. While the term is sometimes used interchangeably with the term *speaker* (*loudspeaker*), it is usually applied to specialized transducers which reproduce only a portion of the audible frequency range. For high fidelity reproduction of sound, multiple loudspeakers are often mounted in the same enclosure, each reproducing a different part of the audible frequency range. In this case the individual speakers are referred to as *drivers* and the entire unit is called a *loudspeaker*. Drivers made for reproducing high audio frequencies are called tweeters, those for middle frequencies are called mid-range drivers, and those for low frequencies are called woofers, while those for very low bass range are subwoofers. Less common types of drivers are supertweeters and rotary woofers.

The electroacoustic mechanism most widely used in speakers to convert the electric current to sound waves is the *dynamic* or *electrodynamic* driver, invented in 1925 by Edward W. Kellogg and Chester W. Rice, which creates sound with a coil of wire called a voice coil suspended between the poles of a magnet. There are others which are far less widely used: electrostatic drivers, piezoelectric drivers, planar magnetic drivers, Heil air motion drivers, and ionic drivers, among others

FIG. SPEAKER

Components

Cut-away view of a dynamic loudspeaker

Speaker drivers include a diaphragm that moves back and forth to create pressure waves in the air column in front, and depending on the application, at some angle to the sides. The diaphragm is typically in the shape of

a cone for low and mid frequencies or a dome for higher frequencies, or less commonly, a ribbon, and is usually made of coated or uncoated paper or polypropylene plastic. More exotic materials are used on some drivers, such as woven fiberglass, carbon fiber, aluminum, titanium, pure cross carbon and a very few use PEI, polyimide, PET film plastic film as the cone, dome or radiator.

All speaker drivers have a means of electrically inducing back-and-forth motion. Typically there is a tightly wound coil of insulated wire (known as a voice coil) attached to the neck of the driver's cone. In a ribbon speaker the voice coil may be printed or bonded onto a sheet of very thin paper, aluminum, fiberglass or plastic. This cone, dome or other radiator is mounted at its outer edge by a flexible surround to a rigid frame which supports a permanent magnet in close proximity to the voice coil. For the sake of efficiency the relatively lightweight voice coil and cone are the moving parts of the driver, whereas the much heavier magnet remains stationary. Other typical components are a spider or damper, used as the rear suspension element, simple terminals or binding posts to connect the audio signal, and possibly a compliant gasket to seal the joint between the chassis and enclosure.

Operation

In operation, a signal is delivered to the voice coil by means of electrical wires, from the amplifier through speaker cable, then through flexible tinsel wire to the moving coil. The current creates a magnetic field that causes the diaphragm to be alternately forced one way or the other, by the magnetic field produced by current flowing in the voice coil, against the field established in the magnetic gap by the fixed magnet structure as the electrical signal varies. The resulting back-and-forth motion drives the air in front of the diaphragm, resulting in pressure differentials that travel away as sound waves.

The spider and surround act as a spring restoring mechanism for motion away from the balanced position established when the driver was assembled at the factory. In addition, each contributes to centering the voice coil and cone, both concentrically within the magnet assembly, and front-to-back, restoring the voice coil to a critical position within the magnetic gap, neither toward one end nor the other.

The voice coil and magnet essentially form a linear motor working against the centering "spring tension" of the spider and surround. If there were no restriction on travel distance imposed by the spider and surround, the voice coil could be ejected from the magnet assembly at high power levels, or travel inward deep enough to collide with the back of the magnet assembly. The majority of speaker drivers work only against the centering forces of the spider and surround, and do not actively monitor the position of the driver element or attempt to precisely position it. Some speaker driver designs have provisions to do so (typically termed servomechanisms); these are generally used only in woofers and especially subwoofers, due to the greatly increased cone excursions required at those frequencies in a driver whose cone size is well under the

wavelength of the some of the sounds it is made to reproduce (I.e, bass frequencies below perhaps 100 Hz or so).

Applications

Speaker drivers are the primary means for sound reproduction. They are used among other places in audio applications such as loudspeakers, headphones, telephones, megaphones, instrument amplifiers, television and monitor speakers, public address systems, portable radios, toys, and in many electronics devices that are designed to emit sound.

Performance characteristics

Speaker drivers may be designed to operate within a broad or narrow frequency range. Small diaphragms are not well suited to moving the large volume of air that is required for satisfying low frequency response. Conversely, large drivers may have heavy voice coils and cones that limit their ability to move at very high frequencies. Drivers pressed beyond their design limits may have high distortion. In a multi-way loudspeaker system, specialized drivers are provided to produce specific frequency ranges, and the incoming signal is split by a crossover. Drivers can be sub-categorized into several types: full-range, tweeters, super tweeters, mid-range drivers, woofers, and subwoofers

CHAPTER-3

ARDUINO UNO

3.1 Microcontroller:

3.1.1 Introduction:

Microcontroller as the name suggest, a small controller. They are like single chip computers that are often embedded into other systems to function as processing/controlling unit. For example, the control you are using probably has microcontrollers inside that do decoding and other controlling functions. They are also used in automobiles, washing machines, microwaves ovens, toys….etc, where automation is needed.

3.1.2 Arduino Uno Microcontroller:

The Arduino Uno is a microcontroller board based on the ATmega328 (datasheet). It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started.

The Uno differs from all preceding boards in that it does not use the FTDI USB-to-serial driver chip. Instead, it features the Atmega8U2 programmed as a USB-to-serial converter. "Uno" means "One" in Italian and is named to mark the upcoming release of Arduino 1.0. The Uno and version 1.0 will be the reference versions of Arduino, moving forward. The Uno is the latest in a series of USB Arduino boards, and the reference model for the Arduino platform; for a comparison with previous versions, see the index of Arduino boards.

The Arduino Uno can be powered via the USB connection or with an external power supply. The power source is selected automatically. External (non-USB) power can come either from an AC-to-DC adapter (wall-wart) or battery. The adapter can be connected by plugging a 2.1mm center-positive plug into the board's power jack. Leads from a battery can be inserted in the Gnd and Vin pin headers of the POWER connector. The board can operate on an external supply of 6 to 20 volts. If supplied with less than 7V, however, the 5Vpin may supply less than five volts and the board may be unstable. If using more than 12V, the voltage regulator may overheat and damage the board. The recommended range is 7 to 12 volts

The power pins are as follows:·

- **VIN.** The input voltage to the Arduino board when it's using an external power source (as opposed to5 volts from the USB connection or other regulated power source). You can supply voltage through this pin, or, if supplying voltage via the power jack, access it through this pin.·
- **5V.** The regulated power supply used to power the microcontroller and other components on the board. This can come either from VIN via an on-board regulator, or be supplied by USB or another regulated 5V supply.
- **3.3V.**A 3.3 volt supply generated by the on-board regulator. Maximum current draw is 50 mA.
- **GND.** Ground pins.

Memory:

The Atmega328 has 32 KB of flash memory for storing code (of which 0,5 KB is used for the bootloader); It has also 2 KB of SRAM and 1 KB of EEPROM (which can be read and written with the EEPROM library).

Input and Output:

Each of the 14 digital pins on the Uno can be used as an input or output, using pin Model(), digital Write(), and digital Read() functions. They operate at 5 volts. Each pin can provide or receive a maximum of 40 mA and has an internal pull-up resistor (disconnected by default) of 20-50 k Ohms. In addition, some pins have specialized functions:

- **Serial: 0 (RX) and 1 (TX).** Used to receive (RX) and transmit (TX) TTL serial data. These pins are connected to the corresponding pins of the ATmega8U2 USB-to-TTL Serial chip.
- **External Interrupts: 2 and 3.** These pins can be configured to trigger an interrupt on a low value, arising or falling edge, or a change in value. See the attach Interrupt () function for details.
- **PWM: 3, 5, 6, 9, 10, and 11.** Provide 8-bit PWM output with the analog Write () function.
- **SPI: 10 (SS), 11 (MOSI), 12 (MISO), 13 (SCK).** These pins support SPI communication, which although provided by the underlying hardware, is not currently included in the Arduino language.
- **LED: 13.** There is a built-in LED connected to digital pin 13. When the pin is HIGH value, the LED is on, when the pin is LOW, it's off.

The Uno has 6 analog inputs, each of which provide 10 bits of resolution (i.e. 1024 different values). By default they measure from ground to 5 volts, though is it possible to change the upper end of their range using the AREF pin and the analog Reference() function. Additionally, some pins have specialized

functionality:

- **I2C: 4 (SDA) and 5 (SCL).** Support I2C (TWI) communication using the Wire library. There are a couple of other pins on the board:
- **AREF.** Reference voltage for the analog inputs. Used with analog Reference().
- **Reset.** Bring this line LOW to reset the microcontroller. Typically used to add a reset button to shields which block the one on the board.

Communication:

The Arduino Uno has a number of facilities for communicating with a computer, another Arduino, or other microcontrollers. The ATmega328 provides UART TTL (5V) serial communication, which is available on digital pins 0 (RX) and 1 (TX). An ATmega8U2 on the board channels this serial communication over USB and appears as a virtual com port to software on the computer. The '8U2 firmware uses the standard USBCOM drivers, and no external driver is needed. However, on Windows, an *.inf file is required. The Arduino software includes a serial monitor which allows simple textual data to be sent to and from the Arduino board. The RX and TX LEDs on the board will flash when data is being transmitted via the USB-to serial chip and USB connection to the computer (but not for serial communication on pins 0 and 1). A Software Serial library allows for serial communication on any of the Uno's digital pins. The ATmega328 also support I2C (TWI) and SPI communication. The Arduino software includes a Wire library to simplify use of the I2C bus

3.1.3 ARDUINO UNO BOARD:

The Arduino Uno is a microcontroller board based on the ATmega328. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz ceramic resonator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started.

