

RB-See-175

Seedstudio Arduino Sidekick Basic Kit

Arduino Sidekick Basic Kit

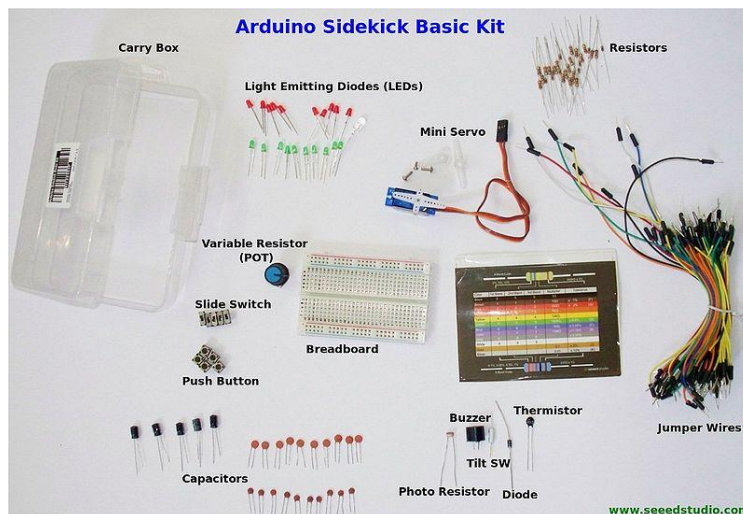
Introduction

The Arduino Sidekick Basic Kit is designed to be used with your Arduino / Seeduino / Seeduino ADK / Maple LilyPad or any MCU board. It contains everything needed for a first-time user to connect their computer to an Arduino. It includes many of the most popular accessories for DIY projects : like Breadboard, Jumper wires, Color LEDs, Resistors, Buzzer, etc.

All of this comes in its own handy box for easy transportation and minimal clutter.



Kit Contents



Breadboard x 1

1. Breadboard jumper wire x 70
2. Red Led x 10
3. Green Led x 10
4. RGB led x 1
5. Ceramic Capacitor (10nF x 10, 100nF x 10)
6. Electrolytic Capacitor (100uF x 5)
7. Resistor (330 x 10, 1k x 10, 10k x 10)
8. Tilt switch x 1
9. Thermistor x 1
10. Photo resistor x 1
11. Diode x 1
12. Buzzer x 1
13. button x 5
14. switch x 5
15. Mini Servo x 1
16. Potentiometer with knob x 1
17. Resistor Instructor card x 1
18. Box x 1

Basic electronics refresher

Current and Voltage

Current is the rate of flow of electric charge in a conductor. Voltage is the potential difference (electric driving force) applied between two points to conduct current. Current is expressed in terms of Amperes (A) and Voltage in terms of Volts (V).

Resistor

Resistors are obstacles to flow of current through a conductor. They are used to limit the flow of current to an electronic device like lamp. The resistance to the flow of current is expressed in Ohms (O). They are divided into Fixed resistor and variable resistor (POT) .

Connecting Resistors

Resistors can be connected in two different types in parallel or in series with each other.

Resistors in series

When the resistors are connected in series the total equivalent resistance will be equal to sum of all the values of resistors in series.

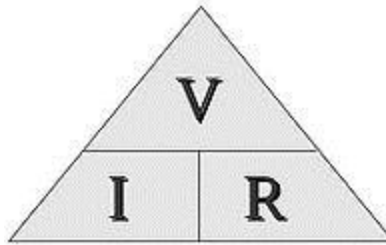
Resistors in parallel

The total equivalent resistance of resistors in parallel is equal to the sum of their reciprocals.

