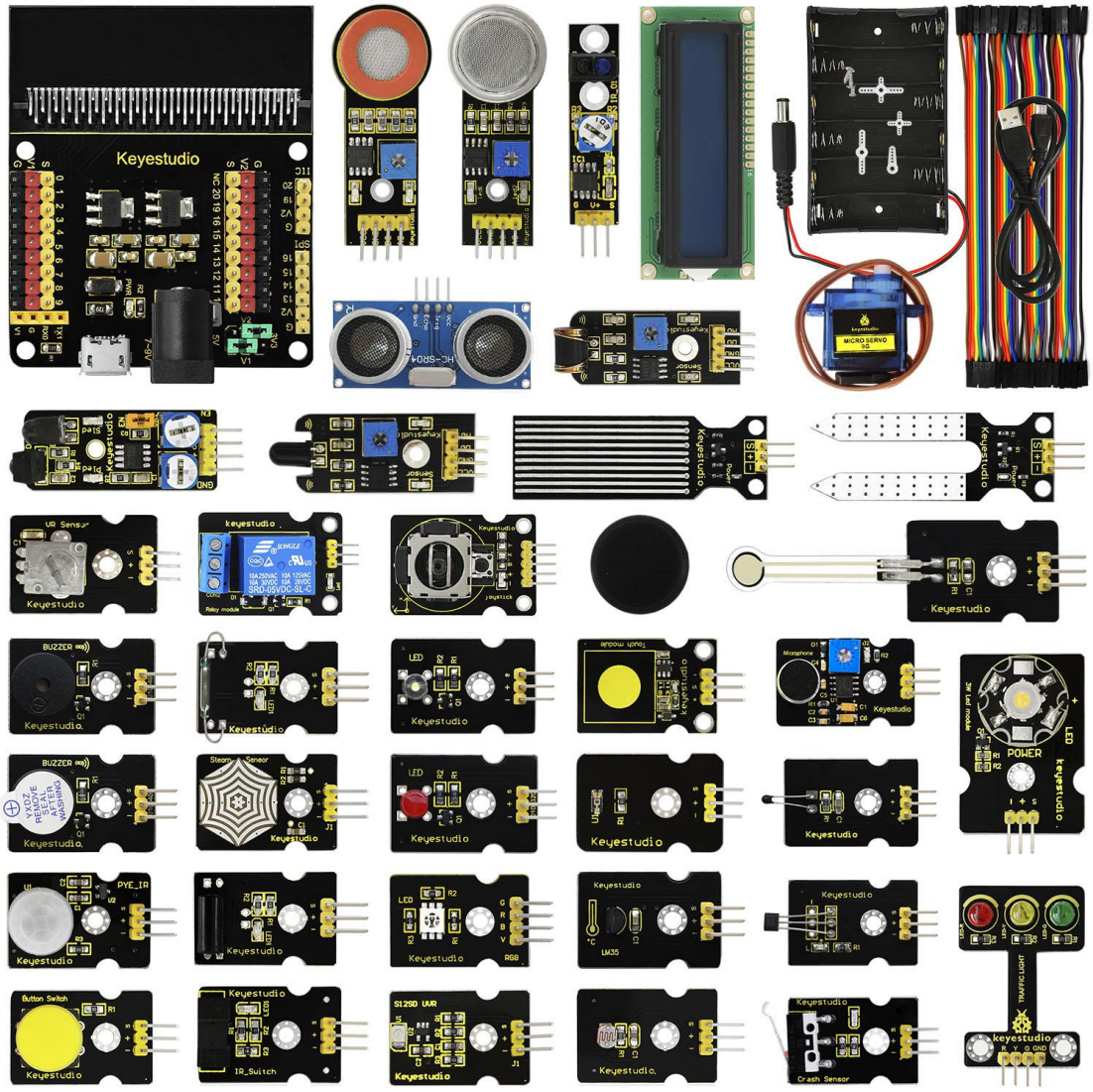
keyestudio 37 in 1 Starter Kit for BBC micro:bit



CONTENT

1. Kit Description

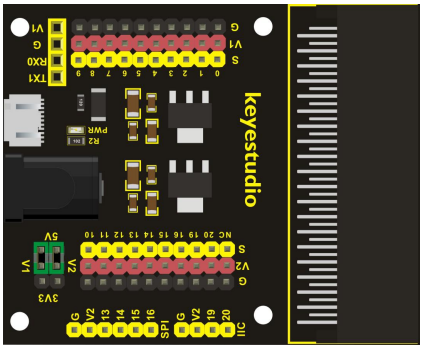
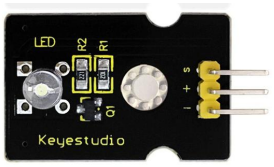
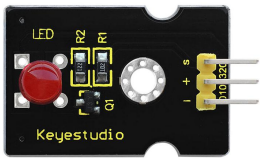
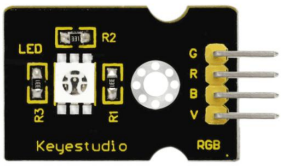
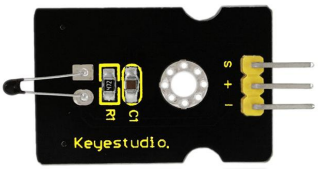
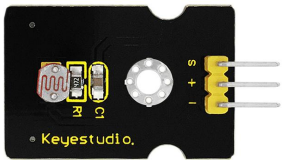
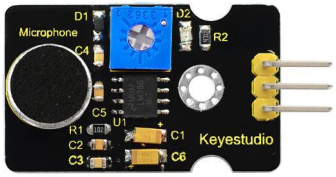
micro: bit is a powerful hand-held, fully programmable, computer designed by the BBC. It is only half size of a credit card, available for children's programming education.
Onboard comes with Bluetooth, accelerometer, compass, three buttons, 5x5 LED matrix, USB interface, connection pins.

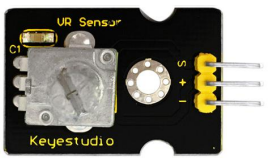
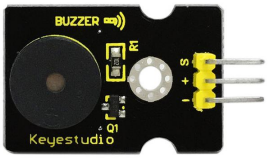
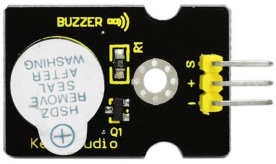
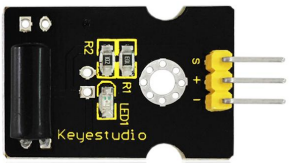
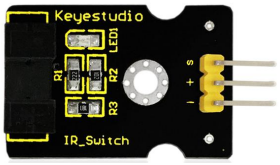
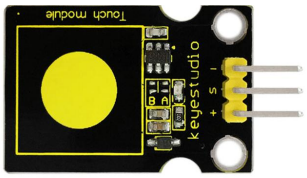
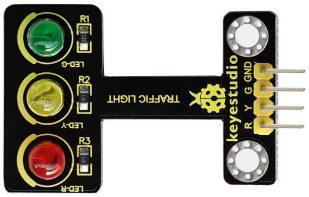
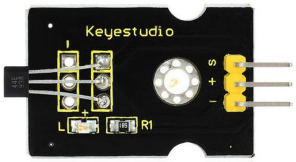
In order to learn micro bit more easier, we particularly make this kit, in which includes a keyestudio sensor shield fully compatible with micro bit and other commonly used sensor modules.
In addition, this sensor kit also provides various learning projects for you, including wiring diagram, source code and more. It can help you make learning easy and fun to enjoy the programming.

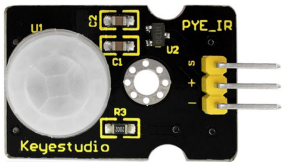
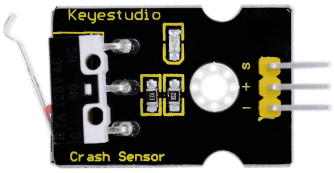
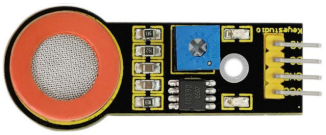
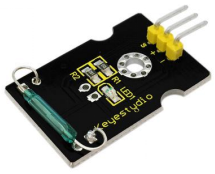
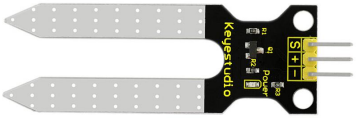
2.Kit List

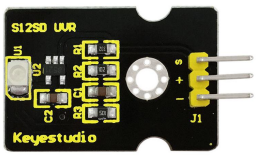
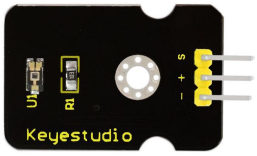
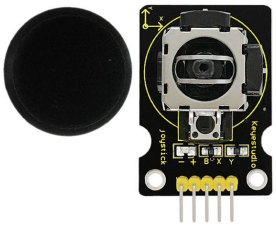
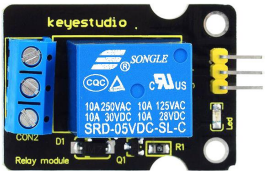
Note: The micro:bit main board is Not Included in KS0361 starter kit, but Included in KS0365 starter kit.

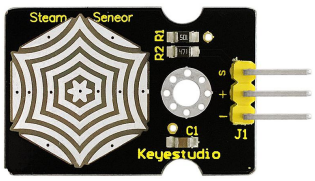
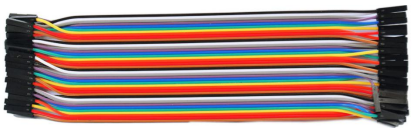
No.	Component	Quantity	Picture
0	micro:bit board **Not Included** in KS0361 Kit		
0	micro:bit board **Included** in KS0365 Kit	1	

1	Keyestudio Micro bit Sensor Shield V2	1	
2	keyestudio White LED Module	1	
3	keyestudio red LED Module	1	
4	keyestudio 3W LED Module	1	
5	keyestudio RGB LED Module	1	
6	keyestudio Analog Temperature Sensor	1	
7	keyestudio Photocell Sensor	1	
8	keyestudio Analog Sound Sensor	1	

9	keyestudio Analog Rotation Sensor	1	
10	keyestudio Passive Buzzer module	1	
11	keyestudio Digital Buzzer Module	1	
12	keyestudio Digital Push Button	1	
13	keyestudio Digital Tilt Sensor	1	
14	keyestudio Photo Interrupter Module	1	
15	keyestudio Capacitive Touch Sensor	1	
16	Keyestudio Traffic Light Module	1	
17	keyestudio Hall Magnetic Sensor	1	
18	keyestudio Line Tracking Sensor	1	

19	keyestudio Infrared Obstacle Detector Sensor	1	
20	keyestudio PIR Motion Sensor	1	
21	keyestudio Flame Sensor	1	
22	keyestudio Crash Sensor	1	
23	keyestudio Analog Gas Sensor	1	
24	keyestudio Analog Alcohol Sensor	1	
25	keyestudio Reed Switch Module	1	
26	keyestudio Water Sensor	1	
27	keyestudio Soil Humidity Sensor	1	
28	keyestudio LM35 Linear Temperature Sensor	1	