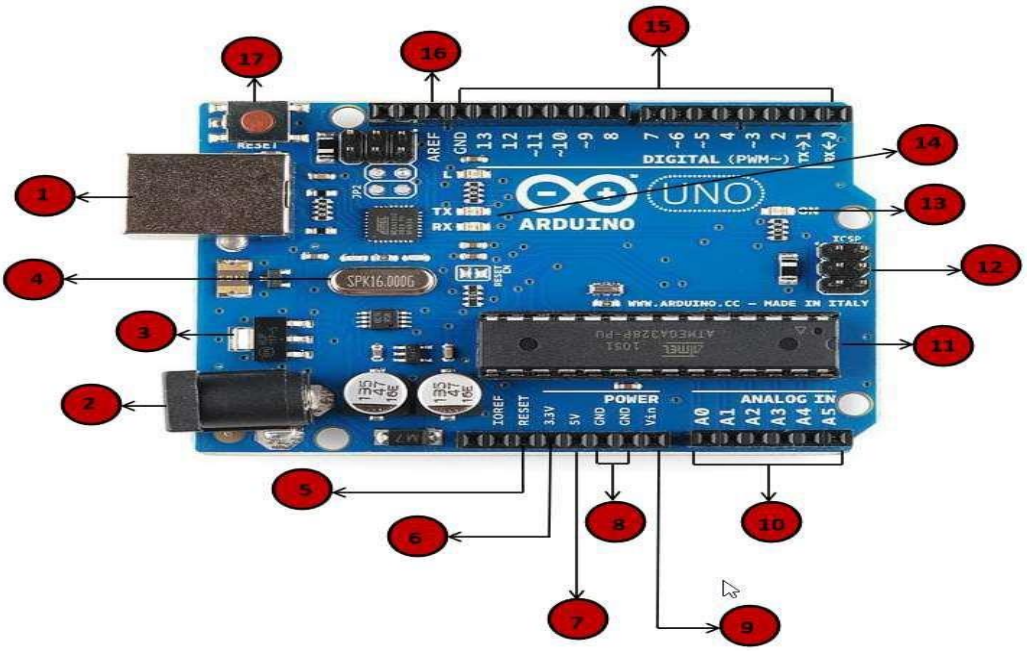


Figure 3.1: Arduino uno board

The Uno differs from all preceding boards in that it does not use the FTDI USB-to-serial driver chip. Instead, it features the Atmega16U2 (Atmega8U2 up to version R2) programmed as a USB-to-serial converters

3.1.4 Technical Specifications:

FEATURE	SPECIFICATION
Microcontroller	ATmega328
Operating Voltage	5V
Input Voltage (recommended)	7-12V
Input Voltage (limits)	6-20V
Digital I/O Pins	14 (of which 6 provide PWM output)
Analog Input Pins	6
DC Current per I/O Pin	40 mA
DC Current for 3.3V Pin	50 mA
Flash Memory	32 KB (ATmega328) of which 0.5 KB used by boot loader
SRAM	2 KB (ATmega328)
EEPROM	1 KB (ATmega328)
Clock Speed	16 MHz

Table 3.1: Arduino uno specifications

The Arduino Uno can be powered via the USB connection or with an external power supply. The power source is selected automatically. External (non-USB) power can come either from an AC-to-DC adapter (wall-wart) or battery. The adapter can be connected by plugging a 2.1mm center-positive plug into the board's power jack. Leads from a battery can be inserted in the Gnd and Vin pin headers of the POWER connector. The board can operate on an external supply of 6 to 20 volts. If supplied with less than 7V, however, the 5V pin may supply less than five volts and the board may be unstable. If using more than 12V, the voltage regulator may overheat and damage the board. The recommended range is 7 to 12 volts.

1. **USB Interface:**

Arduino board can be powered by using the USB cable from your computer. All you need to do is connect the USB cable to the USB connection

2. **External power supply:**

Arduino boards can be powered directly from the AC mains power supply by connecting it to the power supply (Barrel Jack)

3. **Voltage Regulator:**

The function of the voltage regulator is to control the voltage given to the Arduino board and stabilize the DC voltages used by the processor and other elements.

4. **Crystal Oscillator:**

The crystal oscillator helps Arduino in dealing with time issues. How does Arduino calculate time? The answer is, by using the crystal oscillator. The number printed on top of the Arduino crystal is 16.000H9H. It tells us that the frequency is 16,000,000 Hertz or 16 MHz.

5-17.Arduino Reset:

It can reset your Arduino board, i.e., start your program from the beginning. It can reset the UNO board in two ways. First, by using the reset button (17) on the board. Second, you can connect an external reset button to the Arduino pin labelled RESET (5).

6-9.Pins (3.3, 5, GND, Vin):

- 3.3V (6): Supply 3.3 output volt

- 5V (7): Supply 5 output volt
- Most of the components used with Arduino board works fine with 3.3 volt and 5 volt.
- GND (8)(Ground): There are several GND pins on the Arduino, any of which can be used to ground your circuit.
- Vin (9): This pin also can be used to power the Arduino board from an external power source, like AC mains power supply.

10. Analog pins:

The Arduino UNO board has five analog input pins A0 through A5. These pins can read the signal from an analog sensor like the humidity sensor or temperature sensor and convert it into a digital value that can be read by the microprocessor.

11. Main microcontroller:

Each Arduino board has its own microcontroller (11). You can assume it as the brain of your board. The main IC (integrated circuit) on the Ardsuino is slightly different from board to board. The microcontrollers are usually of the ATMEL Company. You must know what IC your board has before loading up a new program from the Arduino IDE. This information is available on the top of the IC. For more details about the IC construction and functions, you can refer to the data sheet.

Tthe Atmega8U2 programmed as a USB-to-serial converter. "Uno" means "One" in Italian and is named to mark the upcoming release of Arduino 1.0. The Uno and version 1.0 will be the reference versions of Arduino, moving forward. The Uno is the latest in a series of USB Arduino boards, and the reference model for the Arduino platform; for a comparison with previous versions, see the index of Arduino boards

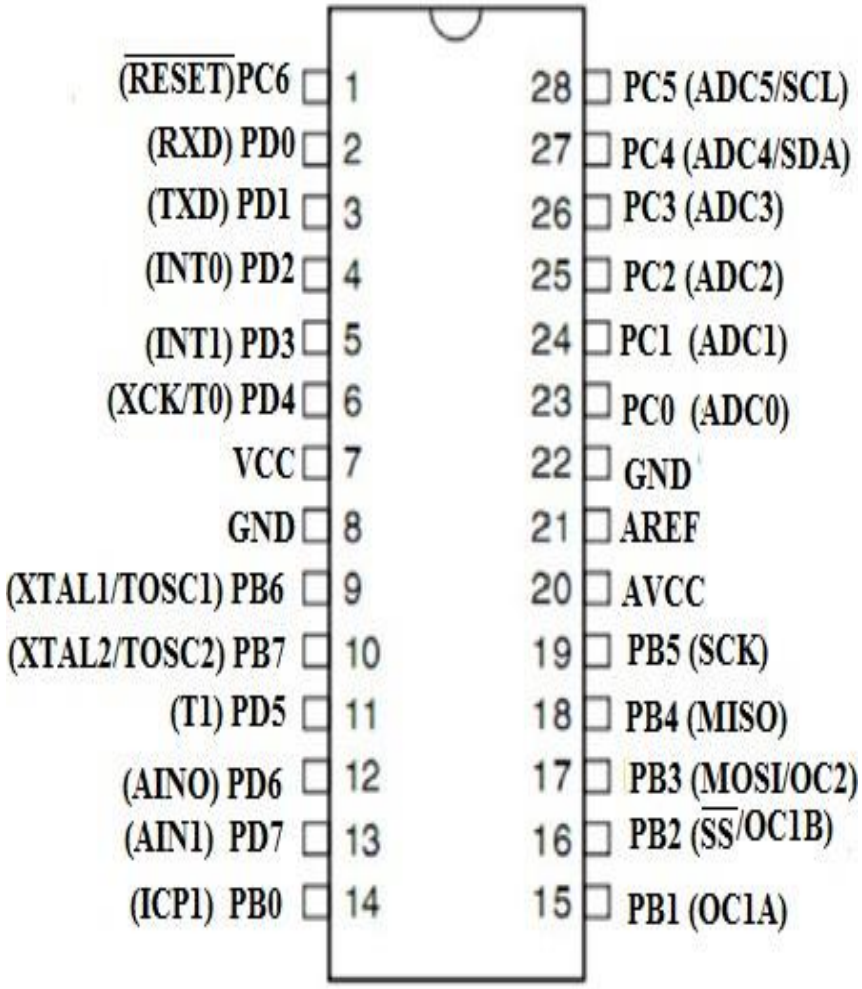


Figure 3.2: Pin diagram

3.1.3.2 Pin Description:

VCC: Digital supply voltage.

GND: Ground.

Port B (PB[7:0]) XTAL1/XTAL2/TOSC1/TOSC2:

Port B is an 8-bit bi-directional I/O port with internal pull-up resistors (selected for each bit). The Port B output buffers have symmetrical drive characteristics with both high sink and source capability. As inputs, Port B pins that are externally pulled low will source current if the pull-up resistors are activated. The Port B pins are tri-stated when a reset condition becomes active, even if the clock is not running.

Depending on the clock selection fuse settings, PB6 can be used as input to the inverting Oscillator amplifier and input to the internal clock operating circuit.

Depending on the clock selection fuse settings, PB7 can be used as output from the inverting Oscillator amplifier.

If the Internal Calibrated RC Oscillator is used as chip clock source, PB[7:6] is used as TOSC[2:1] input for the Asynchronous Timer/Counter2 if the AS2 bit in ASSR is set.

Port C (PC[5:0]):

Port C is a 7-bit bi-directional I/O port with internal pull-up resistors (selected for each bit). The PC[5:0] output buffers have symmetrical drive characteristics with both high sink and source capability. As inputs,

Port C pins that are externally pulled low will source current if the pull-up resistors are activated. The Port C pins are tri-stated when a reset condition becomes active, even if the clock is not running.

PC6/RESET:

If the RSTDISBL Fuse is programmed, PC6 is used as an I/O pin. Note that the electrical characteristics of PC6 differ from those of the other pins of Port C.

If the RSTDISBL Fuse is unprogrammed, PC6 is used as a Reset input. A low level on this pin for longer than the minimum pulse length will generate a Reset, even if the clock is not running. Shorter pulses are not guaranteed to generate a Reset.

PC6/RESET:

If the RSTDISBL Fuse is programmed, PC6 is used as an I/O pin. Note that the electrical characteristics of PC6 differ from those of the other pins of Port C.