Ohm's Law

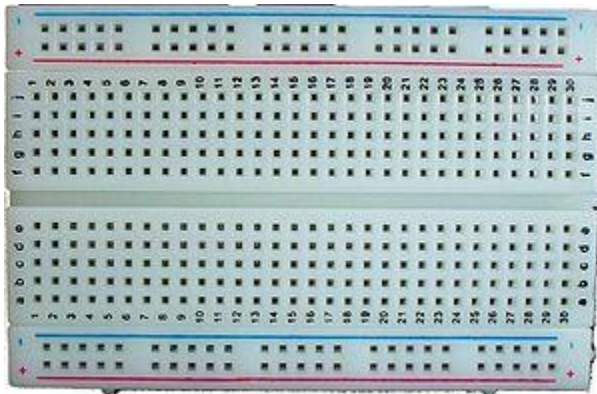
The relation between Current, Voltage and Resistance is governed by Ohm's Law - Which states that "The current through a conductor (I Amperes) between two points is directly proportional to the potential difference or voltage across the two points(V Volts), and inversely proportional to the resistance between them (R Ohms)"

i.e $I = V / R$. Hence $V = IR$ or $R = V / I$. The following Ohm's Law triangle can be used to remember the relationship between V,I and R. The vertical line indicates multiplication operation and horizontal line indicates division operation.

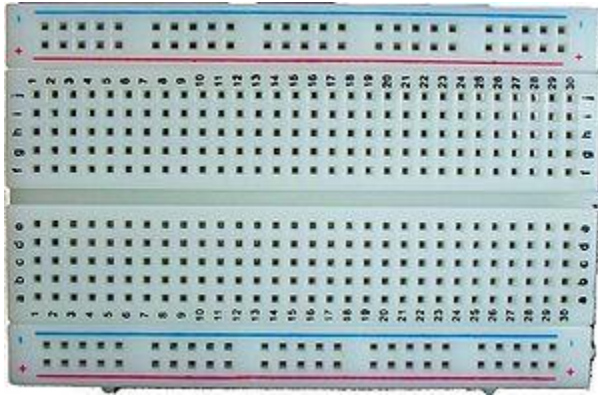


eg: Hence to know current I, we divide V by R.

Breadboard



Breadboard is a prototyping device for electronic circuits. Very useful to connect electronics components to make a circuit without soldering. Breadboard consist of rows and columns of holes with metal contacts to insert components. The breadboard supplied with Arduino Sidekick Basic Kit is arranged of 2 X 30 five-hole columns and 4 X twentyfive-hole rows. These holes are connected internally in a manner as illustrated below



Fixed Resistors

The resistors supplied with Basic Kit are of made of carbon and fixed value type. The value of resistance is marked by the colored bands. Use the resistor color code sheet to know the value.

- The first band indicates the first digit of the resistance value.
- The second band indicates the second digit.
- The third band indicates the multiplier value of the resistor.
- The fourth band denotes the Tolerance value.

Potentiometer (POT)

POT is a variable resistor whose resistance can be changed by rotating the knob. It has three terminals - The left and right most terminal are connected to ends of conductor made of resistive material. The middle terminal is connected to a slider which moves over the resistive material. The value of resistance changes proportionally to the position of the knob.



Thermistors

Thermistors are special resistors which changes resistance when temperature changes around it. They are inexpensive way to sense temperature difference.



Light Dependent Resistors (LDR)

LDR changes resistance when the intensity of light falling on them changes. They are also called photocell. It offers maximum resistance when there is no light falling on it and gives least resistance when exposed to bright light. It is made up of photo sensitive material like Cadmium Sulphide. It can be connected either way in the circuit. It can be used as a light sensing element.



Light Emitting Diodes

LEDs emit light when forward biased. They are encapsulated in a transparent casing and come in various colors like red, green and blue. LEDs are made of gallium arsenide phosphide and by altering the proportions of arsenic and phosphorus, different colors are obtained. Monocolor LEDs has two leads Anode(+ve) and Cathode (-ve). Tricolor LEDs have 4 Leads - one anode and 3 cathode for each color. The LEDs can be used in display boards.

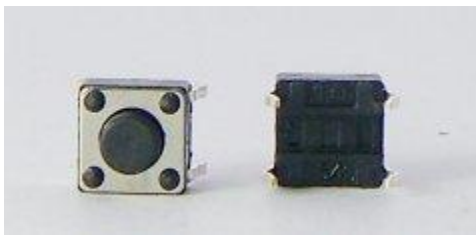


Switch

The switches are used to close or open the circuit. The switches supplied with Basic kit are of two types - Push button switch and Slide Switch.