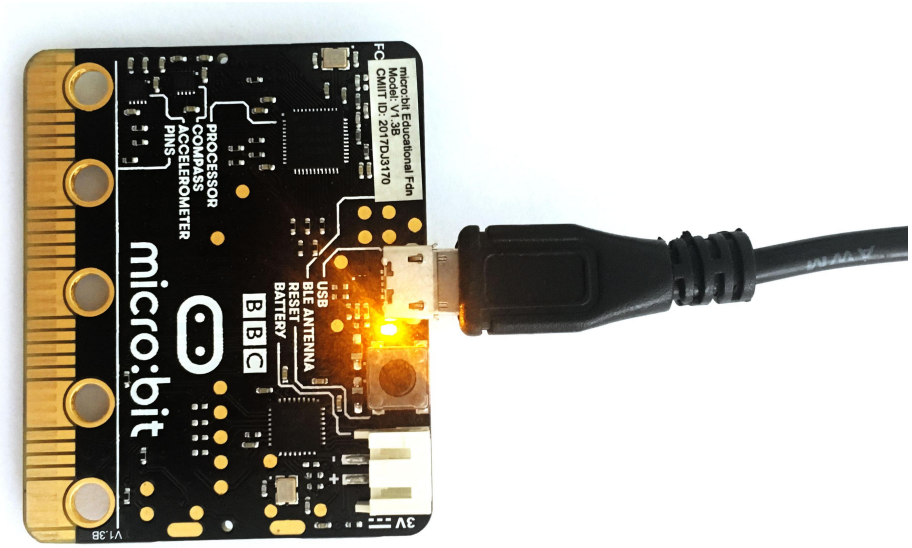
29	Keyestudio Vibration Sensor	1	
30	keyestudio Thin-film Pressure Sensor	1	
31	keyestudio GUVA-S12SD 3528 Ultraviolet Sensor	1	
32	keyestudio 1602 I2C Module	1	
33	keyestudio TEMT6000 Ambient Light Sensor	1	
34	HC-SR04 Ultrasonic Module	1	
35	keyestudio Joystick Module	1	
36	keyestudio Micro Servo	1	
37	keyestudio Single Relay Module	1	

38	keyestudio Steam Sensor	1	
39	F-F Dupont Jumper Wire 40pin	1	
40	USB Cable	1	
41	Premium Battery Case 6-cell AA	1	

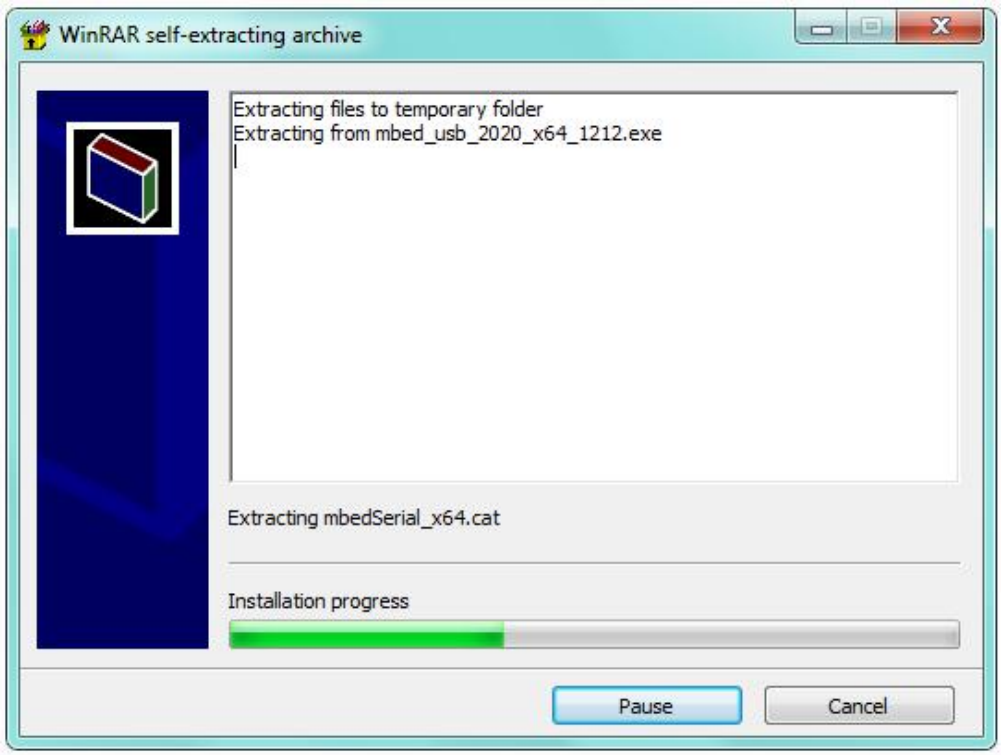
3.micro:bit Driver Installation

Next, let's install the driver for micro:bit main board.

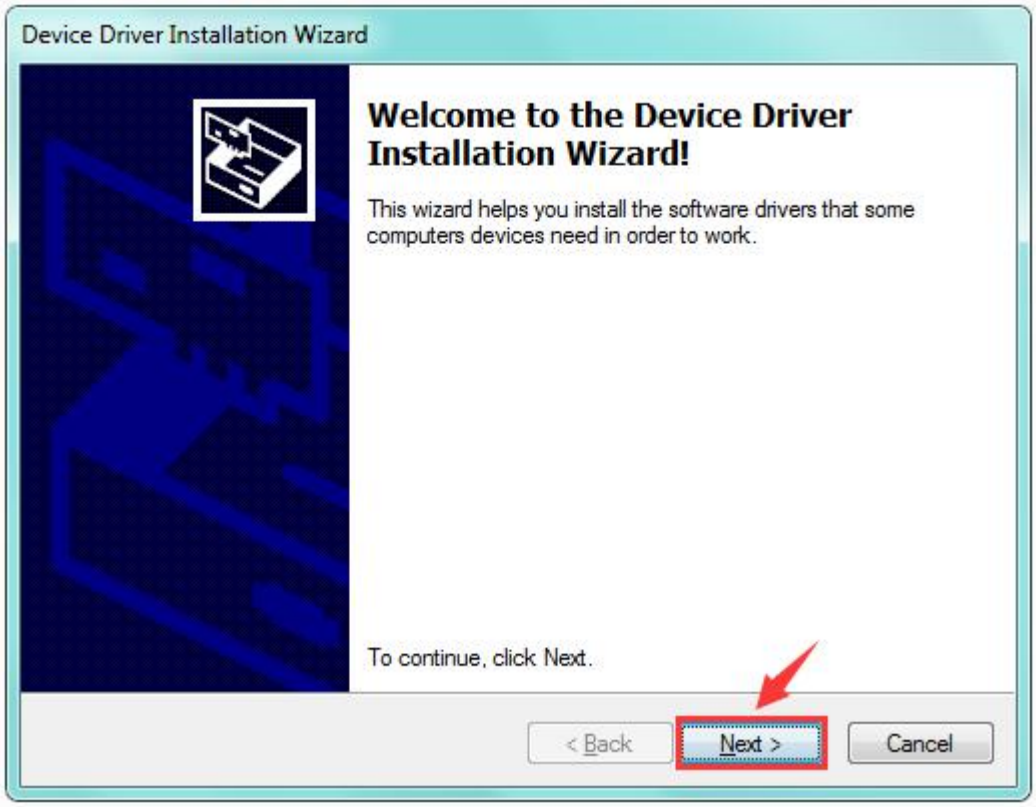
1) First of all, connect the micro:bit to your computer using a USB cable.



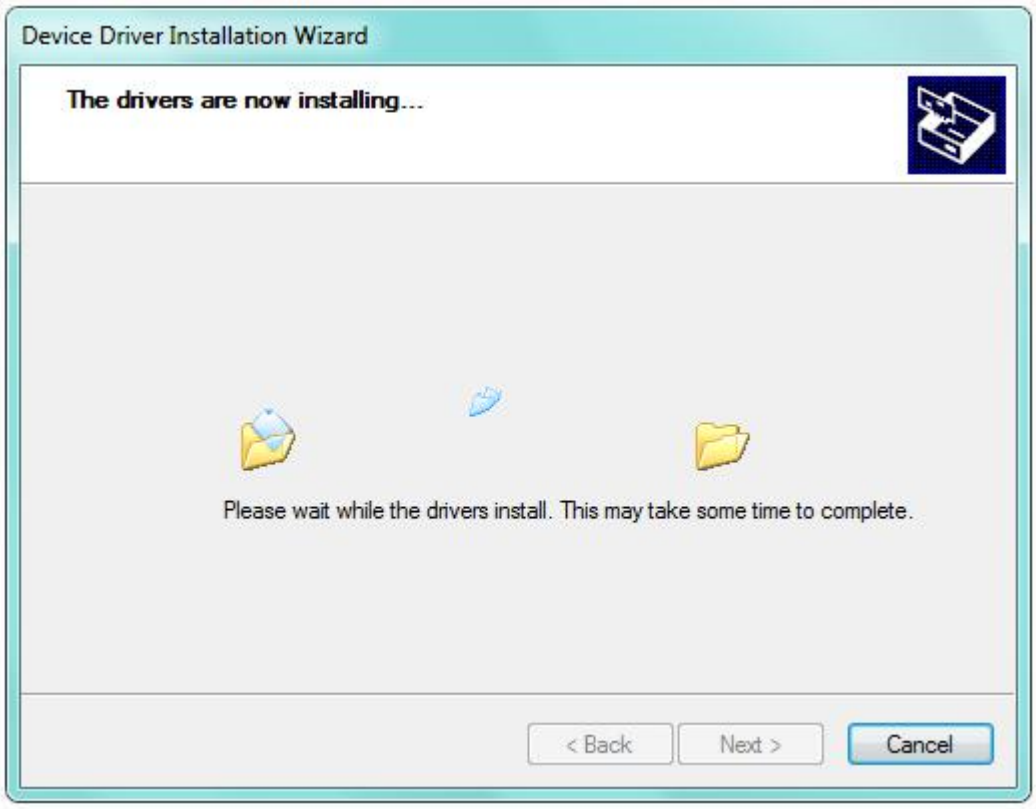
2) Then, double click the driver software to install it. Here you can click the icon below to download it.



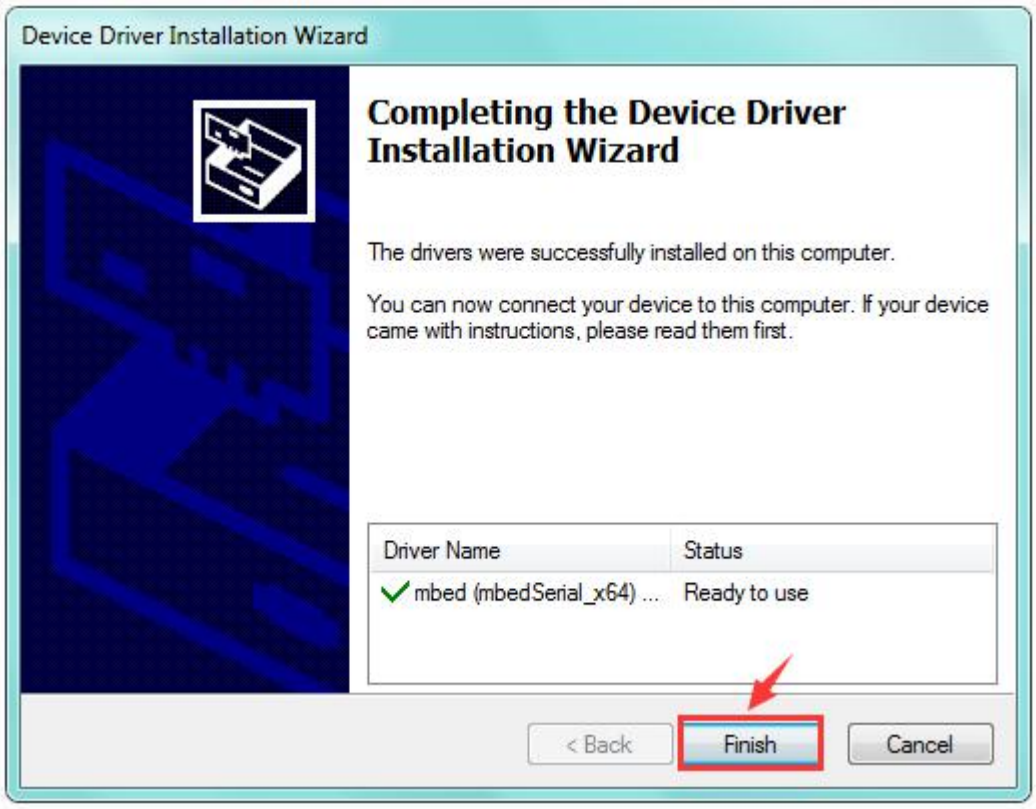
3) After that, click Next to continue the installation.