If the RSTDISBL Fuse is unprogrammed, PC6 is used as a Reset input. A low level on this pin for longer than the minimum pulse length will generate a Reset, even if the clock is not running. Shorter pulses are not guaranteed to generate a Reset.

Port D (PD[7:0]):

Port D is an 8-bit bi-directional I/O port with internal pull-up resistors (selected for each bit). The Port D output buffers have symmetrical drive characteristics with both high sink and source capability. As inputs, Port D pins that are externally pulled low will source current if the pull-up resistors are activated. The Port D pins are tri-stated when a reset condition becomes active, even if the clock is not running.

AVCC: AVCC is the supply voltage pin for the A/D Converter, PC[3:0], and PE[3:2]. It should be externally connected to VCC, even if the ADC is not used. If the ADC is used, it should be connected to VCC through a low-pass filter. Note that PC[6:4] use digital supply voltage, VCC.

AREF: AREF is the analog reference pin for the A/D Converter.

ADC [7:6] (TQFP and VFQFN Package Only): In the TQFP and VFQFN package, ADC[7:6] serve as analog inputs to the A/D converter. These pins are powered from the analog supply and serve as 10-bit ADC channels.

12. ICSP pin: Mostly, ICSP (12) is an AVR, a tiny programming header for the Arduino consisting of MOSI, MISO, SCK, RESET, VCC, and GND. It is often referred to as an SPI (Serial Peripheral Interface), which could be considered as an "expansion" of the output. Actually, you are slaving the output device to the master of the SPI bus.

13. Power LED indicator: This LED should light up when you plug your Arduino into a power source to indicate that your board is powered up correctly. If this light does not turn on, then there is something wrong with the connection.

14. TX and RX LEDs: On your board, you will find two labels: TX (transmit) and RX (receive). They appear in two places on the Arduino UNO board. First, at the digital pins 0 and 1, to indicate the pins responsible for serial communication. Second, the TX and RX led (13). The TX led flashes with different speed while sending the serial data. The speed of flashing depends on the baud rate used by the board. RX flashes during the receiving process.

15. Digital I / O: The Arduino UNO board has 14 digital I/O pins (15) (of which 6 provide PWM (Pulse Width Modulation) output. These pins can be configured to work as input digital pins to read logic values (0 or 1) or as digital output pins to drive different modules like LEDs, relays, etc. The pins labeled "~" can be used to generate PWM.

16. AREF:AREF stands for Analog Reference. It is sometimes, used to set an external reference voltage (between 0 and 5 Volts) as the upper limit for the analog input pinsworking.

CHAPTER-4
HARDWARE COMPONENTS

4.1.POWER SUPPLY:

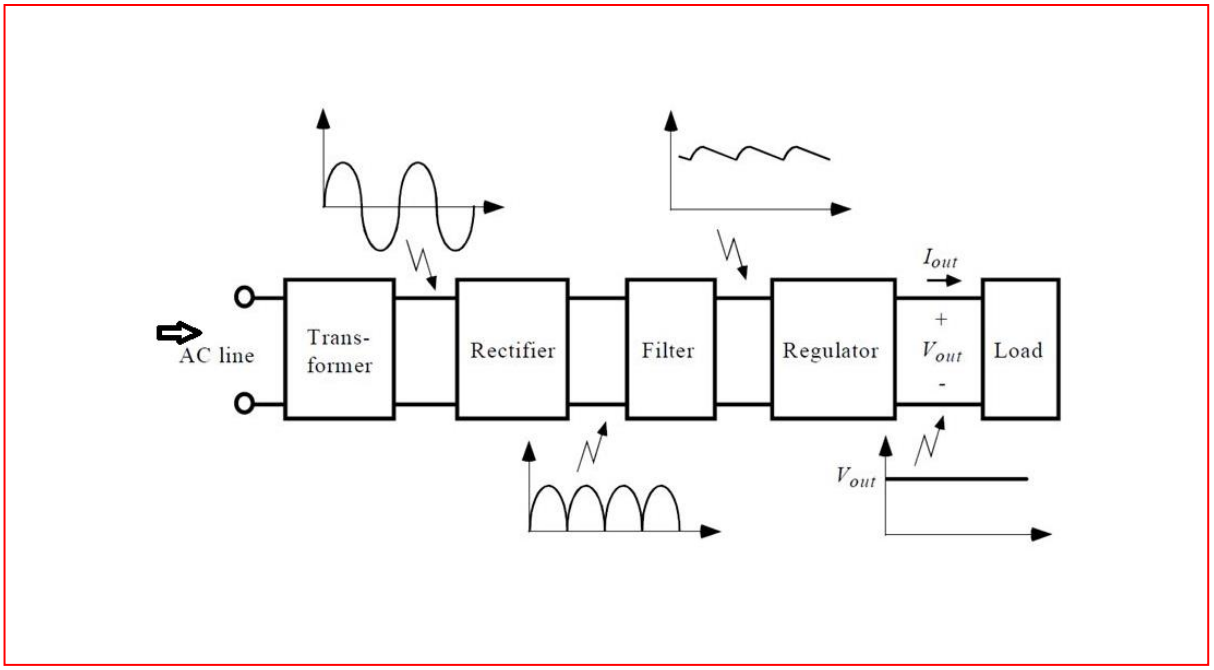


Figure.4.1.power supply

4.1.1.Transformer:

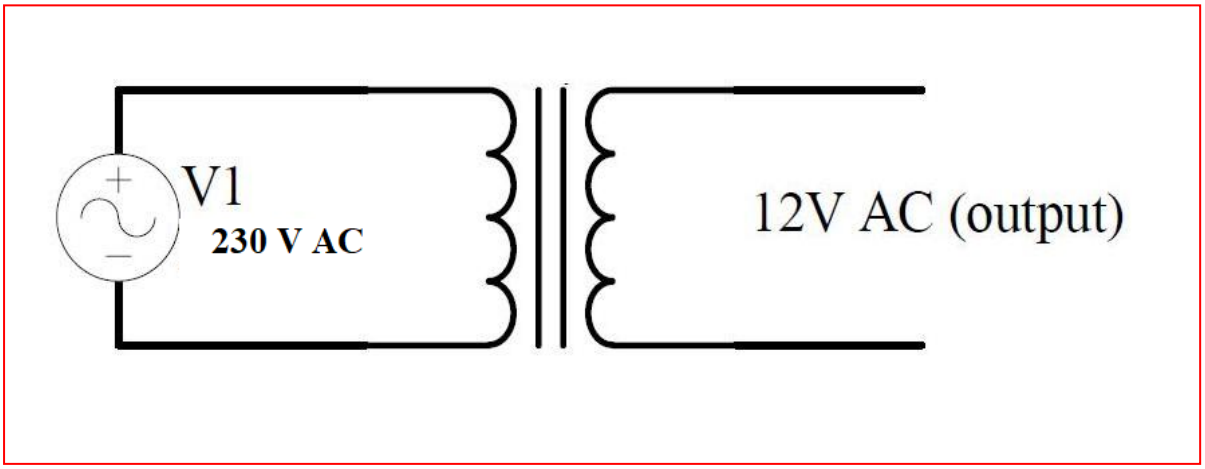
Transformer is a static device used to convert the voltage from one level to another level without change its frequency. There are two types of transformers

1. Step-up transformer
2. Step-down transformer

Step-up transformer converts low voltage level into high voltage level without change its frequency.

Step-down transformer converts high voltage level into low voltage level without change its frequency.

In this project we using step-down transformer which converts 230V AC to 12V AC [or] 230V AC to 5V as shown below.



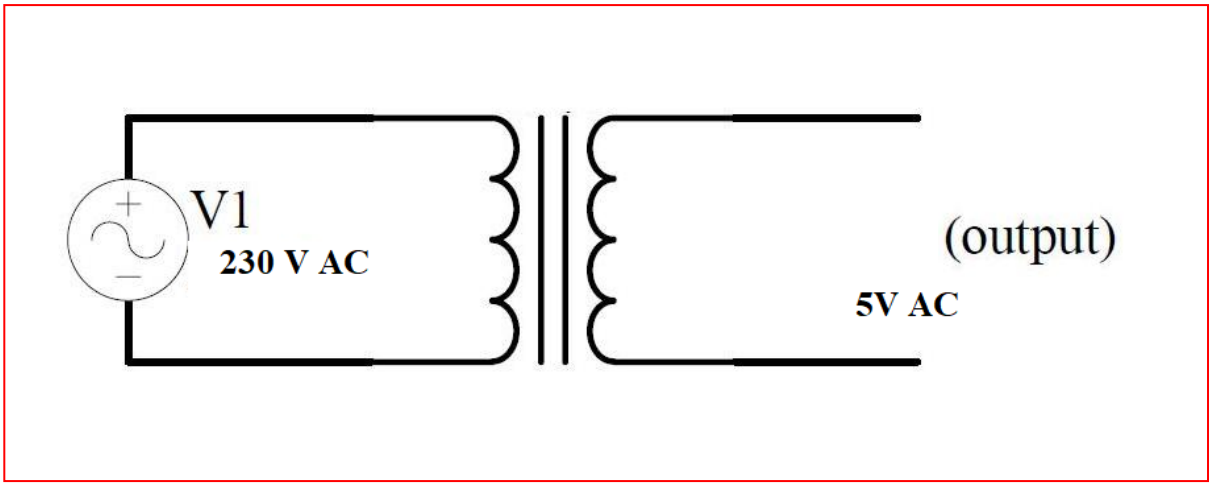


Figure.4.2.Transformers

4.1.2.Diodes:

Diodes allow electricity to flow in only one direction. The arrow of the circuit symbol shows the direction in which the current can flow. Diodes are the electrical version of a valve and early diodes were actually called valves.

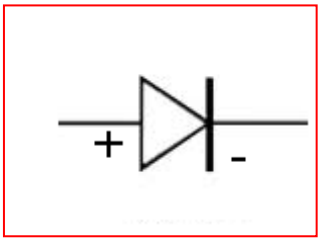


Figure.4.3. Diode Symbol

A **diode** is a device which only allows current to flow through it in one direction. In this direction, the diode is said to be 'forward-biased' and the only effect on the signal is that there will be a voltage loss of around 0.7V. In the opposite direction, the diode is said to be 'reverse-biased' and no current will flow through it.