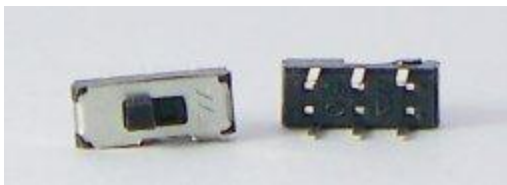
Push Button Switch

Push button switch close the circuit as long as it is pressed.



Slide Switch

Slide switch is a simple two position switch. It can be used to open or close a circuit by setting it to appropriate position.

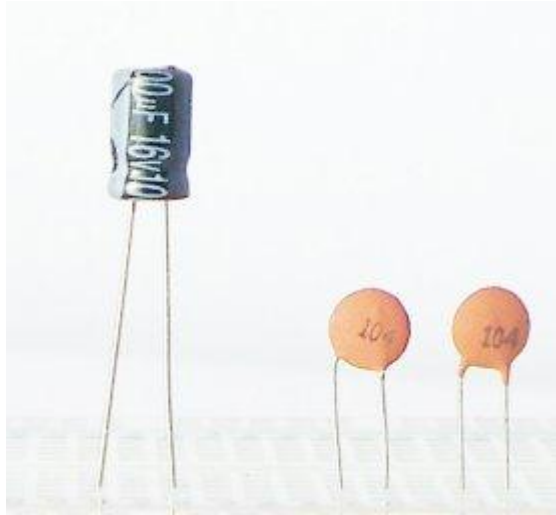


Tilt Switch

Tilt switch contains two terminals connected to the circuit , it closes the circuit when tilted horizontally and opens the circuit when it is tilted vertically.

Capacitors

Capacitors are used to store electric charge they are classified into two different types Electrolytic and Ceramic disc Capacitor. Capacitors are expressed in terms of micro Farads(μF).



Connecting the Capacitor

Capacitors can be connected in two type of arrangement in a circuit they are as follows

Capacitors in Series

The total equivalent capacitance when two or more capacitors are connected in series with each other is equal to the sum of the reciprocal of individual capacitance value .

[[Image:]]

Capacitors in Parallel

The total equivalent capacitance of two or more capacitors connected in parallel is equal to sum of the individual capacitance.

[[Image:]]

Electrolytic Capacitors

Electrolytic Capacitors normally have small volume for a large value of capacitance. They are classified into polarized and non-polarized electrolytic capacitors. Metals like Aluminium, tantalum, vanadium and bismuth are used to form anode and cathode foils.

Ceramic Disc Capacitors

The Ceramic Capacitors use ceramic dielectric with thin metal films as electrodes bonded to the ceramic. In the Disc type capacitor silver is fixed on to both sides of ceramic to form conductor plates. The disc capacitors are used only for small value of capacitance.

Buzzer

A buzzer is an audio signaling device, which may be mechanical, electromechanical, or Piezoelectric. It produces various audio signals based on the oscillation of the material used in it. They are commonly used in alarms and timers.



Diode

A diode is a semi-conducting material that conducts current only in one direction. It starts conducting only after the supply voltage is greater than the barrier potential. It acts like a closed switch in forward-biased condition and acts like an open switch when it is reverse-biased. Diodes are classified based on the semiconducting material used to fabricate them like PN Junction diode, zener diode, light-emitting diode etc.

Biasing a Diode

Applying voltage to a diode is called biasing a diode. The diode gets forward-biased when a positive supply voltage is applied across the terminals and starts conducting above 0.7V for a silicon diode and 0.3V for a germanium diode. When a negative voltage is applied across the terminals of a diode, it is said to be reverse-biased. The diode gets damaged when the reverse-biasing voltage exceeds breakdown voltage.



Mini Servo

Servos are DC motors with gearing and feedback system. They are used in driving mechanism of robots.