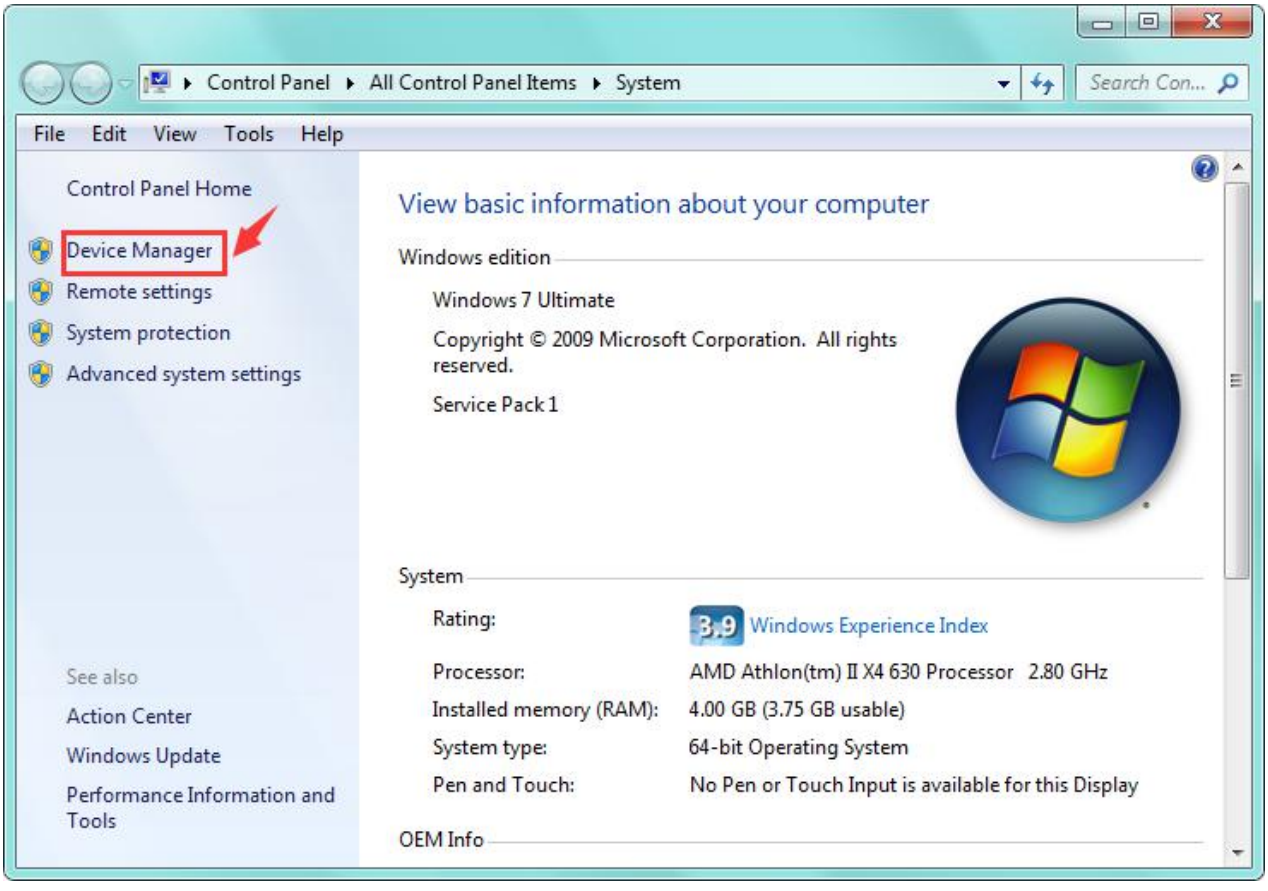
4) Wait the driver installing finished.



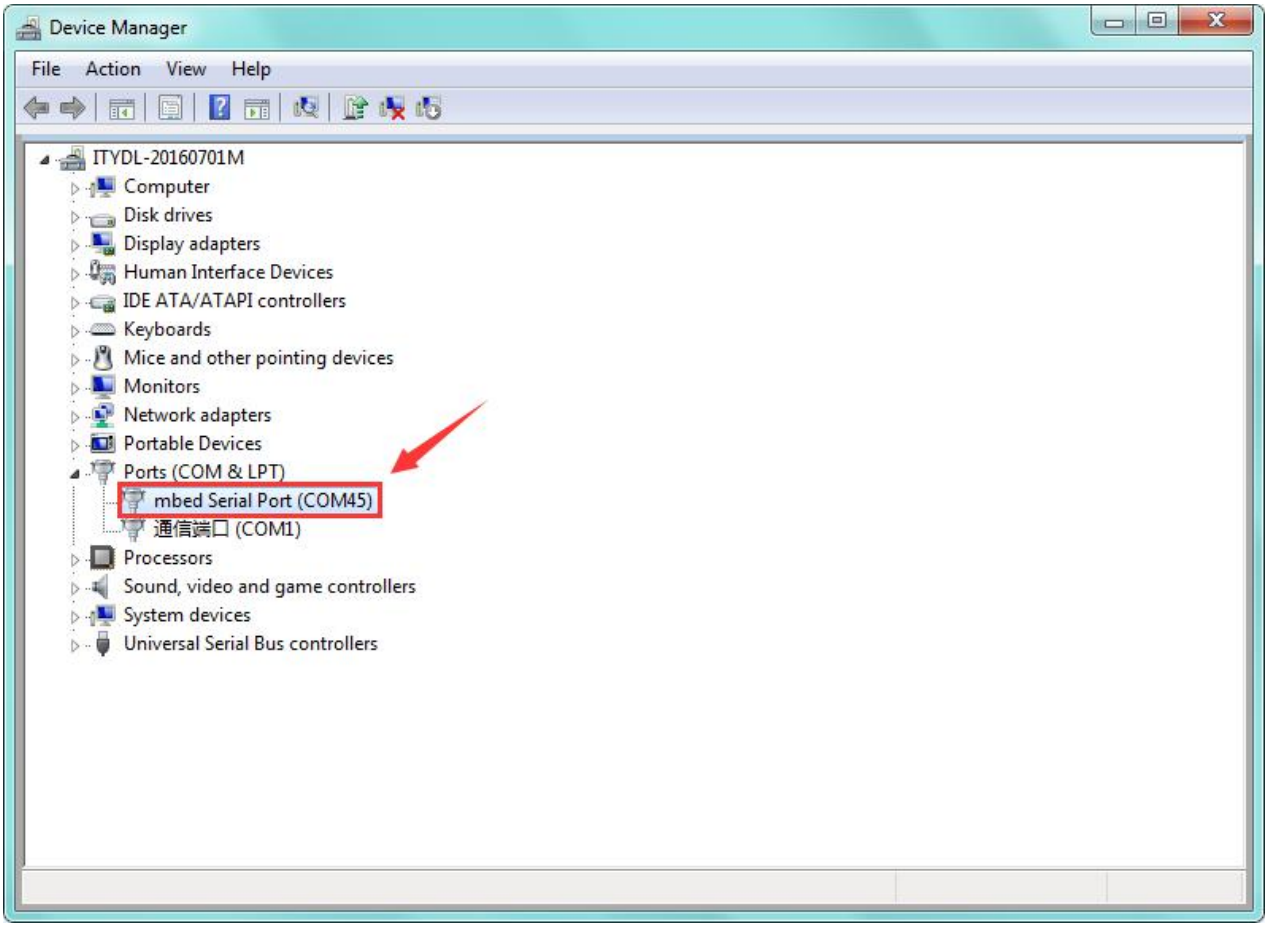
5) Wait the driver installing finished.



6) Driver installation completed, then you can right click the "Computer" —> "Properties"—> "Device Manager".



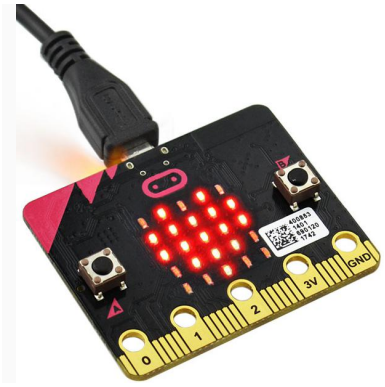
You can check the detailed Ports information shown as below.



4. micro:bit Example Use

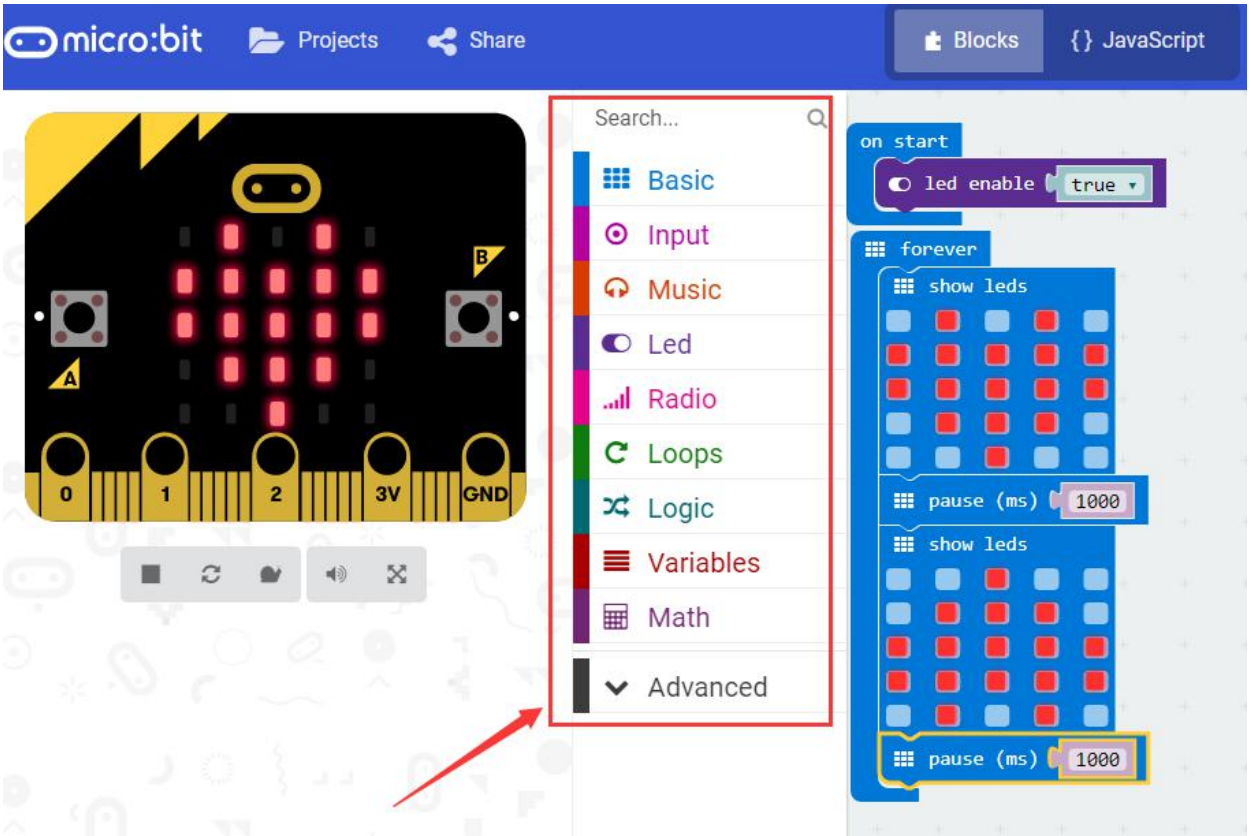
Step 1: Connect It

Connect the micro:bit to your computer via a micro USB cable. Your micro:bit will show up on your computer as a drive called 'micro:bit'.