4.1.3.Rectifier

The purpose of a rectifier is to convert an AC waveform into a DC waveform (OR) Rectifier converts AC current or voltages into DC current or voltage. There are two different rectification circuits, known as **'half-wave'** and **'full-wave' rectifiers**. Both use components called **diodes** to convert **AC into DC**.

The Half-wave Rectifier

The half-wave rectifier is the simplest type of rectifier since it only uses one diode, as shown in figure.

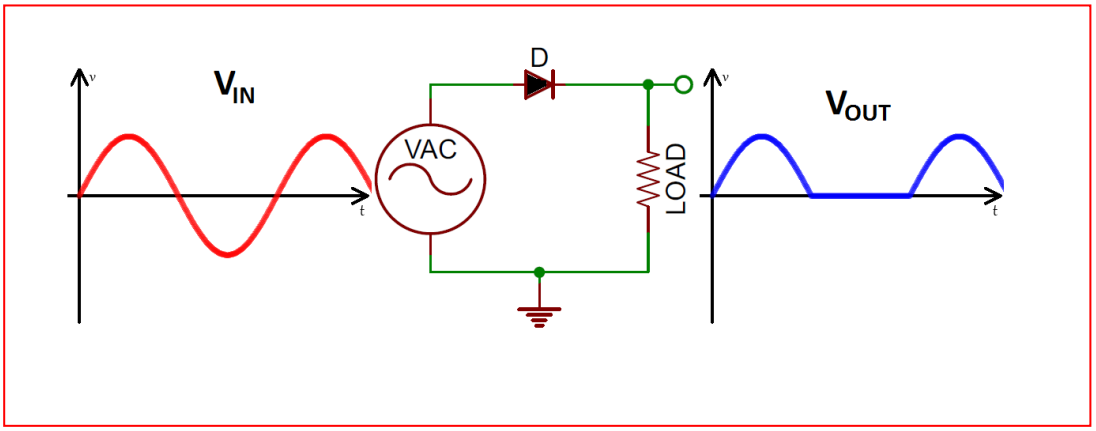


Figure.4.4.Half Wave Rectifier

Figure 2 shows the AC input waveform to this circuit and the resulting output. As you can see, when the AC input is positive, the diode is forward-biased and lets the current through. When the AC input is negative, the diode is reverse-biased and the diode does not let any current through, meaning the output is 0V. Because there is a 0.7V voltage loss across the diode, the peak output voltage will be 0.7V less than Vs.

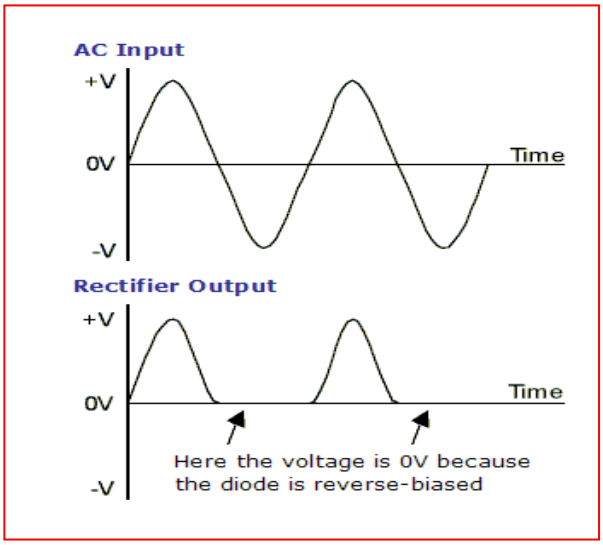


Figure.4.5Half-Wave Rectification

While the output of the half-wave rectifier is DC (it is all positive), it would not be suitable as a power supply for a circuit. Firstly, the output voltage continually varies between 0V and Vs-0.7V, and secondly, for half the time there is no output at all.

The Full-wave Bridge Rectifier

The circuit in figure 3 addresses the second of these problems since at no time is the output voltage 0V. This time four diodes are arranged so that both the positive and negative parts of the AC waveform are converted to DC. The resulting waveform is shown in figure 4.

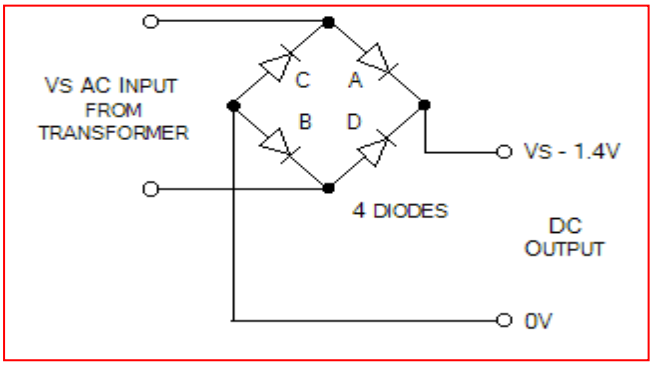


Figure.4.6. Full-Wave Rectifier

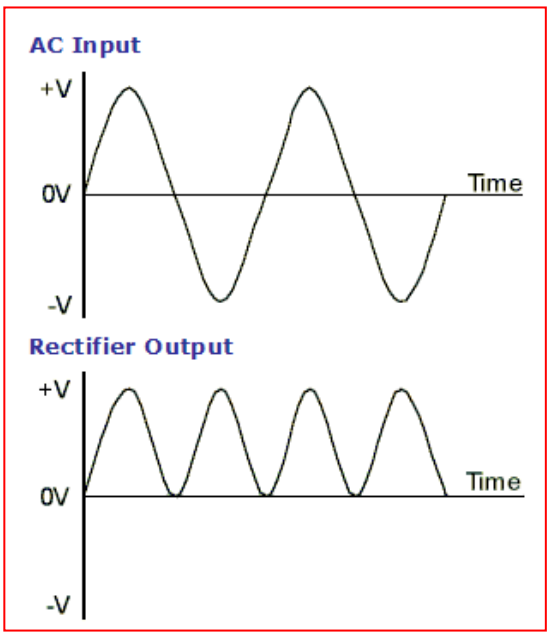


Figure.4.7. Full-Wave Rectification

When the AC input is positive, diodes A and B are forward-biased, while diodes C and D are reverse-biased. When the AC input is negative, the opposite is true - diodes C and D are forward-biased, while diodes A and B are reverse-biased.

While the full-wave rectifier is an improvement on the half-wave rectifier, its output still isn't suitable as a power supply for most circuits since the output voltage still varies between 0V and Vs-1.4V. So, if you put 12V AC in, you will 10.6V DC out.

4.1.4.Capacitor Filter

The **capacitor-input filter**, also called "Pi" filter due to its shape that looks like the Greek letterpi, is a type of electronic filter. Filter circuits are used to remove unwanted or undesired frequencies from a signal. A typical capacitor input filter consists of a filter capacitor C1, connected across the rectifier output. The capacitor C1 offers low reactance to the AC component of the rectifier output while it offers infinite reactance to the DC component. As a result the AC components are going to ground. At that time DC components are feed to Regulator.

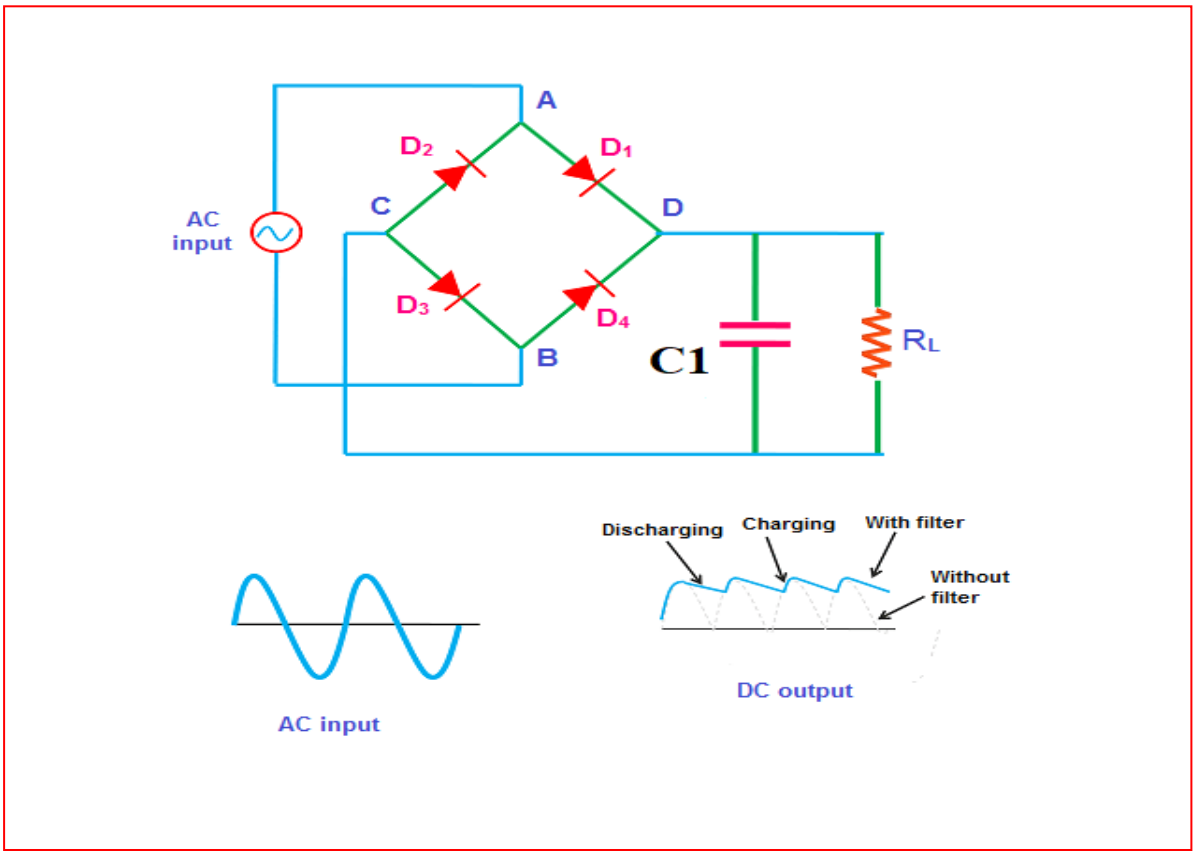


Figure.4.8.Centered Tapped Full-Wave Rectifier with a Capacitor Filter

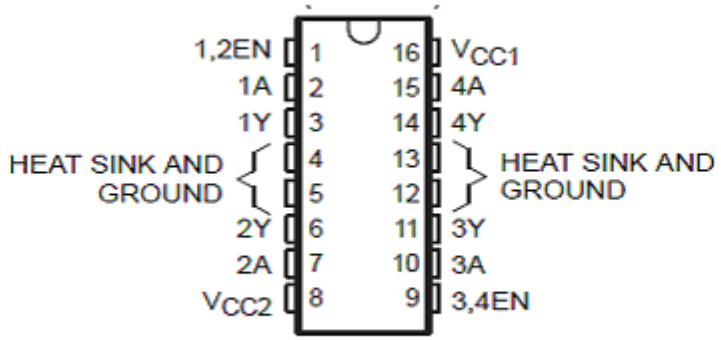
4.1.5. Voltage Regulator:

A **voltage regulator** is an electricalregulator designed to automatically maintain a constant voltage level. It may use an electromechanical mechanism, or passive or active electronic components. Depending on the design, it may be used to regulate one or more AC or DC voltages. There are two types of regulator are they.