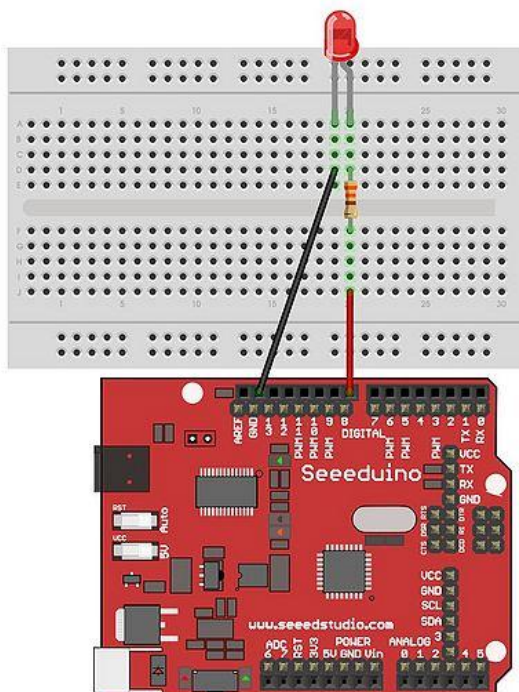


Lessons

Hello World! : The Blinking LED

Circuit

- Connect a LED to Digital Pin 8 as shown below. The 330 Ohm resistor limits the current flowing to the LED.



Program

Compile and upload the following sketch:

```
//Blink a LED connected to Digital Pin 8 via a 330 Ohm resitors.
```

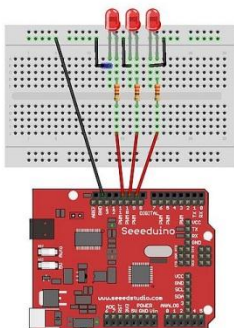
```
void setup() {  
  pinMode(8, OUTPUT);  // Initialize Arduino Digital Pin 8 as output  
}
```

```
void loop()  
{  
  digitalWrite(8, HIGH); // Switch On LED  
  delay(500);           // Wait for half a second  
  digitalWrite(8, LOW); // Switch Off LED  
  delay(500);          // Wait for half a second  
}
```

Running LED display

Circuit

- Connect 3 LEDs to Digital Pins 9, 10 and 11 via a 330 Ohms resistor each.



Program

Compile and upload the following sketch:

//Running LED display: Three LEDs connected to Digital Pin 9, 10 and 11.

```
void setup()
{
  pinMode(9, OUTPUT);    // Initialize Arduino Digital Pins 9 as output
  pinMode(10, OUTPUT);   // Initialize Arduino Digital Pins 10 as output
  pinMode(11, OUTPUT);   // Initialize Arduino Digital Pins 11 as output
}

void loop()
{
  digitalWrite(9, LOW);
  digitalWrite(10, LOW);
  digitalWrite(11, HIGH);

  delay(250);           // Wait for quarter of a second

  digitalWrite(9, LOW);
  digitalWrite(10, HIGH);
  digitalWrite(11, LOW);

  delay(250);           // Wait for quarter of a second

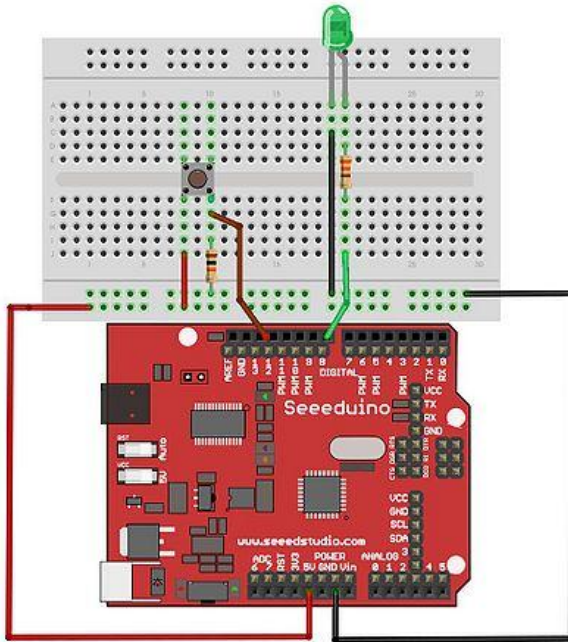
  digitalWrite(9, HIGH);
  digitalWrite(10, LOW);
  digitalWrite(11, LOW);

  delay(250);           // Wait for quarter of a second
}
```

Talk to Arduino : Connecting a Pushbutton Switch

Circuit

- Connect a LED to Digital Pin 8 as shown below. The 330 Ohm resistor limits the current flowing to the LED.
- Connect one of Push button switch to Digital Pin 12 and to GND via a 10K resistor.
- Connect other end of Push button to +5V.