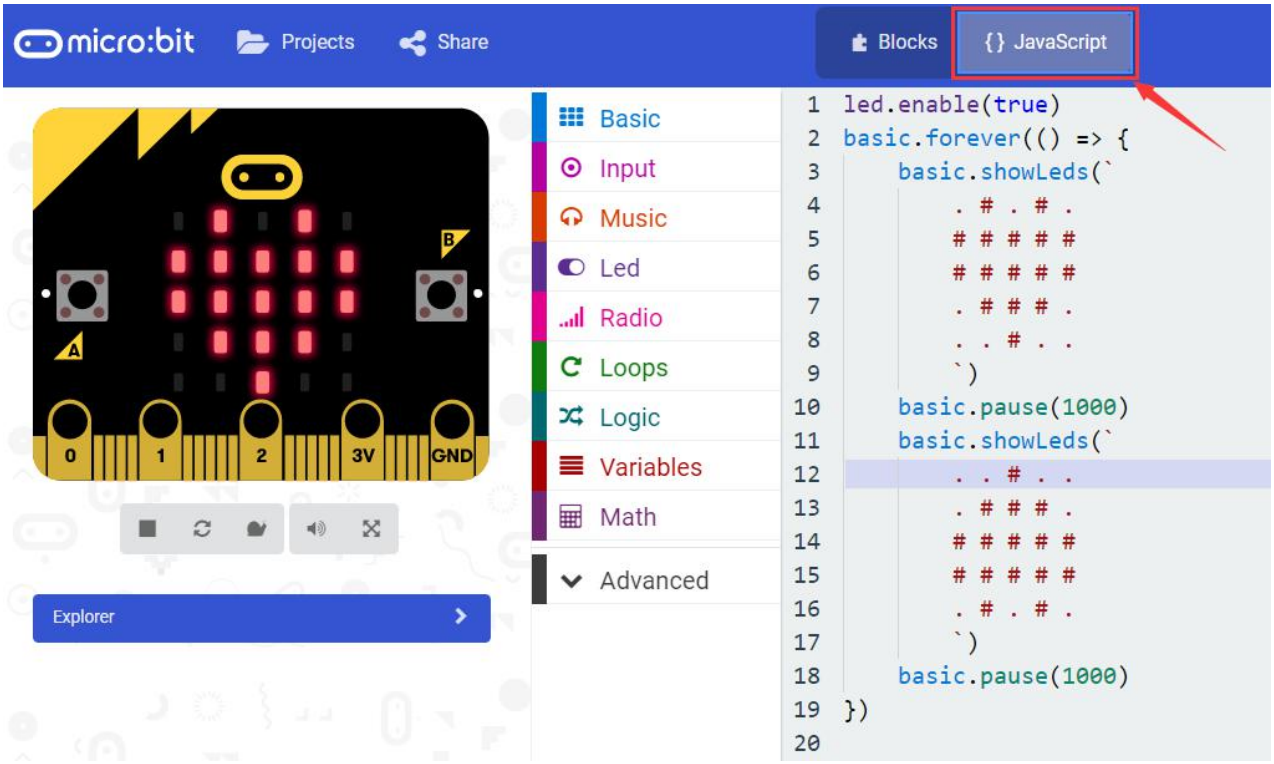


Step 2: Program It

Using micro bit MakeCode Block editor https://makecode.micro:bit.org/, write your first micro:bit code. You can drag and drop some example blocks and try your program on the Simulator in the Javascript Blocks Editor, like in the image below.



Click the **JavaScript**, you can see the corresponding program code. Shown as below figure.

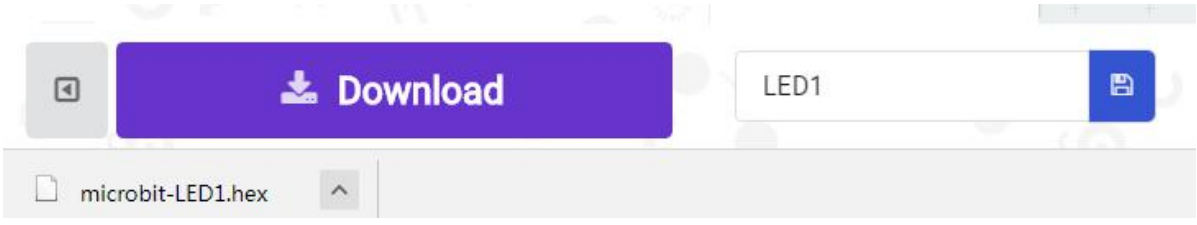


Step 3: Download It

Click the Download button in the editor. This will download a 'hex' file, which is a compact format of your program that your micro:bit can read.

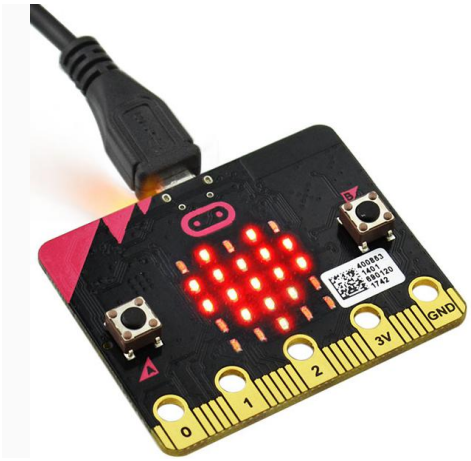
Here you can name the project as LED1, then click "Save". Shown below.

Once the hex file has downloaded, copy it to your micro:bit just like copying a file to a USB drive. On Windows you can right click the file and choose "Send To→micro:bit."

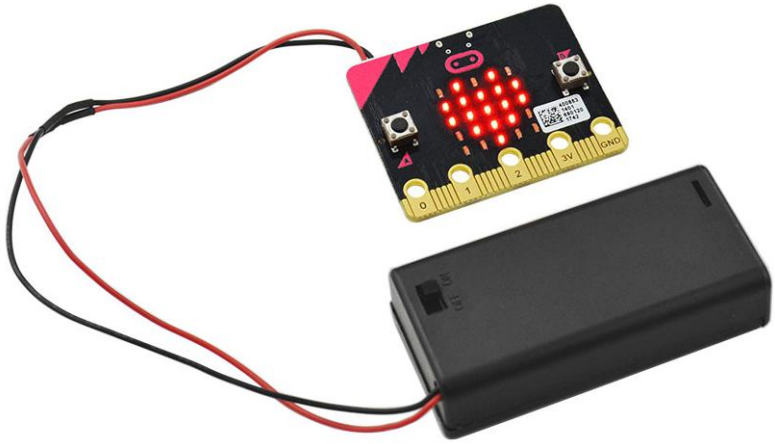


Step 4: Play It

The micro:bit will pause and the yellow 5*5 LED on the back of the micro:bit will display the images while your code is programmed.

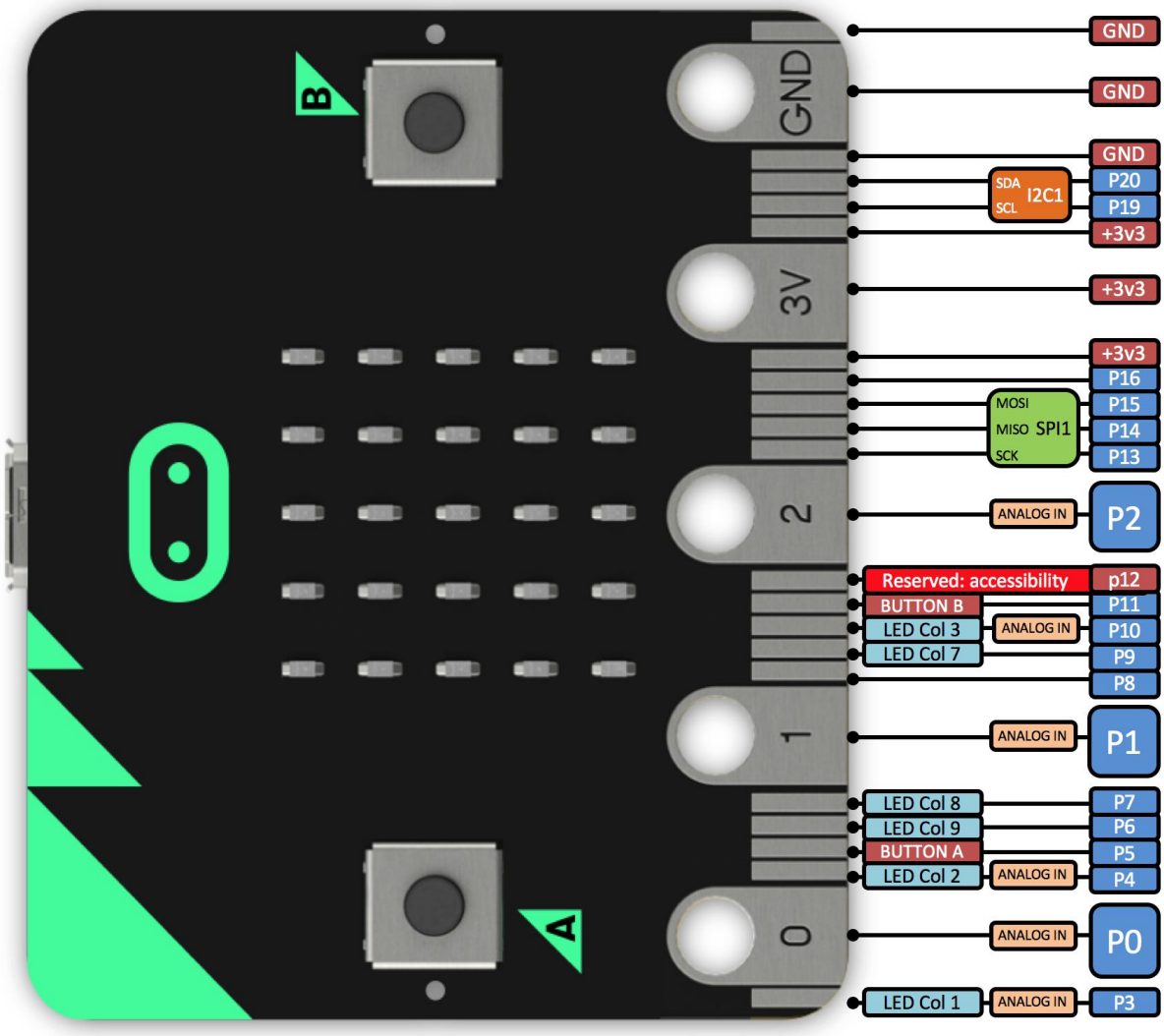


You can power it using USB cable or battery. The battery holder need to connect two 1.5V AA batteries. Shown below.



5. micro:bit Pins

Before getting started with the following projects, first need to figure out each pin of micro:bit main board. Please refer to the reference diagram shown below.



The BBC micro:bit has 25 external connections on the edge connector of the board, which we refer to as 'pins'. The edge connector is the gray area on the right side of the figure above. There are five large pins, that are also connected to holes in the board labeled: 0, 1, 2, 3V, and GND. And along the same edge, there are 20 small pins that you can use when plugging the BBC micro:bit into an edge connector.