- Positive Voltage Series (78xx) and
- Negative Voltage Series (79xx)

78xx:'78' indicate the positive series and 'xx' indicates the voltage rating. Suppose 7805 produces the maximum 5V.'05'indicates the regulator output is 5V.

L293D- Current Driver



Pin diagram

Features

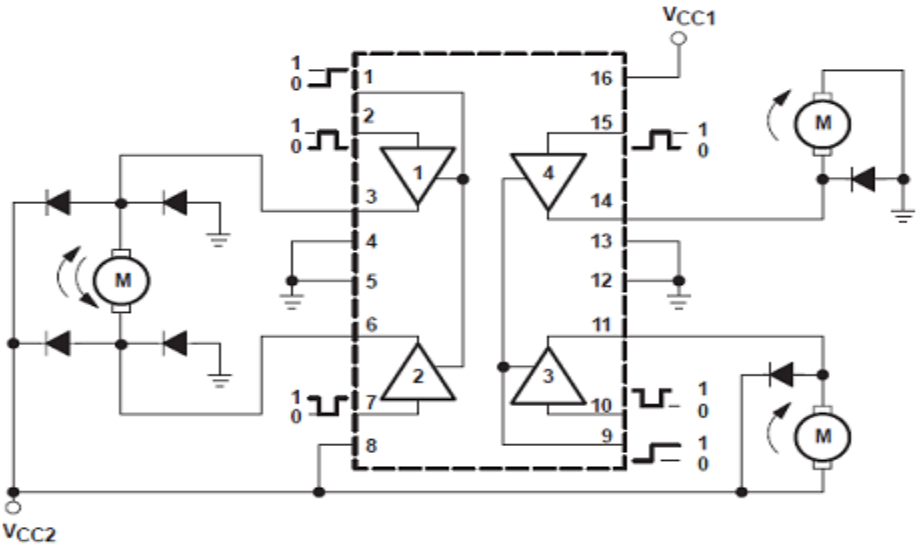
- Wide Supply-Voltage Range: 4.5 V to 36 V
- Separate Input-Logic Supply
- Internal ESD Protection
- Thermal Shutdown
- High-Noise-Immunity Inputs
- Functionally Similar to SGS L293 and SGS L293D
- Output Current 1 A Per Channel (600 mA for L293D)
- Peak Output Current 2 A Per Channel (1.2 A for L293D)
- Output Clamp Diodes for Inductive Transient Suppression (L293D)

Description

The L293 and L293D are quadruple high-current half-H drivers. The L293 is designed to provide bidirectional drive currents of up to 1 A at voltages from 4.5 V to 36 V. The L293D is designed to provide bidirectional drive currents of up to 600-mA at voltages from 4.5 V to 36 V. Both devices are designed to drive inductive loads such as relays, solenoids, dc and bipolar stepping motors, as well as other high-current/high-voltage loads in positive-supply applications.

All inputs are TTL compatible. Each output is a complete totem-pole drive circuit, with a Darlington transistor sink and a pseudo- Darlington source. Drivers are enabled in pairs, with drivers 1 and 2 enabled by 1,2EN and drivers 3 and 4 enabled by 3,4EN. When an enable input is high, the associated drivers are enabled and their outputs are active and in phase with their inputs. When the enable input is low, those drivers are disabled and their outputs are off and in the high-impedance state. With the proper data inputs, each pair of drivers forms a full-H (or bridge) reversible drive suitable for solenoid or motor applications. On the L293, external high-speed output clamp diodes should be used for inductive transient suppression.
A VCC1 terminal, separate from VCC2, is provided for the logic inputs to minimize device power dissipation. The L293 and L293D are characterized for operation from 0 to 70 degree Celsius.

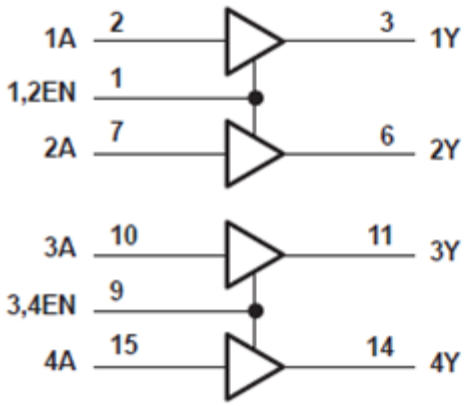
Block Diagram



FUNCTION TABLE
(each driver)

INPUTS†		OUTPUT
A	EN	Y
H	H	H
L	H	L
X	L	Z

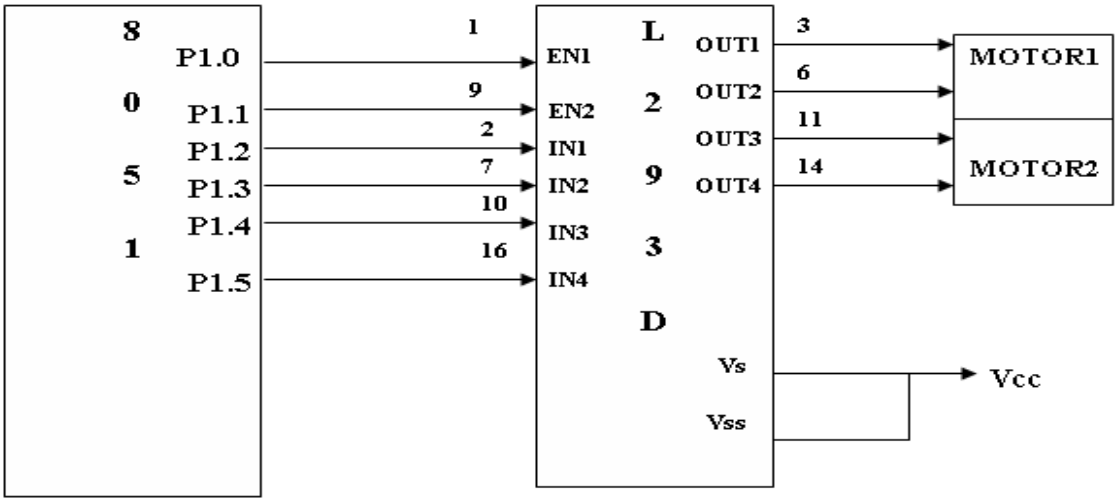
H = high level, L = low level, X = irrelevant,
Z = high impedance (off)
† In the thermal shutdown mode, the output is in the high-impedance state, regardless of the input levels.



Logic Diagram

This chip contains 4 enable pins. Each enable pin corresponds to 2 inputs. Based on the input values given, the device connected to this IC works accordingly.

L293D Interfacing with 8051:



Controlling the Robot to obtain the different directions of movement

	Left Wheel	Right Wheel	Movement
1	Forward	Forward	Forward
2	Backward	Backward	Backward
3	Forward	Stop	Right Turn
4	Stop	Forward	Left Turn
5	Forward	Backward	Sharp Right Turn
6	Backward	Forward	Sharp Left Turn

CHAPTER-5
SOFTWARES

5.1 Introduction to Arduino IDE

Arduino is a prototype platform (open-source) based on an easy-to-use hardware and software. It consists of a circuit board, which can be programmed (referred to as a microcontroller) and a ready-made software called Arduino IDE (Integrated Development Environment), which is used to write and upload the computer code to the physical board.

The key features are:

- Arduino boards are able to read analog or digital input signals from different sensors and turn it into an output such as activating a motor, turning LED on/off, connect to the cloud and many other actions.
- You can control your board functions by sending a set of instructions to the microcontroller on the board via Arduino IDE (referred to as uploading software).
- Unlike most previous programmable circuit boards, Arduino does not need an extra piece of hardware (called a programmer) in order to load a new code onto the board. You can simply use a USB cable.
- Additionally, the Arduino IDE uses a simplified version of C++, making it easier to learn to program.
- Finally, Arduino provides a standard form factor that breaks the functions of the micro-controller into a more accessible package.

After learning about the main parts of the Arduino UNO board, we are ready to learn how to set up the Arduino IDE. Once we learn this, we will be ready to upload our program on the Arduino board.

5.1.1 Arduino data types:

Data types in C refers to an extensive system used for declaring variables or functions of different types. The type of a variable determines how much space it occupies in the storage and how the bit pattern stored is interpreted.

The following table provides all the data types that you will use during Arduino programming.

Void:

The void keyword is used only in function declarations. It indicates that the function is expected to return no information to the function from which it was called.

Example:

```
Void Loop ( )
{
// rest of the code
}
```

Boolean:

A Boolean holds one of two values, true or false. Each Boolean variable occupies one byte of memory.

Example:

Boolean state= false ; // declaration of variable with type boolean and initialize it with false.

Boolean state = true ; // declaration of variable with type boolean and initialize it with false.

Char:A data type that takes up one byte of memory that stores a character value. Character literals are written in single quotes like this: 'A' and for multiple characters, strings use double quotes: "ABC".

However, characters are stored as numbers. You can see the specific encoding in the ASCII chart. This means that it is possible to do arithmetic operations on characters, in whichthe ASCII value of the character is used. For example, 'A' + 1 has the value 66, since theASCII value of the capital letter A is 65.