Program

Compile and upload the following sketch:

```
//Pushbutton switch demo: LED is connected to digital pin 8 and Pushbutton is connected to digital pin 12.
```

```
//The LED glows when the button is pressed.
```

```
char inputButtonState;
```

```
void setup()
```

```
{
```

```

pinMode(8, OUTPUT);    // Initialize Arduino Digital Pins 8 as output for connecting LED
pinMode(12,INPUT);    // Initialize Arduino Digital Pins 12 as input for connecting Pushbutton
}

void loop()
{
inputButtonState = digitalRead(12); //Read the Pushbutton state.

if (inputButtonState == HIGH)
{
digitalWrite(8, HIGH); //Switch on LED
}
else
{
digitalWrite(8, LOW); //Switch off LED
}

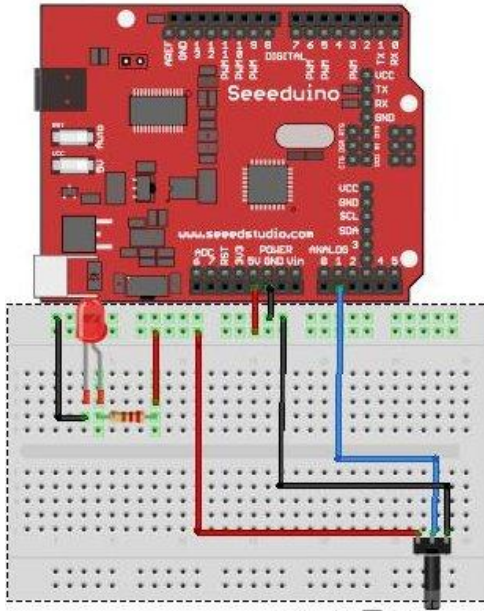
}

```

3 Analog : POT

Circuit

- Connect anode of LED to PWM Pins via a 220 Ohms resistor .
- Connect cathode of LED to GND Pin.
- Mount the Pot in the bread board.
- Connect the right leg of the Pot to +5v.
- Connect the middle leg of the Pot to any of the Analog input pins(0-5).
- Connect left leg of the Pot to the Ground Terminal.



Program

Connect LED anode to digital pin 5 (instead of 5V). Compile and Upload the following sketch:

//Varying the brightness of the LED using a Pot

```
int value=0;
```

```
int mval;
```

```
void setup()
```

```
{
```

```
  pinMode(5, OUTPUT);
```

```
}
```

```
void loop()
```

```
{
```

```
  value=analogRead(A1); //read analog value from input A1
```

```
  // PWM output given to the LED
```

```
  mval = map(value, 0, 1023, 0, 100);
```

```
  analogWrite(5,mval);
```