Note that it read from the BBC micro:bit official website. More reference you can click the link below:

BBC micro bit Pins: http://micro:bit.org/guide/hardware/pins/

BBC micro:bit website: http://micro:bit.org/

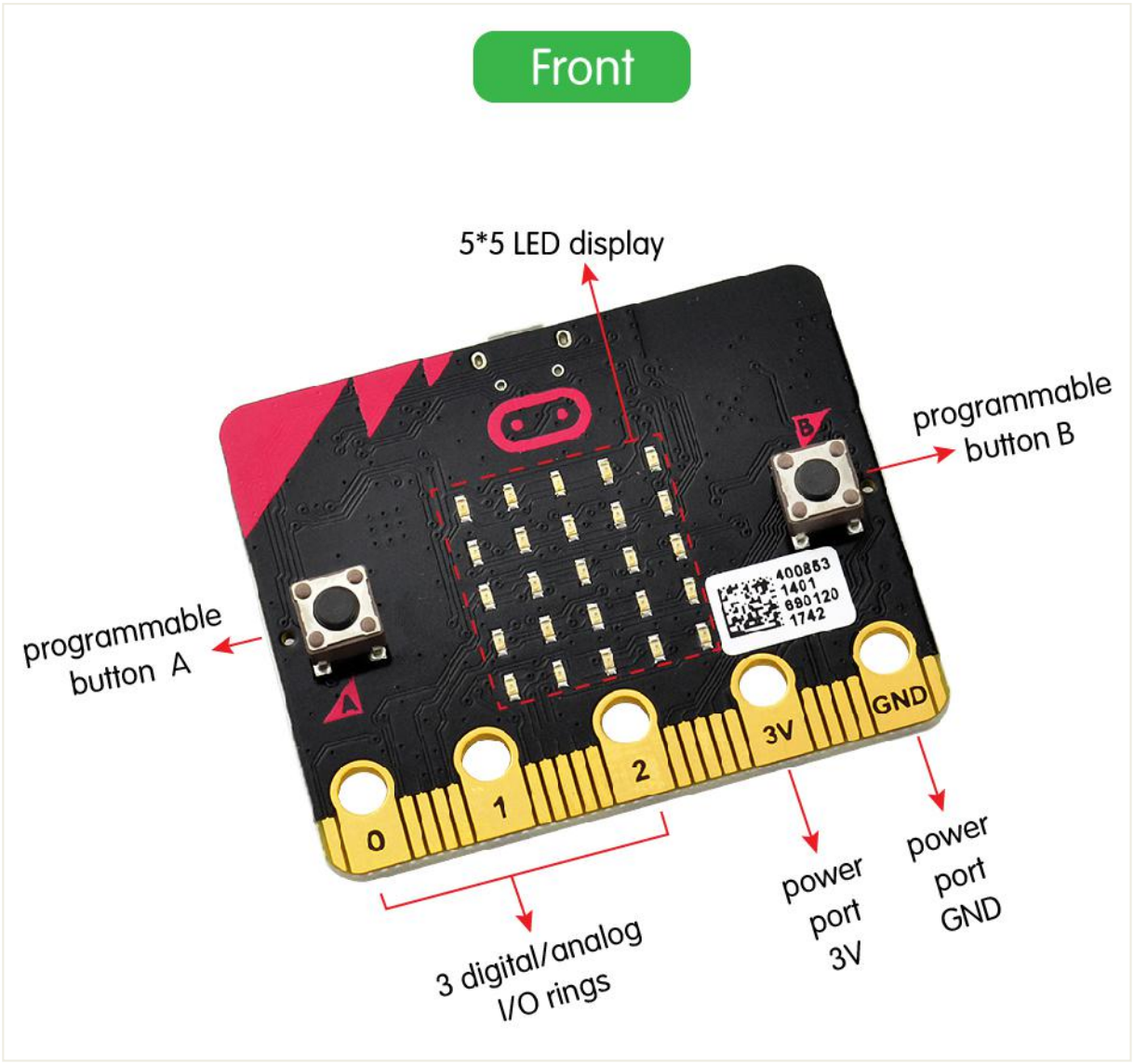
Micro bit MakeCode Block Editor: https://makecode.micro:bit.org/

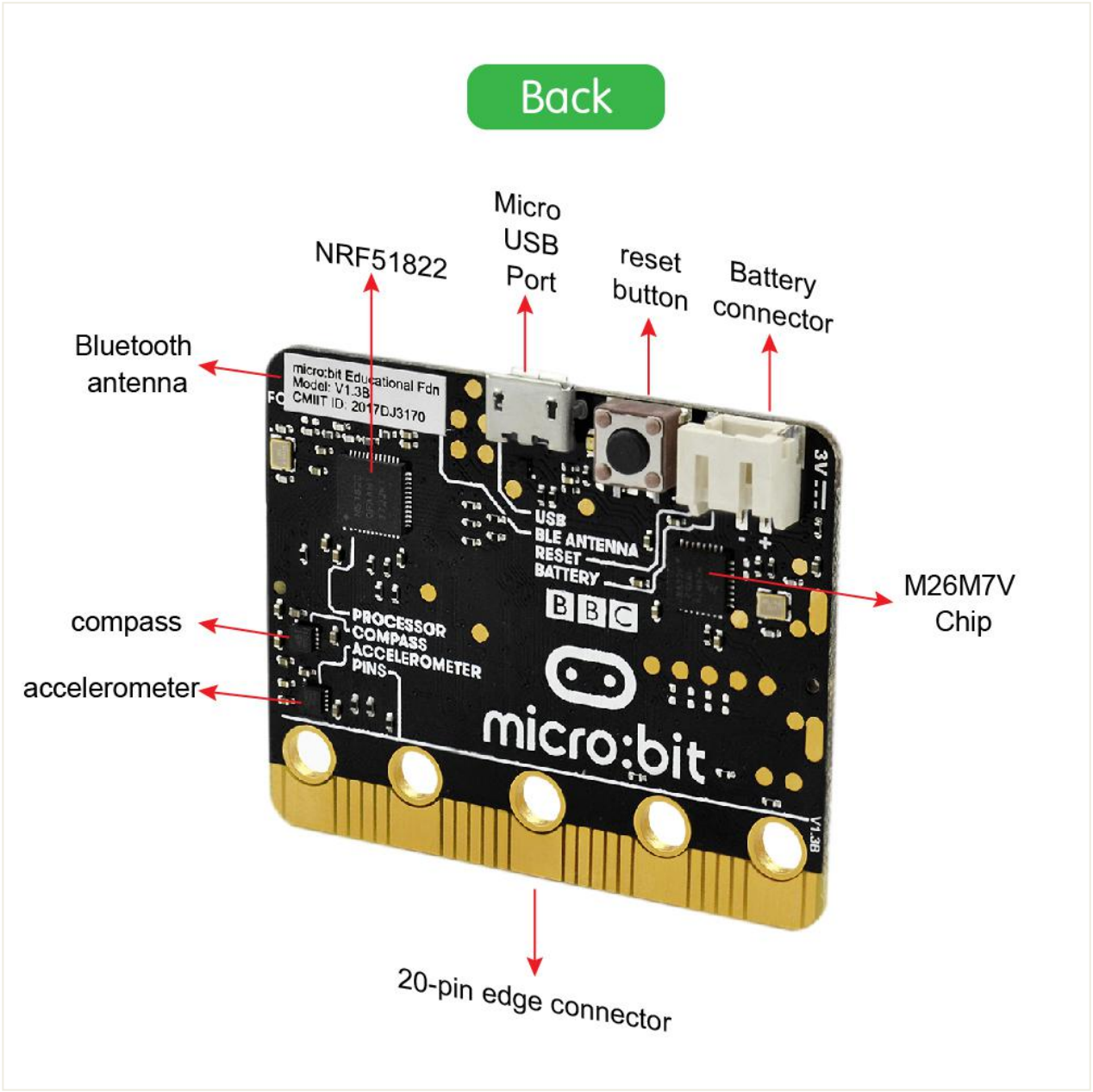
Meet micro:bit starter programming: http://micro:bit.org/guide/

BBC micro:bit Features Guide: http://micro:bit.org/guide/features/

BBC micro:bit Safety Warnings: http://micro:bit.org/guide/features/

BBC micro:bit Quick Start Guide: http://micro:bit.org/guide/quick/





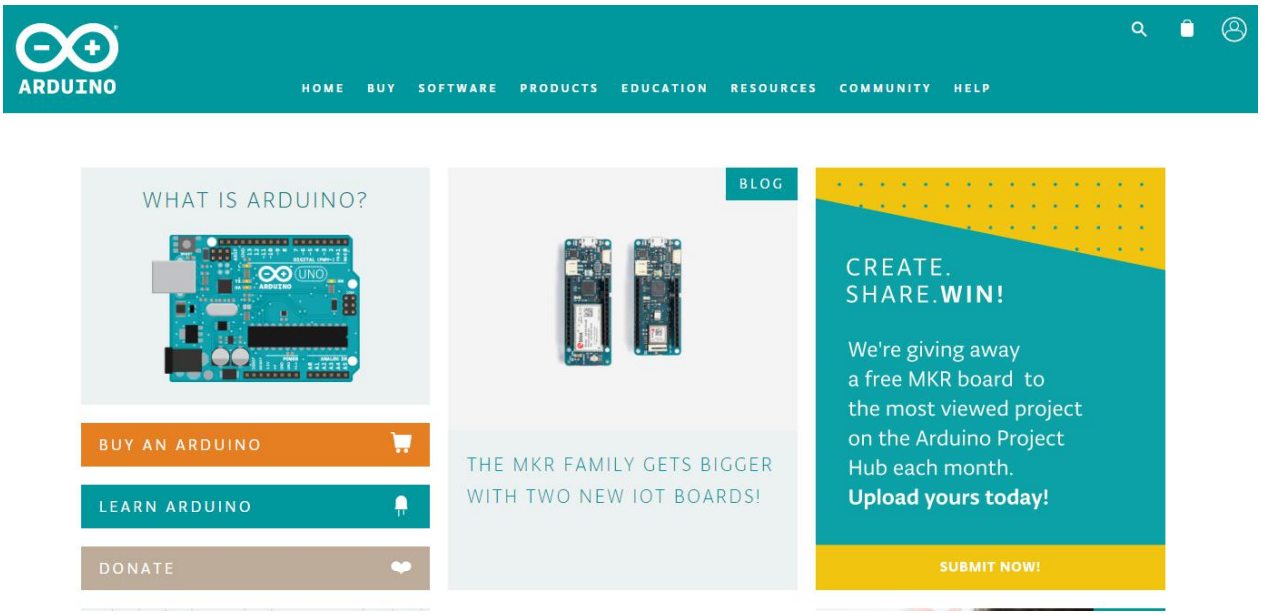
After mastering the basic information of BBC micro:bit, in the following part let's move on to programming projects.

Use this small board with keyestudio micro bit sensor shield and other sensor modules to make some interactive experiments.

Play it and learn it. Enjoy your wonderful time!

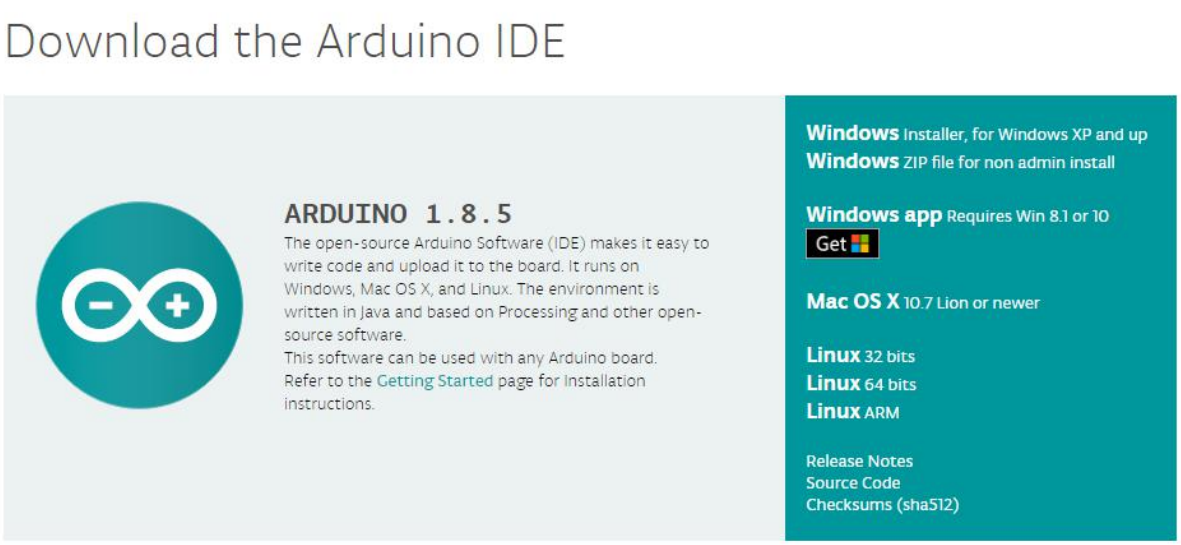
6. Installing Arduino Software

When you get the UNO development board, first you should install the software and driver of Arduino. Here you can browse the ARDUINO website at this link, https://www.arduino.cc, pop up the following interface.



