Component Studies

# Arduino

Arduino is an open-source prototyping platform used for building electronics projects. It consists of both a physical programmable circuit board and a software, or IDE (Integrated Development Environment) that runs on your computer, where you can write and upload the computer code to the physical board.. On an Arduino, it is typically the program you write and upload into the microcontroller's flash memory.

Arduino language is merely a set of C/C++ functions that can be called from your code. Your sketch undergoes minor changes (e.g. automatic generation of function prototypes) and then is passed directly to a C/C++ compiler (avr-g++).

## [**Types of Arduino**](https://www.watelectronics.com/different-types-arduino-boards-uses/)

## **Aurino Uno**

### Arduino Uno Technical Specifications

|  |  |
| --- | --- |
| Operating Voltage | 5V |
| Recommended Input Voltage | 7-12V |
| Input Voltage limits | 6-20V |
| Analog Pins | 6 (A0 - A5) |
| Digital I/O Pins | 14 (Out of which 6 provide PWM Output) |
| DC Current I/O Pins | 40 mA |
| DC Current on 3.3V Pin | 50 mA |
| Flash Memory | 32 KB (0.5 KB is used for Bootloader) |
| SRAM | 2 KB |
| EEPROM | 1 KB |
| Frequency (Clock Speed) | 16 MHz |

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### Pin Description

|  |  |  |
| --- | --- | --- |
| **Pin Category** | Pin Name | Details |
| Power | Vin, 3.3V, 5 V, GND | Vin: Input voltage to Arduino when using an external power source.  5V: Regulated power supply used to power microcontroller and other components on the board.  3.3V: 3.3V supply generated by on-board voltage regulator. Maximum current draw is 50mA.  GND: ground pins. |
| Reset | Reset | Resets the microcontroller. |
| Analog Pins | A0 – A5 | Used to provide analog input in the range of 0-5V |
| Input/Output Pins | Digital Pins 0 - 13 | Can be used as input or output pins. |
| Serial | 0(Rx), 1(Tx) | Used to receive and transmit TTL serial data (RXD - Receiver / TXD- Transmitter ) |
| External Interrupts | 2, 3 | To trigger an interrupt. |
| PWM | 3, 5, 6, 9, 11 | Provides 8-bit PWM output. |
| SPI | 10 (SS), 11 (MOSI), 12 (MISO) and 13 (SCK) | Used for SPI communication. |
| Inbuilt LED | 13 | To turn on the inbuilt LED. |
| TWI | A4 (SDA), A5 (SCA) | Used for TWI communication |
| AREF | AREF | To provide reference voltage for input voltage. |

# L.C.D Screen [Liquid Crystal Display]

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## Features

* Operating Voltage is 4.7V to 5.3V
* Current consumption is 1mA without backlight
* Alphanumeric LCD display module, meaning can display alphabets and numbers
* Consists of two rows and each row can print 16 characters.
* Each character is build by a 5×8 pixel box
* Can work on both 8-bit and 4-bit mode
* It can also display any custom generated characters
* Available in Green and Blue Backlight

## Pin Description

|  |  |  |
| --- | --- | --- |
| Pin  No | Pin Name | Description |
| 1 | Vss (Ground) | Ground pin connected to system ground |
| 2 | Vdd (+5 Volt) | Powers the LCD with +5V (4.7V – 5.3V) |
| 3 | VE (Contrast V) | Decide the contrast level of display. Grounded to get maximum contrast. |
| 4 | Register Select | Connected to Microcontroller to shift between command/data register |
| 5 | Read/Write | Used to read or write data. Normally grounded to write data to LCD |
| 6 | Enable | Connected to Microcontroller Pin and toggled between 1 and 0 for data acknowledgement |
| 7 | Data Pin 0 | Data pins 0 to 7 form an 8-bit data line. They can be connected to Microcontroller to send 8-bit data.  These LCD’s can also operate on 4-bit mode in such case Data pin 4,5,6 and 7 will be left free |
| 8 | Data Pin 1 |  |
| 9 | Data Pin 2 |  |
| 10 | Data Pin 3 |  |
| 11 | Data Pin 4 |  |
| 12 | Data Pin 5 |  |
| 13 | Data Pin 6 |  |
| 14 | Data Pin 7 |  |
| 15 | LED Positive | Backlight LED pin positive terminal |
| 16 | LED Negative | Backlight LED pin negative terminal |

# Water Pump

The main purpose of a water pumping system is to move water from one area to another. All pumps use basic forces of nature to move a liquid. As the moving pump part (impeller, vane, piston diaphragm,etc.) begins to move, air is pushed out of the way. The movement of air creates a partial vacuum (low pressure) which can be filled up by more air, or in the case of water pumps, water.

## [Different Types of Pumps](https://www.elprocus.com/different-types-of-pumps-working-and-their-applications/)

# Voltage Regulator (LM 317 Module)

**LM317** is a linear Voltage Regulator**.** The **LM317** serves a wide variety of applications including local, on card regulation. This device can also be **used** to make a programmable output regulator, or by connecting a fixed resistor between the adjustment and output, the **LM317** can be **used** as a precision current regulator.

## [**Types of Voltage Regulators**](https://www.electronicshub.org/types-of-voltage-regulators/#Components_of_a_Voltage_Regulator)

# Relay (6 VDC Relay)

**Relays** are electric **switches** that use electromagnetism to convert small electrical stimuli into larger currents. These conversions occur when electrical inputs activate electromagnets to either form or break existing circuits.

## [Types of Relay](https://www.electronicshub.org/classification-of-relays/)

# Transistor (BC 547)

A transistor is a semiconductor device used to amplify or switch electronic signals and electrical power. It is composed of semiconductor material usually with at least three terminals for connection to an external circuit.

A transistor works when the electrons and the holes start moving across the two junctions between the n-type and p-type silicon. ... By turning a small input current into a large output current, the transistor acts like an amplifier. But it also acts like a switch at the same time.

Transistors are basically classified into two types; they are Bipolar Junction Transistors (BJT) and Field Effect Transistors (FET). The BJTs are again classified into NPN and PNP transistors.

## [Type of Transistor](https://www.electronicshub.org/transistors-classification-and-types/)

# Rectifier Diode (1n400)

A rectifier diode is a two-lead semiconductor that allows current to pass in only one direction. Generally, P-N junction Diode is formed by joining together n-type and p-type semiconductor materials. The P-type side is called the anode and the n-type side is called the cathode.

When AC voltage or AC current is applied across the P-N junction diode, during the positive half cycle the diode is forward biased and allows electric current through it. Thus, the P-N junction diode acts like a rectifier by converting the AC current into DC current.

The 1N400x series is a family of popular 1 A general-purpose silicon rectifier diodes commonly used in AC adapters for common household appliances. Its blocking voltage varies from 50 volts to 1000 volts.

[Different Type of Rectifier](https://www.elprocus.com/different-types-rectifiers-working/)

# Resistor

A resistor is a passive two-terminal electrical component that implements electrical resistance as a circuit element. In electronic circuits, resistors are used to reduce current flow, adjust signal levels, to divide voltages, bias active elements, and terminate transmission lines, among other uses

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## [Different Type of Resistor](https://docs.google.com/document/d/1brVlfIFw73BuMi7gkN7FJPOt8Quu49ysQ-5XhKnnyAI/edit#)