Example:

Char chr_a = ‘a’ ;//declaration of variable with type char and initialize it with character a.

Char chr_c = 97 ;//declaration of variable with type char and initialize it with character 97.

Unsigned char:

Unsigned char is an unsigned data type that occupies one byte of memory. The unsigned char data type encodes numbers from 0 to 255.

Example:

Unsigned Char chr_y = 121 ; // declaration of variable with type Unsigned char and initialize it with character y

Byte:

A byte stores an 8-bit unsigned number, from 0 to 255.

Example:

byte m = 25 ;//declaration of variable with type byte and initialize it with 25

int:

Integers are the primary data-type for number storage. **int** stores a 16-bit (2-byte) value. This yields a range of -32,768 to 32,767 (minimum value of -2^15 and a maximum value of (2^15) - 1).

The **int** size varies from board to board. On the Arduino Due, for example, an **int** stores a 32-bit (4-byte) value. This yields a range of -2,147,483,648 to 2,147,483,647 (minimum value of -2^31 and a maximum value of (2^31) - 1).

Example:

int counter = 32 ;// declaration of variable with type int and initialize it with 32.

Unsigned int:

Unsigned ints (unsigned integers) are the same as int in the way that they store a 2 byte value. Instead of storing negative numbers, however, they only store positive values, yielding a useful range of 0 to 65,535 (2^16) - 1). The Due stores a 4 byte (32-bit) value, ranging from 0 to 4,294,967,295 (2^32 - 1).

Example:

Unsigned int counter= 60 ; // declaration of variable with type unsigned int and initialize it with 60.

Word:

On the Uno and other ATMEGA based boards, a word stores a 16-bit unsigned number. On the Due and Zero, it stores a 32-bit unsigned number.

Example

word w = 1000 ;//declaration of variable with type word and initialize it with 1000.

Long:

Long variables are extended size variables for number storage, and store 32 bits (4 bytes), from 2,147,483,648 to 2,147,483,647.

Example:

Long velocity= 102346 ;//declaration of variable with type Long and initialize it with 102346

Unsigned long: Unsigned long variables are extended size variables for number storage and store 32 bits (4 bytes). Unlike standard longs, unsigned longs will not store negative numbers, making their range from 0 to 4,294,967,295 (2^32 - 1).

Example:

Unsigned Long velocity = 101006 ;// declaration of variable with type Unsigned Long and initialize it with 101006.

Short:

A short is a 16-bit data-type. On all Arduinos (ATMega and ARM based), a short stores a 16-bit (2-byte) value. This yields a range of -32,768 to 32,767 (minimum value of -2^15 and a maximum value of (2^15) - 1).

Example:

short val= 13 ;//declaration of variable with type short and initialize it with 13

Float:

Data type for floating-point number is a number that has a decimal point. Floating-point numbers are often used to approximate the analog and continuous values because they have greater resolution than integers.

Floating-point numbers can be as large as 3.4028235E+38 and as low as 3.4028235E+38. They are stored as 32 bits (4 bytes) of information.

Example:

float num = 1.352;//declaration of variable with type float and initialize it with 1.352.

Double:

On the Uno and other ATMEGA based boards, Double precision floating-point number occupies four bytes. That is, the double implementation is exactly the same as the float, with no gain in precision. On the Arduino Due, doubles have 8-byte (64 bit) precision.

Example:

double num = 45.352 ;// declaration of variable with type double and initialize it with 45.352.

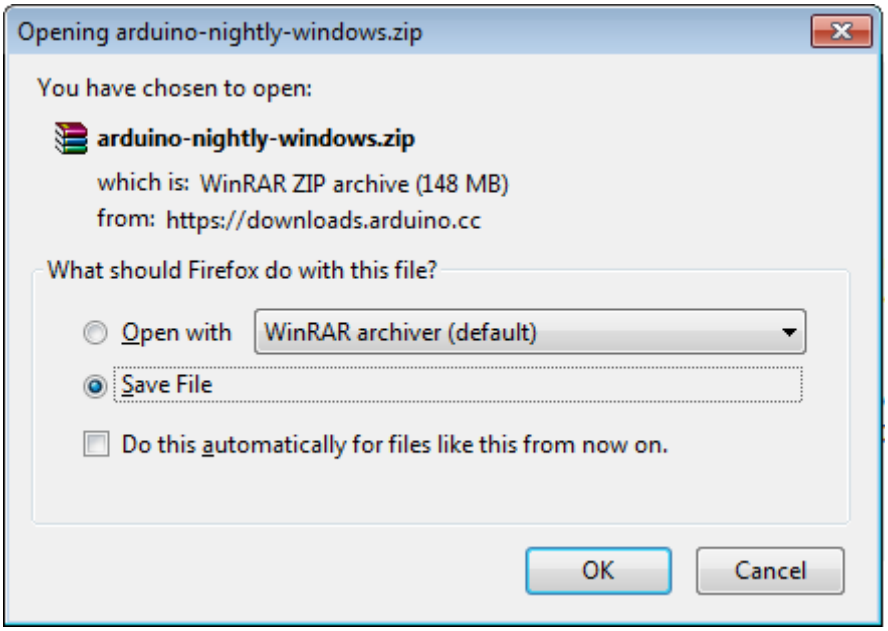
In this section, we will learn in easy steps, how to set up the Arduino IDE on our computerand prepare the board to receive the program via USB cable.

Step 1: First you must have your Arduino board (you can choose your favorite board) anda USB cable. In case you use Arduino UNO, Arduino Duemilanove, Nano, Arduino Mega2560, or Diecimila, you will need a standard USB cable (A plug to B plug), the kind youwould connect to a USB printer as shown in the following image.

Figure 5.1: USB Cable

Step 2: Download Arduino IDE Software.

You can get different versions of Arduino IDE from the Download page on the Arduino Official website. You must select your software, which is compatible with your operating system (Windows, IOS, or Linux). After your file download is complete, unzip the file.

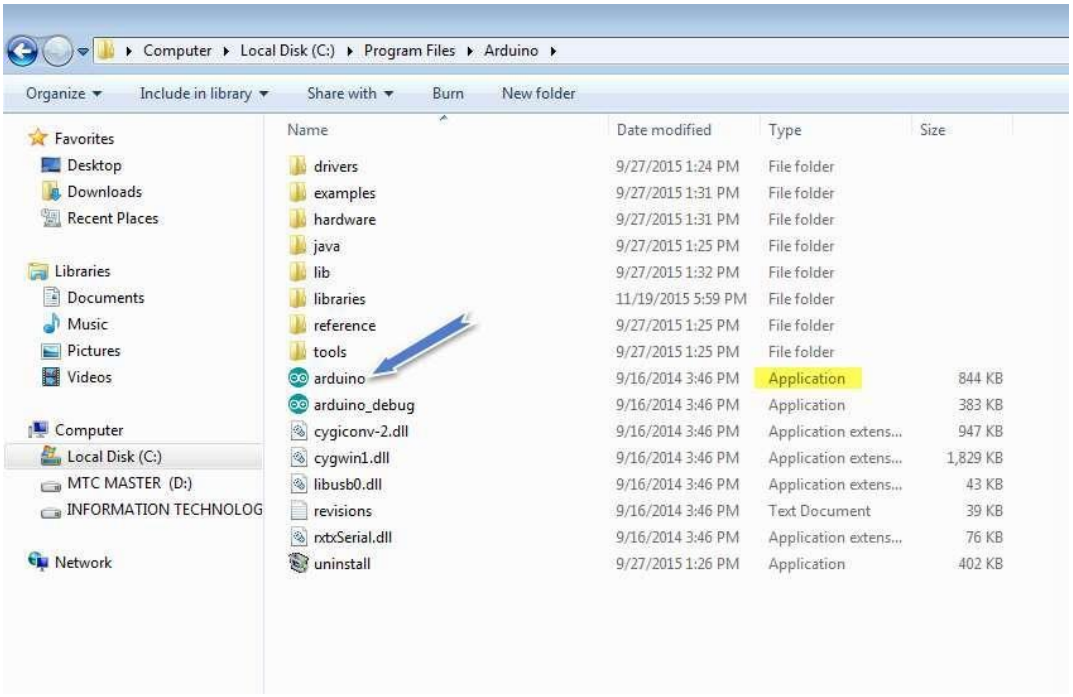


Step 3: Power up your board.

The Arduino Uno, Mega, Duemilanove and Arduino Nano automatically draw power from either, the USB connection to the computer or an external power supply. If you are using an Arduino Diecimila, you have to make sure that the board is configured to draw power from the USB connection. The power source is selected with a jumper, a small piece of plastic that fits onto two of the three pins between the USB and power jacks. Check that it is on the two pins closest to the USB port. Connect the Arduino board to your computer using the USB cable. The green power LED (labeled PWR) should glow.

Step 4: Launch Arduino IDE.

After your Arduino IDE software is downloaded, you need to unzip the folder. Inside the folder, you can find the application icon with an infinity label (application.exe). Doubleclick the icon to start the IDE.