Then click the SOFTWARE on the browse bar, you will have two options ONLINE TOOLS and DOWNLOADS.

Click DOWNLOADS, it will appear the latest software version of ARDUINO 1.8.5 shown as below.



In this software page, on the right side you can see the version of development software for different operating systems. So ARDUINO has a rather powerful compatibility. You should download the software that is compatible with the operating system of your computer.

In our project, we will take WINDOWS system as an example here.

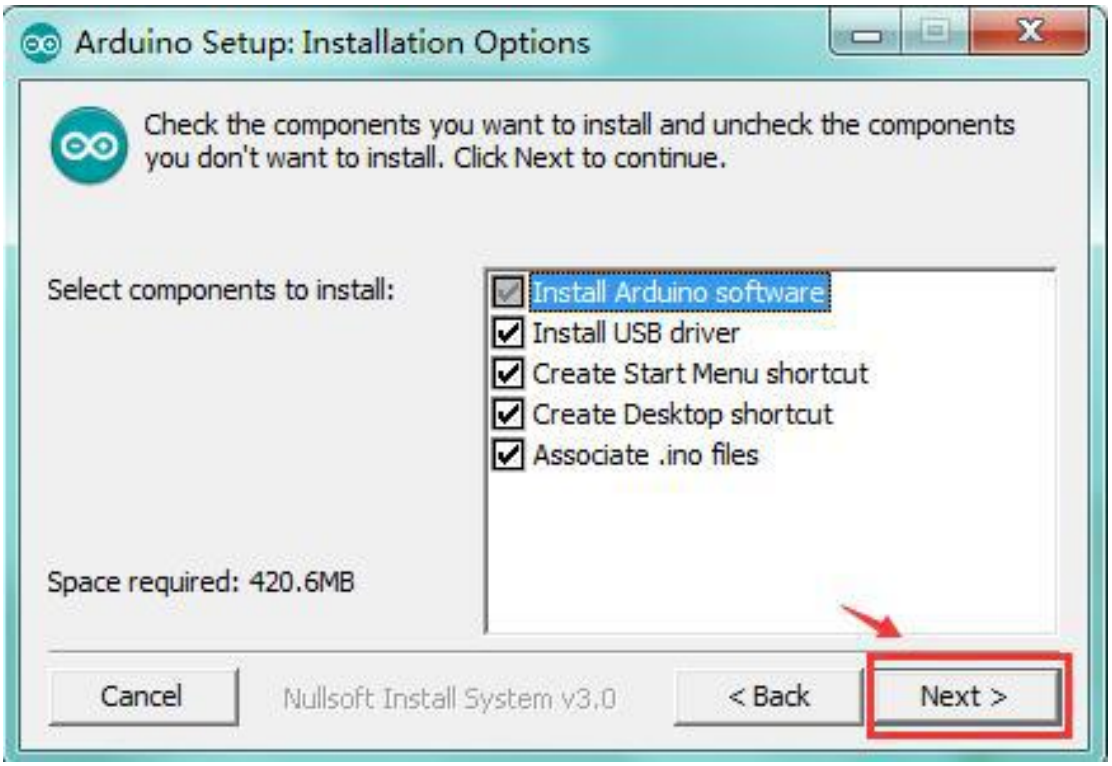
First click Windows Installer, you will get the following page.

Click JUST DOWNLOAD, and when the ZIP file is downloaded well to your computer, you can directly unzip the file and then click the icon of ARDUINO program to start it.

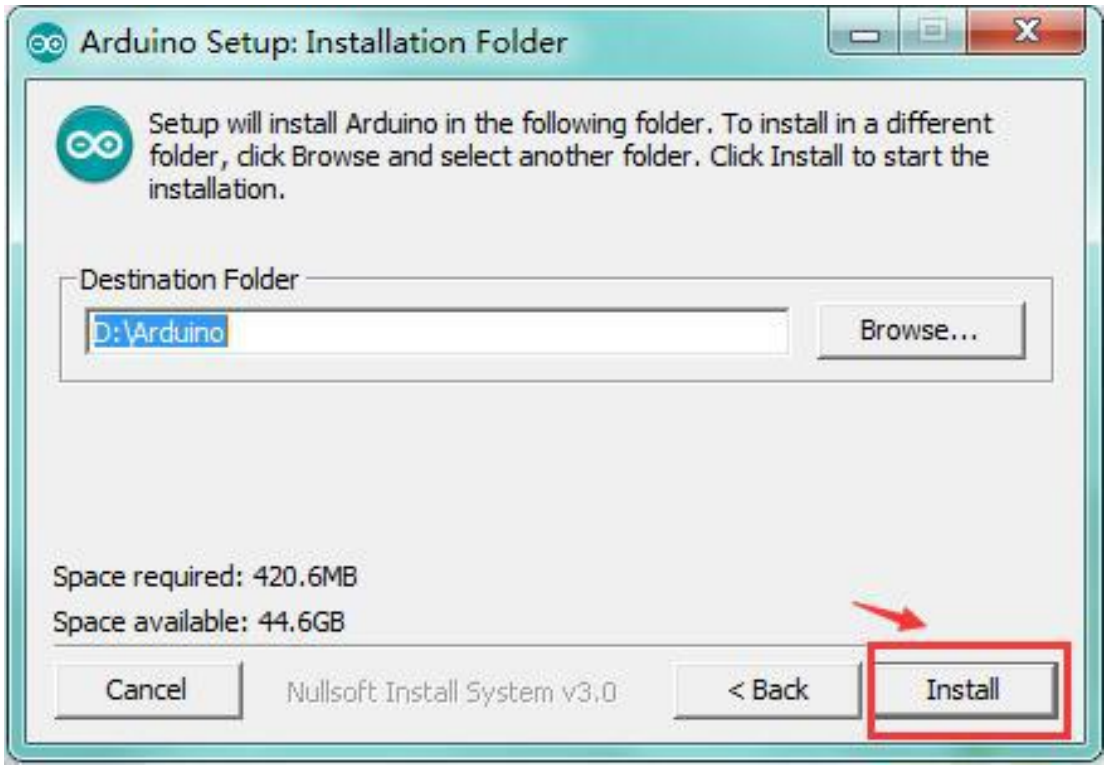
Installing Arduino (Windows)

Install Arduino with the **exe. Installation** package. Here we provide you with Arduino-1.5.6-r2-windows package, you can directly click the icon to install it.

Click *"I Agree"* to see the following interface.

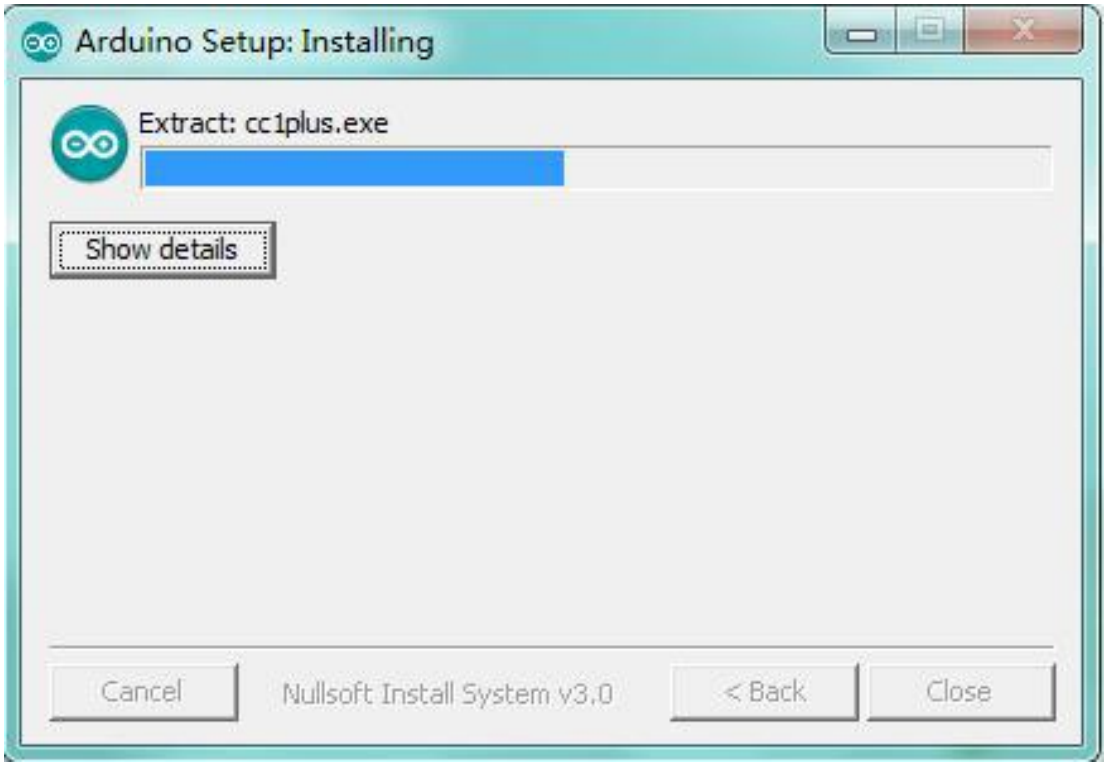


Click *"Next"*. Pop up the interface below.

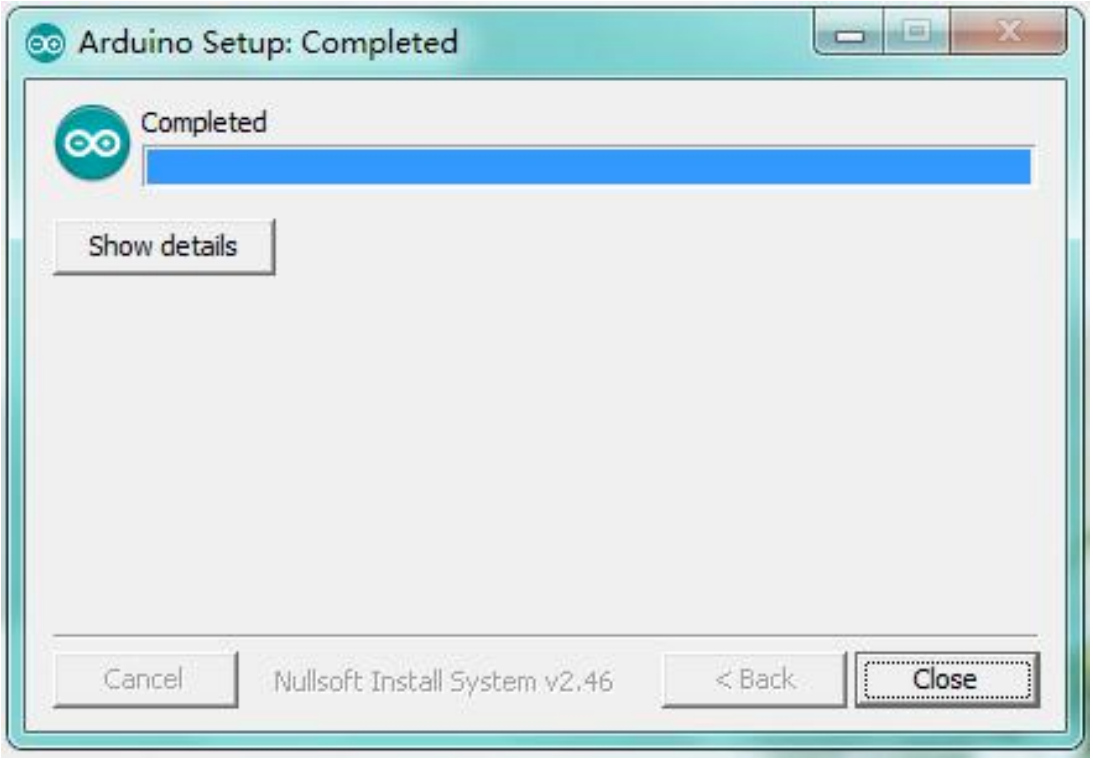


You can press Browse… to choose an installation path or directly type in the directory you want.