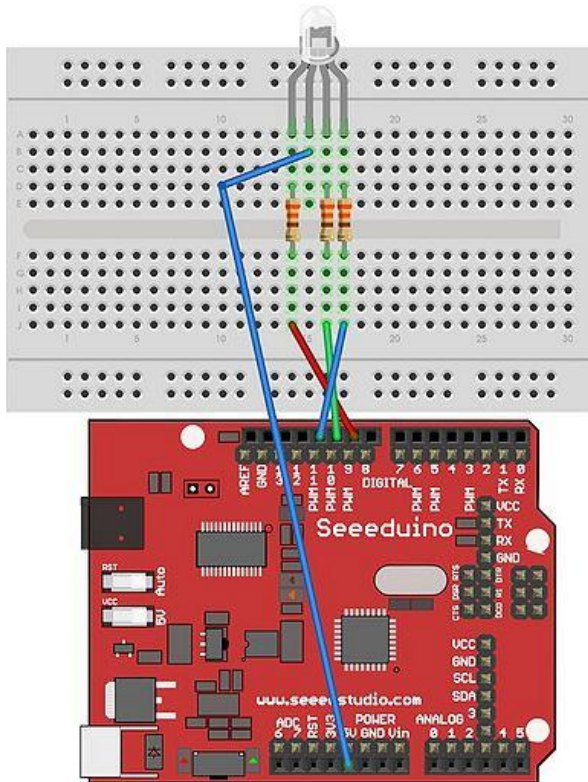
}

4 Rainbow On Desk: Tricolor LED

Circuit

RGB LED supplied with the basic kit is of common anode type. The longest lead is anode. Other three leads are cathodes for Red, Green and Blue respectively.

- Connect RGB cathodes LEDs to Digital Pins 9, 10 and 11 via a 330 Ohms resistor each.
- Connect Anode to +5v



Program

Compile and upload the following sketch:

```
void setup() {
```

```
}
```

```
void loop() {
```

```
for(int r = 0 ; r <= 255; r=r+5)
{
  for(int g = 0 ; g <= 255; g=g+5)
  {
    for(int b = 0 ; b <= 255; b=b+5)
    {
      analogWrite(9, r);
      analogWrite(10, g);
      analogWrite(11, b);
      delay(10);
    }
  }
}
}
```

5 Music:

6 Mini Servo:

Circuit

- Connect the Red colored wire of the servo motor to +5v supply.
- Connect the black colored wire of the servo to ground.
- Connect the yellow wire of the servo to any of the PWM pin in the Arduino.
- Connect the right leg of the Pot to +5v.
- Connect the middle leg of the Pot to any of the Analog input pins(0-5).
- Connect the left leg of the Pot to the Ground Terminal.

Program

Compile and Upload the following sketch:

```
// Controlling a servo position using a potentiometer (variable resistor)
```

```
// by Michal Rinott <http://people.interaction-ivrea.it/m.rinott>
```

```
#include <Servo.h>
```

```
Servo myservo; // create servo object to control a servo
```

```
int potpin = 1; // analog pin used to connect the potentiometer
```

```
int val; // variable to read the value from the analog pin
```

```
void setup()
```

```
{
```

```
  myservo.attach(5); // attaches the servo on pin 5 to the servo object
```

```
  Serial.begin(19200); // some servos doesn't work without Serial
```

```
}
```

```
void loop()
```

```
{
```

```
  val = analogRead(potpin); // reads the value of the potentiometer (value between 0 and 1023)
```

```
  val = map(val, 0, 1023, 0, 179); // scale it to use it with the servo (value between 0 and 180)
```

```
  myservo.write(val); // sets the servo position according to the scaled value
```

```
  delay(15); // waits for the servo to get there
```

```
}
```

Usage

- There is a solderless breadboard so there is no need to purchase a soldering iron or to learn how to solder.
- There are plenty of jumper wires which are long and flexible with rigid tips. These jumper wires are much better than the old fixed length solid wire jumpers of the past.
- There are plenty of LEDs and resistors for your first project including a RGB LED this is a single LED package with with the three primary colored LEDs inside. By adjusting the intensity of the different primary colored LEDs the colors will mix together and produce all the colors of the rainbow.
- There is even a educational how-to card on reading the resistor values.
- The included tilt switch is a very simple device with a small metal ball inside. If the device is tilted to one side the metal ball will touch electrical contacts. This sensor is useful for a variety of projects like a DIY burglar alarm.
- The thermistor is useful for projects where you want to detect the temperature.
- The photo resistor can detect light, it works with light bulbs and sunlight. Photo resistors are commonly used for detecting when it's dark and turning lights on at night.
- The buzzer in the kit works especially well for playing the Mario Brothers theme song.
- There is a Mini Servo motor. You can use it to open and close a deadbolt, lightswitch or valve. You could even use it to make a mini catapult.
- The potentiometer is a great input device. You can use it to control the angle of the Servo arm or the intensity of LEDs.