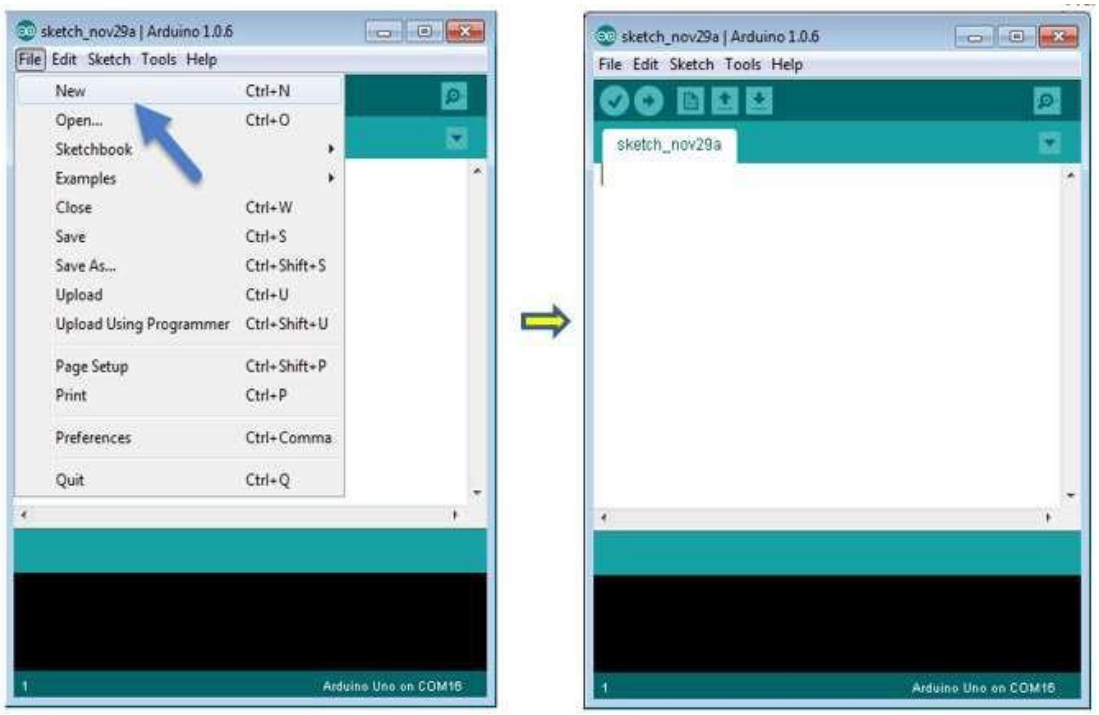


Step 5: Open your first project.

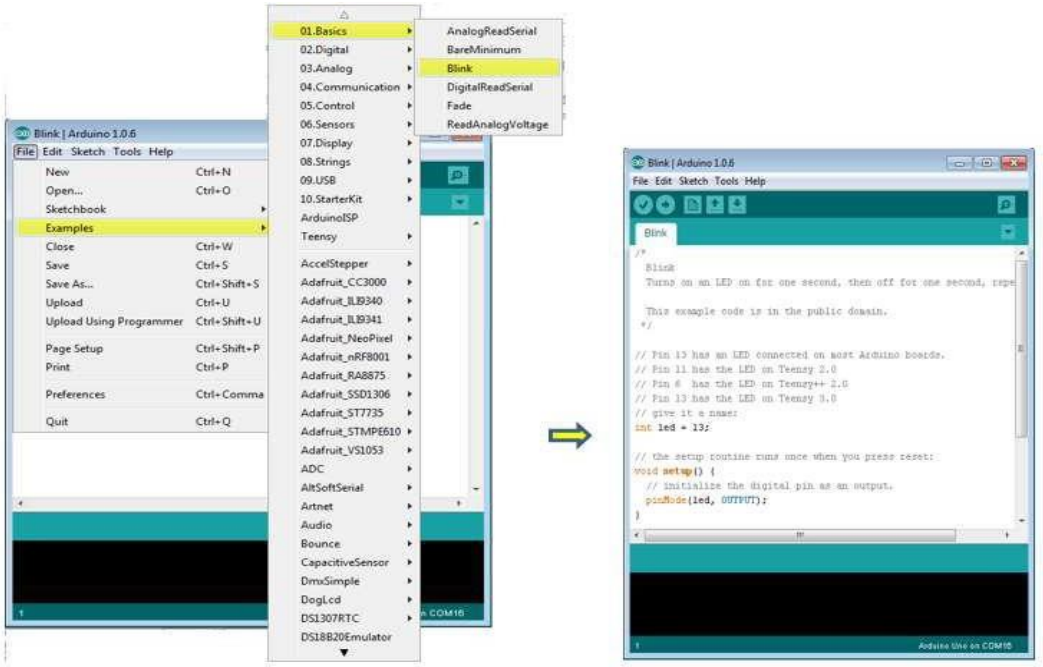
Once the software starts, you have two options:

- Create a new project.
- Open an existing project example.

To create a new project, select File --> New. To open

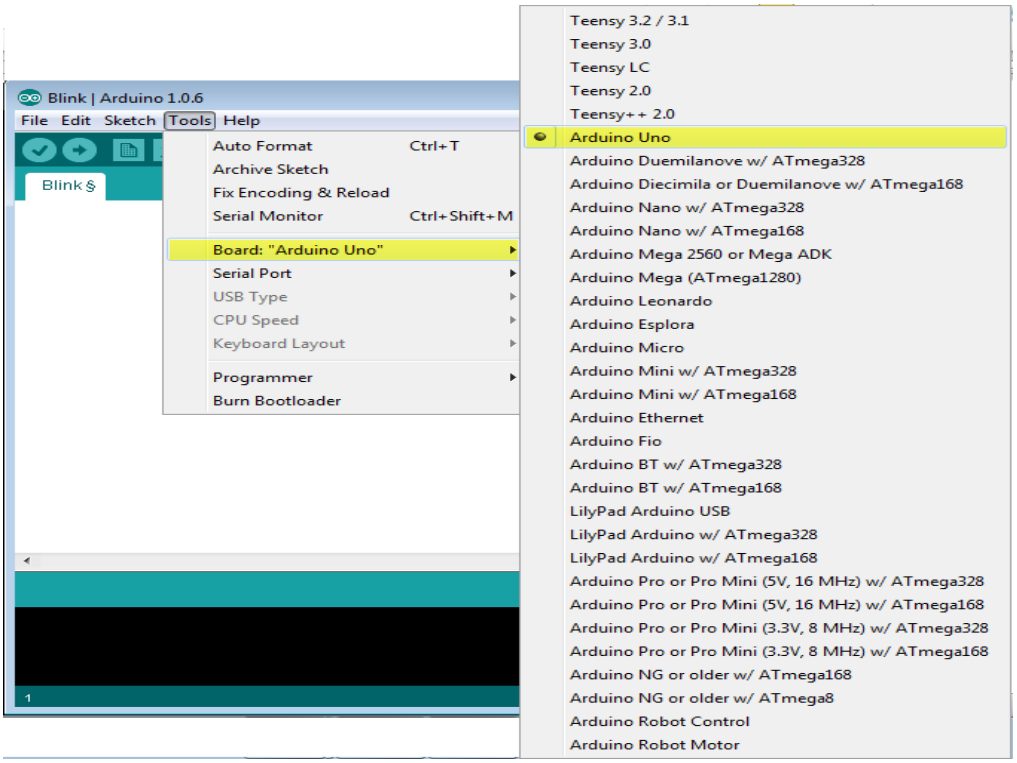


To open an existing project example, select File -> Example -> Basics -> Blink.



Here, we are selecting just one of the examples with the name **Blink**. It turns the LED on and off with some time delay. You can select any other example from the list.

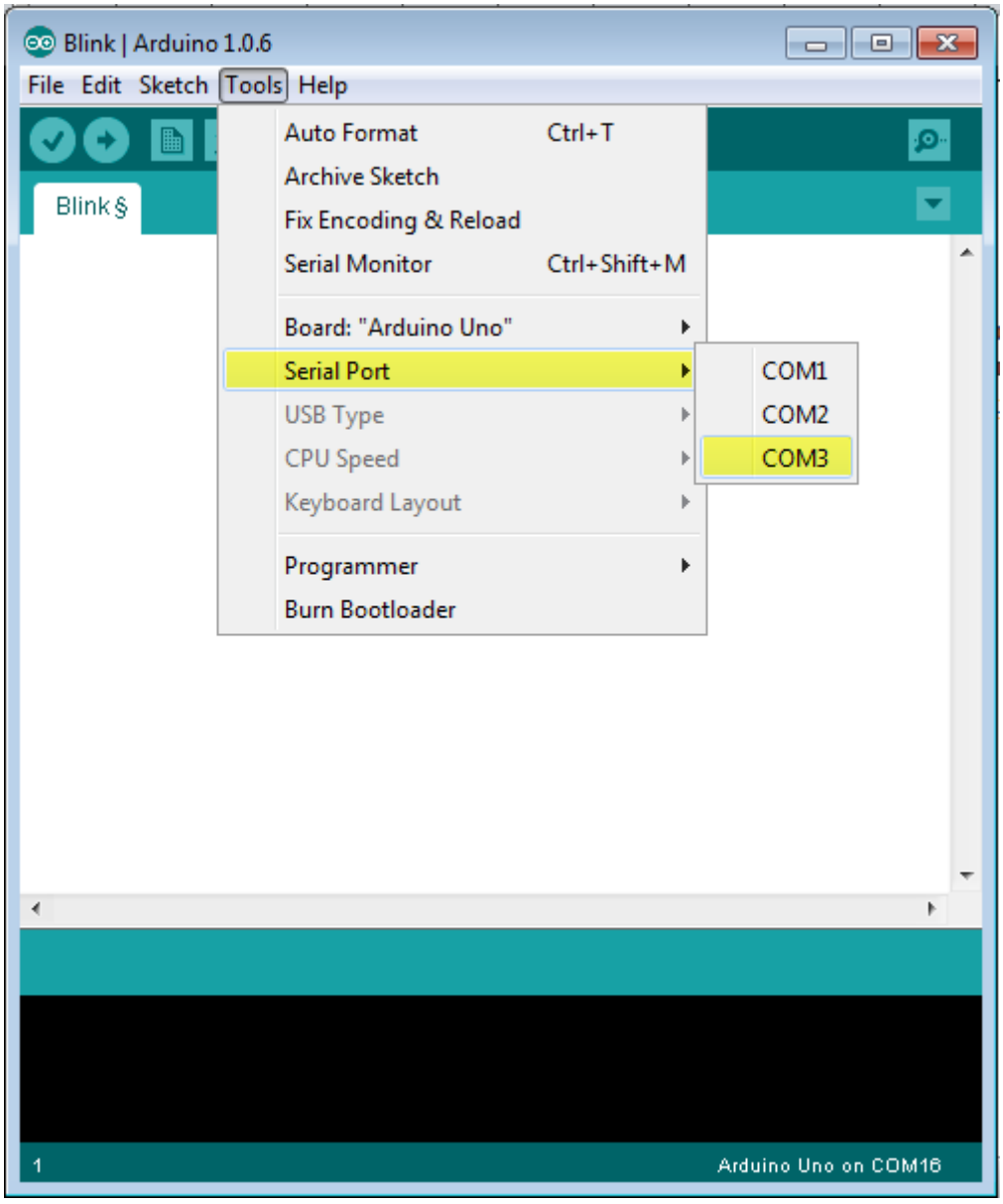
Step 6: Select your Arduino board.