Then click "Install" to initiate installation.

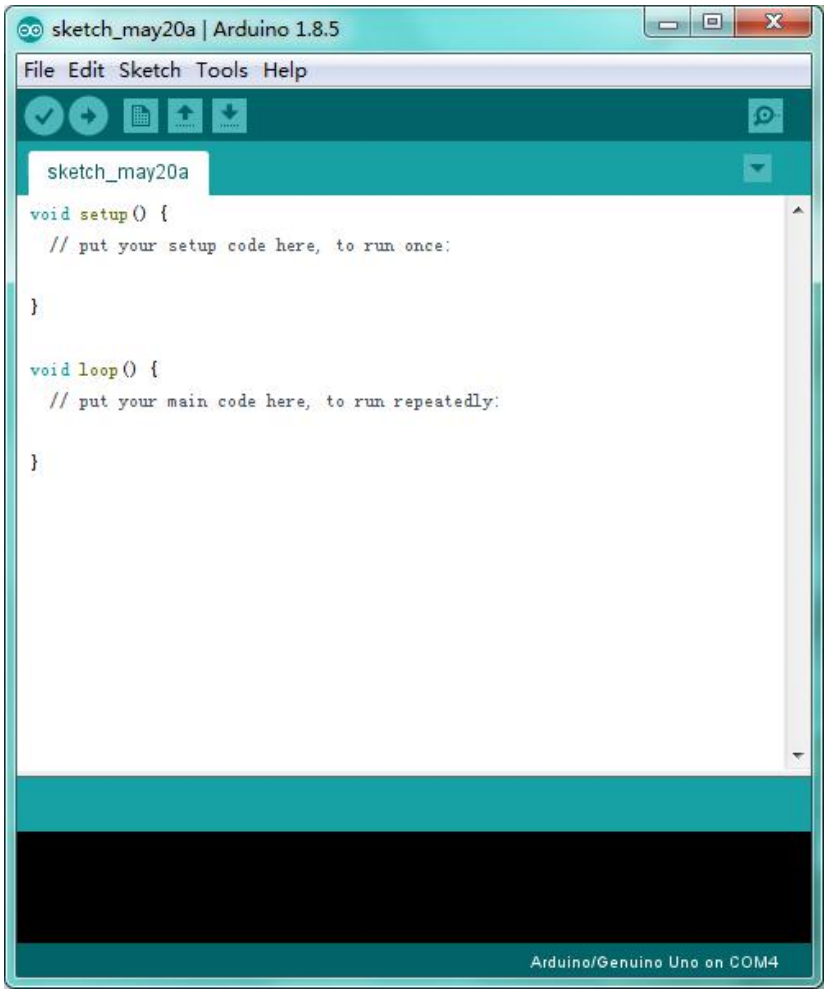


Wait for the installing process, if appear the interface of Window Security, just continue to click Install to finish the installation.



All right, up to now, you have completed the Arduino setup! The following icon will appear on your PC desktop.

Double-click the icon of Arduino to enter the desired development environment shown as below.



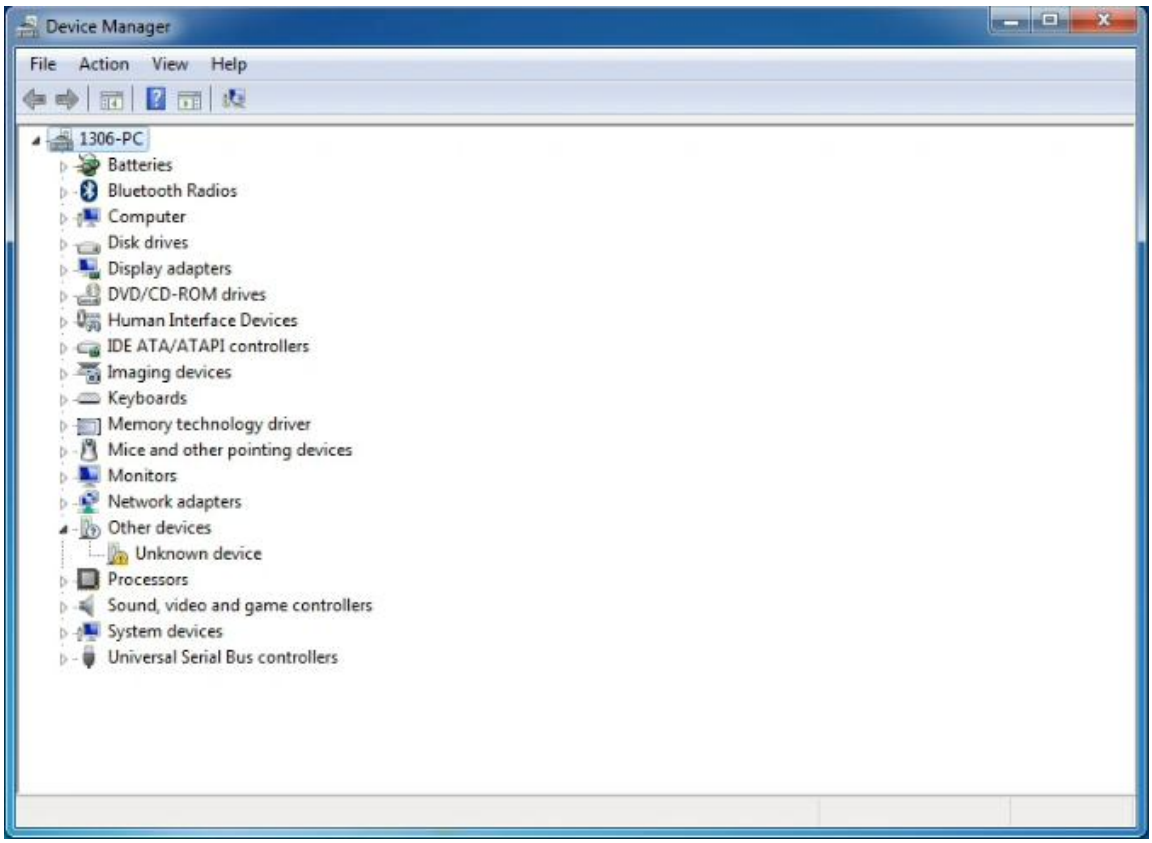
Installing Driver

Next, we will introduce the driver installation of UNO R3 development board. The driver installation may have slight differences in different computer systems. So in the following let's move on to the driver installation in the WIN 7 system.

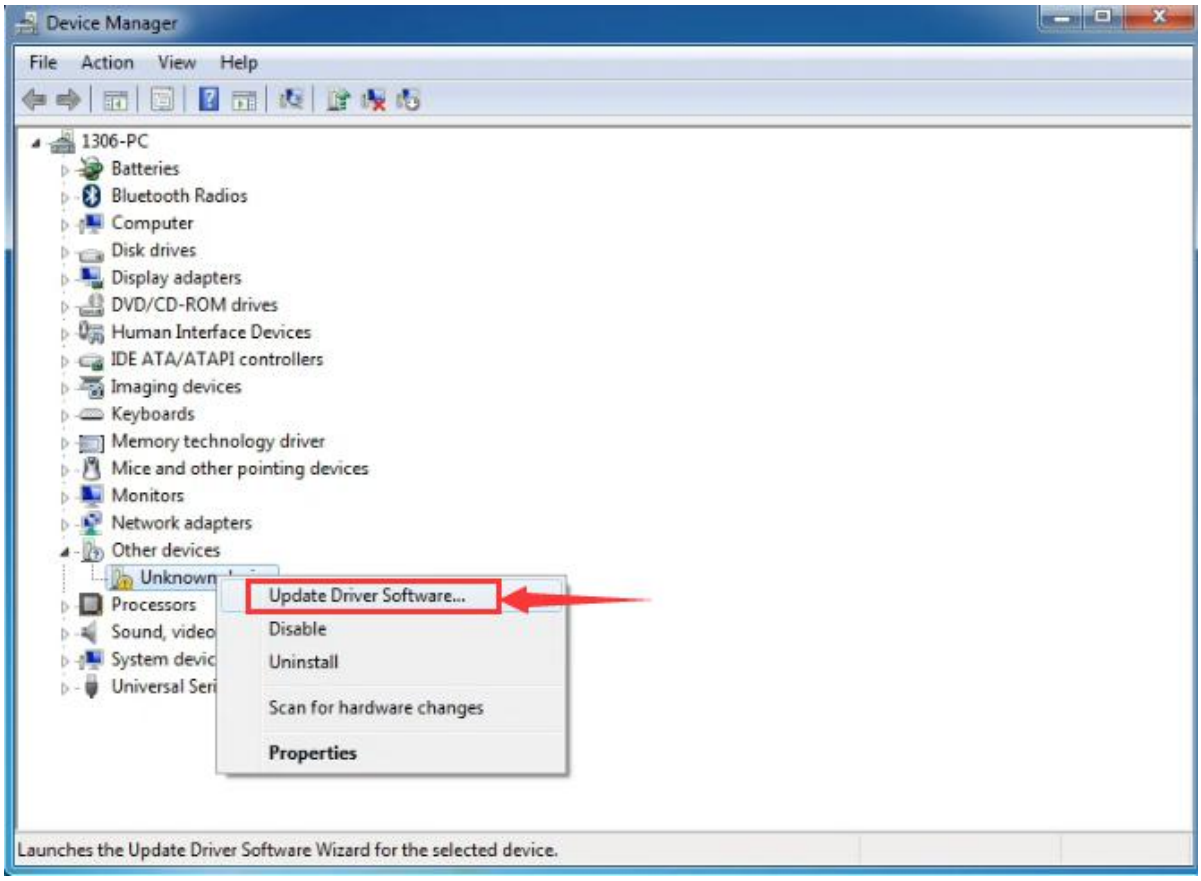
The Arduino folder contains both the Arduino program itself and the drivers that allow the Arduino to be connected to your computer by a USB cable. Before we launch the Arduino software, you are going to install the USB drivers.

Plug one end of your USB cable into the Arduino and the other into a USB socket on your computer.