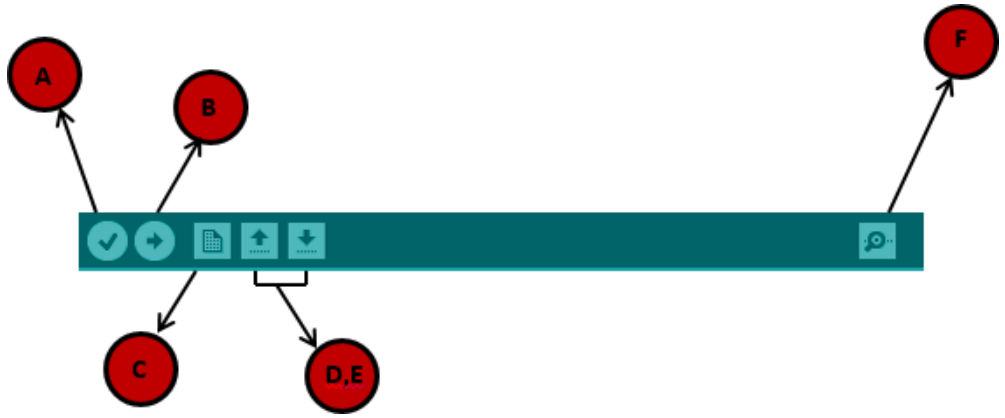
To avoid any error while uploading your program to the board, you must select the correct Arduino board name, which matches with the board connected to your computer.

Step 7: Select your serial port.

Select the serial device of the Arduino board. Go to **Tools** ->**Serial Port** menu. This is likely to be COM3 or higher (COM1 and COM2 are usually reserved for hardware serial ports). To find out, you can disconnect your Arduino board and re-open the menu, the entry that disappears should be of the Arduino board. Reconnect the board and select that serial port.



Step 8: Upload the program to your board. Before explaining how we can upload our program to the board, we must demonstrate the function of each symbol appearing in the Arduino IDE toolbar.



A- Used to check if there is any compilation error.

B- Used to upload a program to the Arduino board.

C- Shortcut used to create a new sketch.

D- Used to directly open one of the example sketch.

E- Used to save your sketch.

F- Serial monitor used to receive serial data from the board and send the serial data to the board.

Now, simply click the "Upload" button in the environment. Wait a few seconds; you will see the RX and TX LEDs on the board, flashing. If the upload is successful, the message "Done uploading" will appear in the status bar.

Note: If you have an Arduino Mini, NG, or other board, you need to press the reset button physically on the board, immediately before clicking the upload button on the Arduino Software.

Arduino programming structure

In this chapter, we will study in depth, the Arduino program structure and we will learn more new terminologies used in the Arduino world. The Arduino software is open-source. The source code for the Java environment is released under the GPL and the C/C++ microcontroller libraries are under the LGPL.

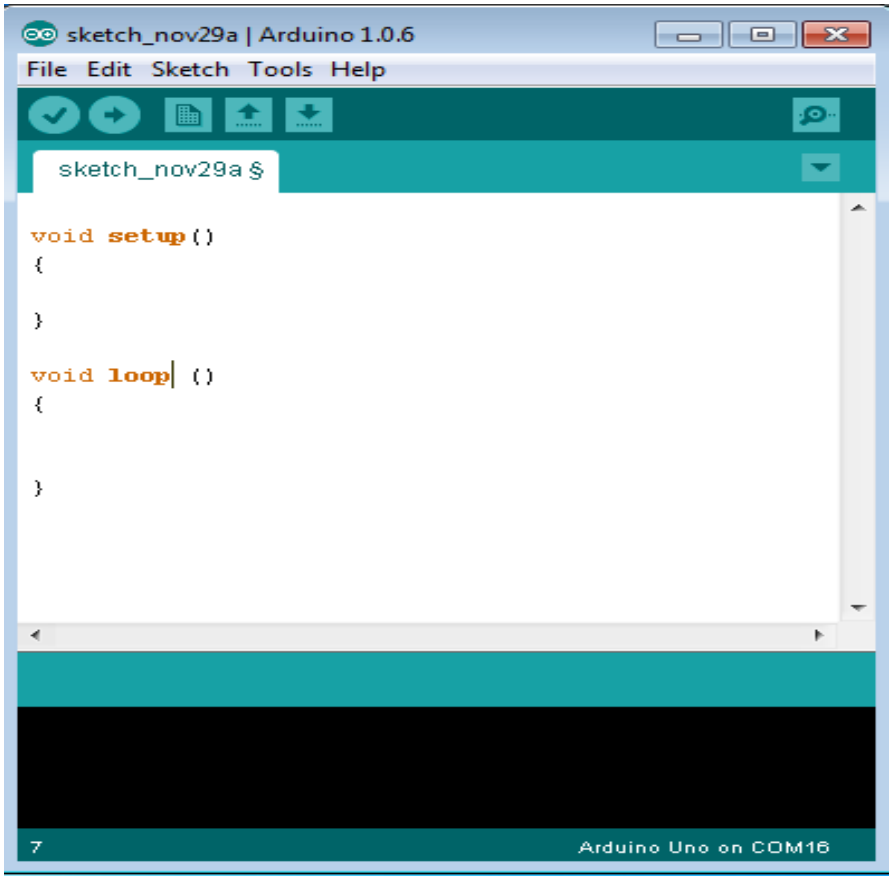
Sketch: The first new terminology is the Arduino program called "**sketch**".

Structure

Arduino programs can be divided in three main parts: **Structure**, **Values** (variables and constants), and **Functions**. In this tutorial, we will learn about the Arduino software program, step by step, and how we can write the program without any syntax or compilation error.

Let us start with the **Structure**. Software structure consists of two main functions:

- Setup( ) function
- Loop( ) function



Void setup ( )

{

}

PURPOSE:

The **setup()** function is called when a sketch starts. Use it to initialize the variables, pin modes, start using libraries, etc. The setup function will only run once, after each power up or reset of the Arduino board.

INPUT

OUTPUT

RETURN

Void Loop ( )

{

}

PURPOSE:

After creating a **setup()** function, which initializes and sets the initial values, the **loop()** function does precisely what its name suggests, and loops secutively, allowing your program to change and respond. Use it to actively control the Arduino board.

INPUT

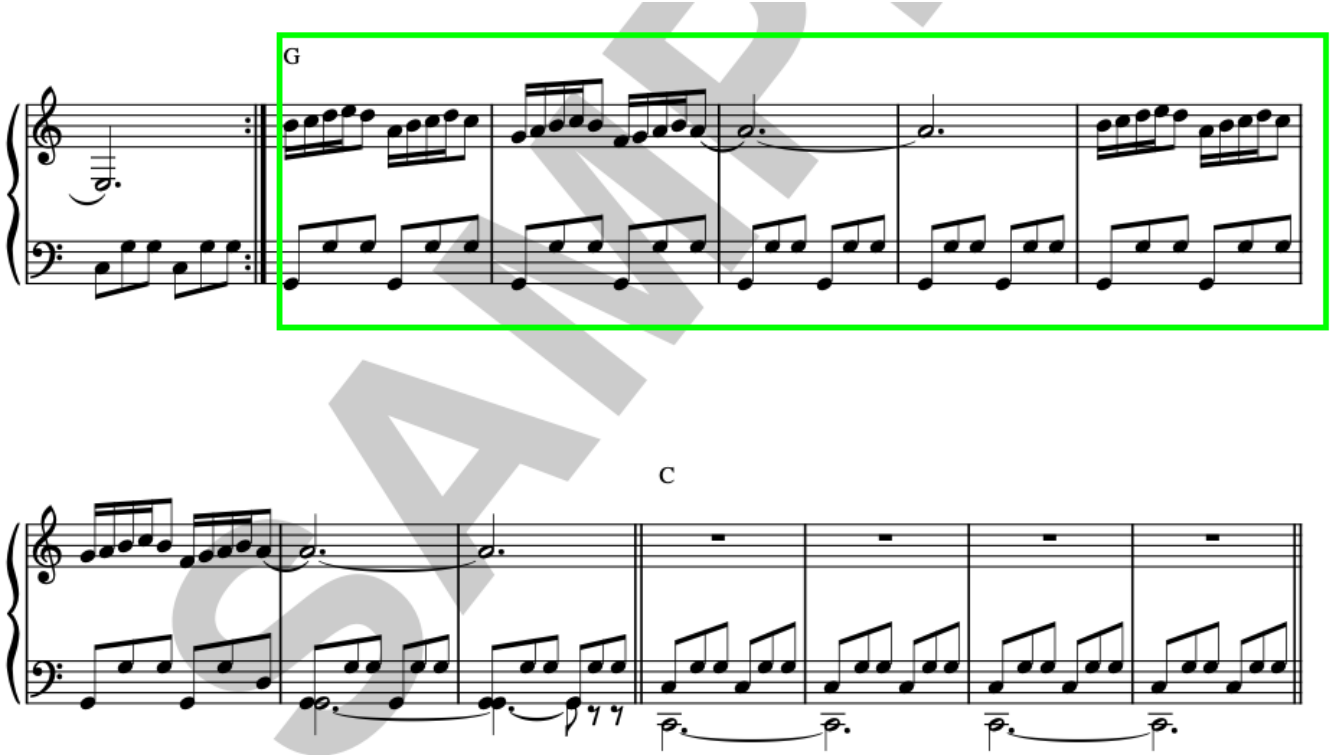
OUTPUT

RETURN

CHAPTER-6

RESULTS

6.1. RESULTS



CHAPTER-7

CONCLUSION AND FUTURE SCOPE

7.1. CONCLUSION

Finally in this project we can operate this music player manually as well, as as per our time requirement. So we listen the music as per our mood. To reduce the noise pollution of manually operated MP3 players as far as possible. The home screen features a clock, date and temperature information as well as two buttons for the music player and the alarm clock.

7.2. FUTURE SCOPE

- An Arduino based MP3 Player advancement can be done in this design. The advantage of this design is that the timings can be edited according to an individuals requirement. Hence it can here used in finite number of times.
- Automatic alarm clock system with announcement is also played according to the programmed time using this design.
- In future much advanced automatic alarm clock system can be made.

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