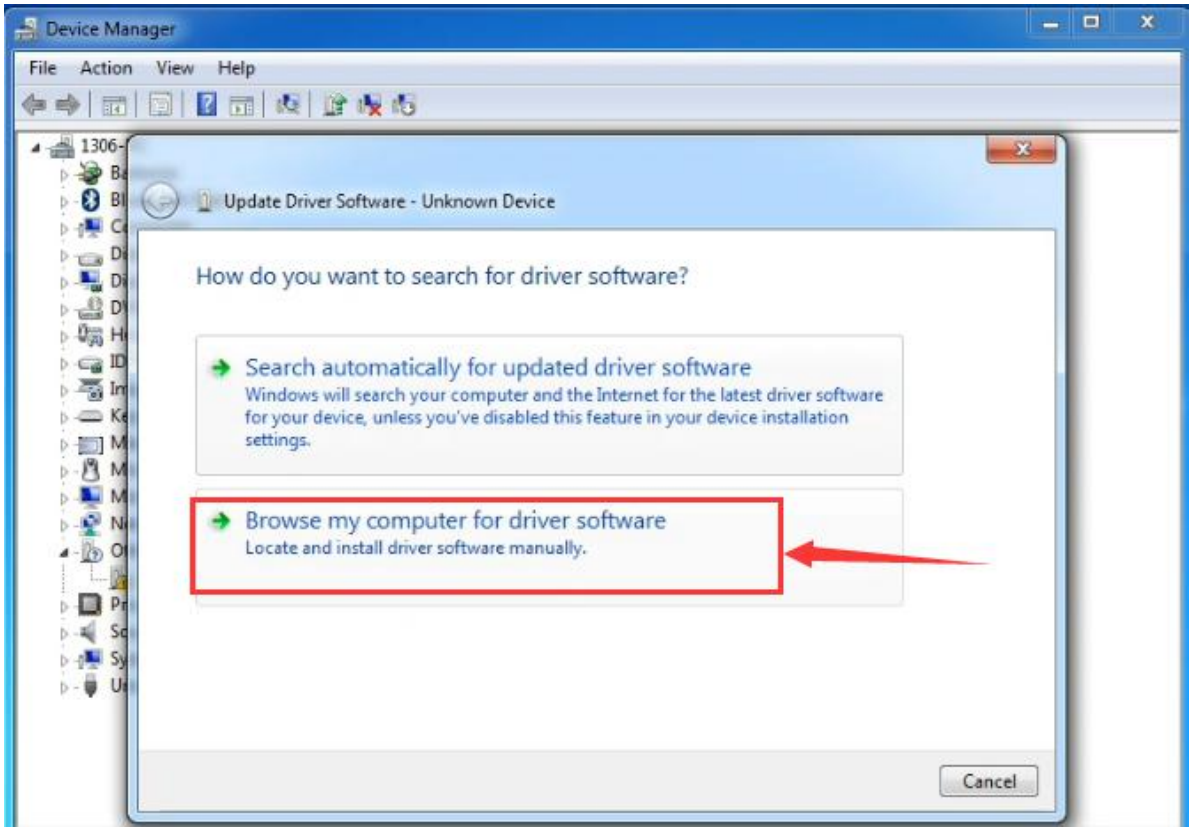
When you connect UNO board to your computer at the first time, right click the icon of your *"Computer" —>for "Properties"—> click "Device manager"*, under "Other Devices", you should see an icon for "Unknown device" with a little yellow warning triangle next to it. This is your Arduino.



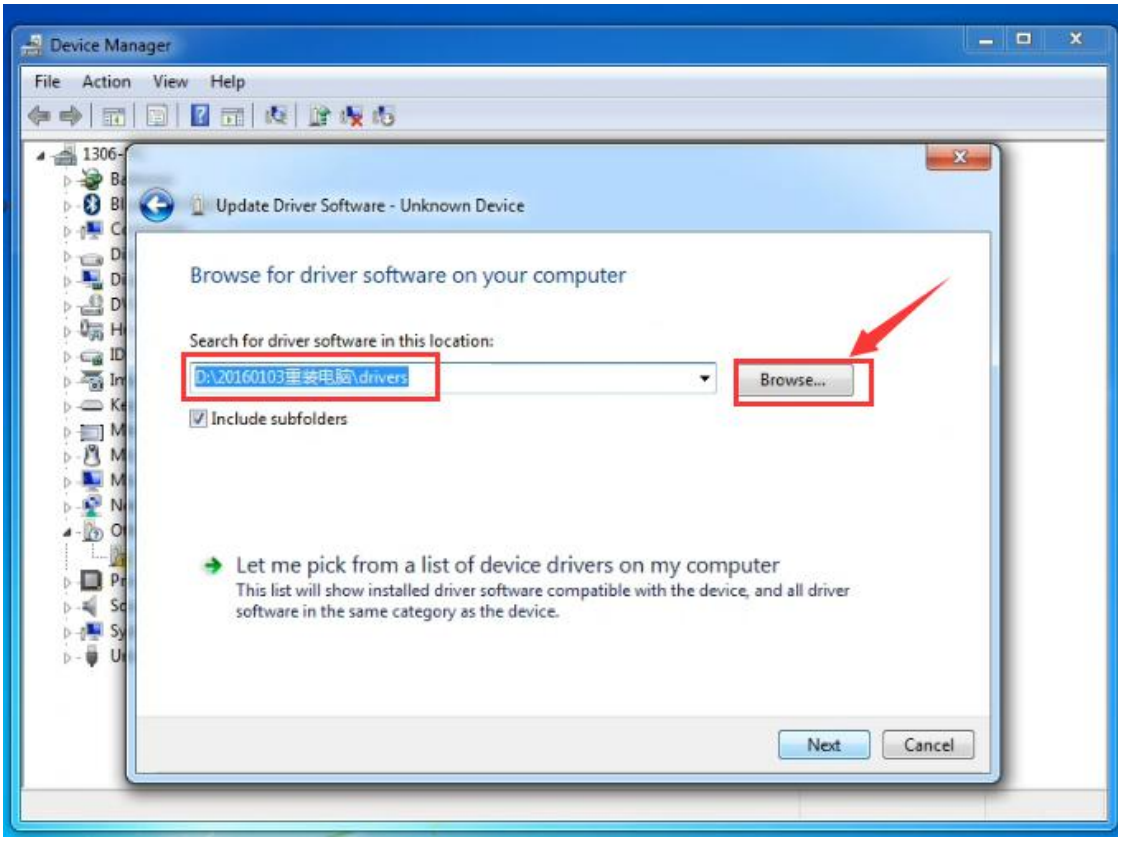
Then right-click on the device and select the top menu option (Update Driver Software...) shown as the figure below.



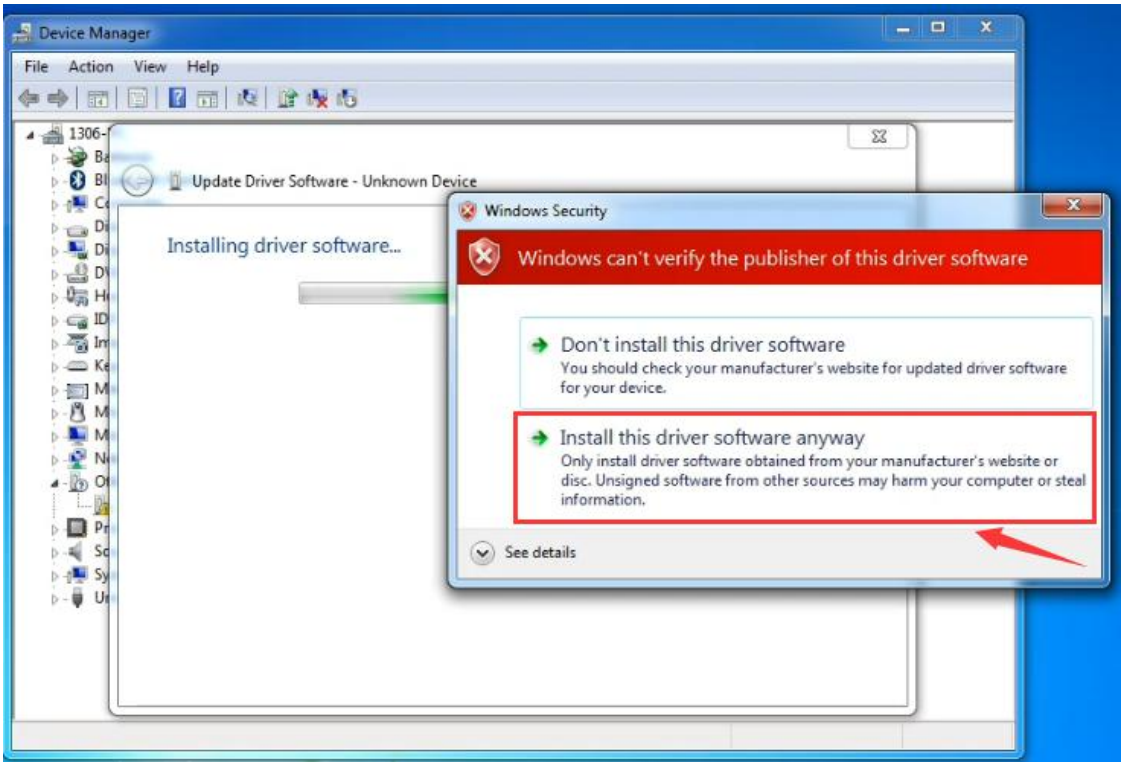
It will then be prompted to either "Search Automatically for updated driver software" or "Browse my computer for driver software". Shown as below. In this page, select "Browse my computer for driver software".



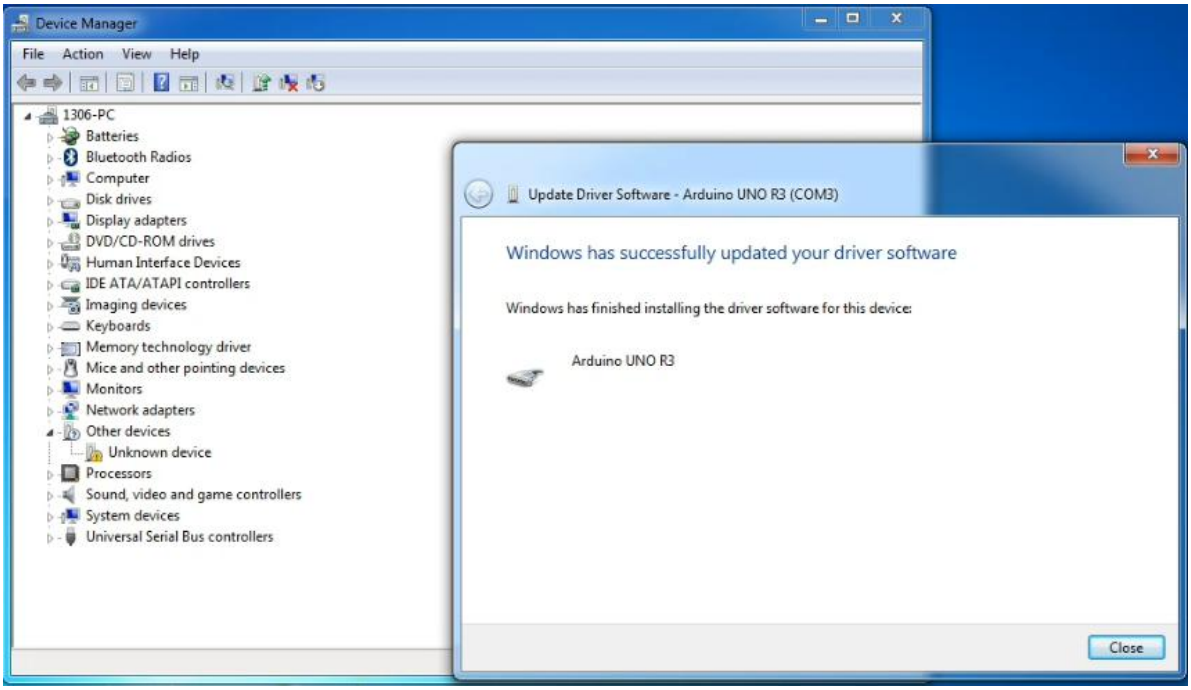
After that, select the option to browse and navigate to the "drivers" folder of Arduino installation.



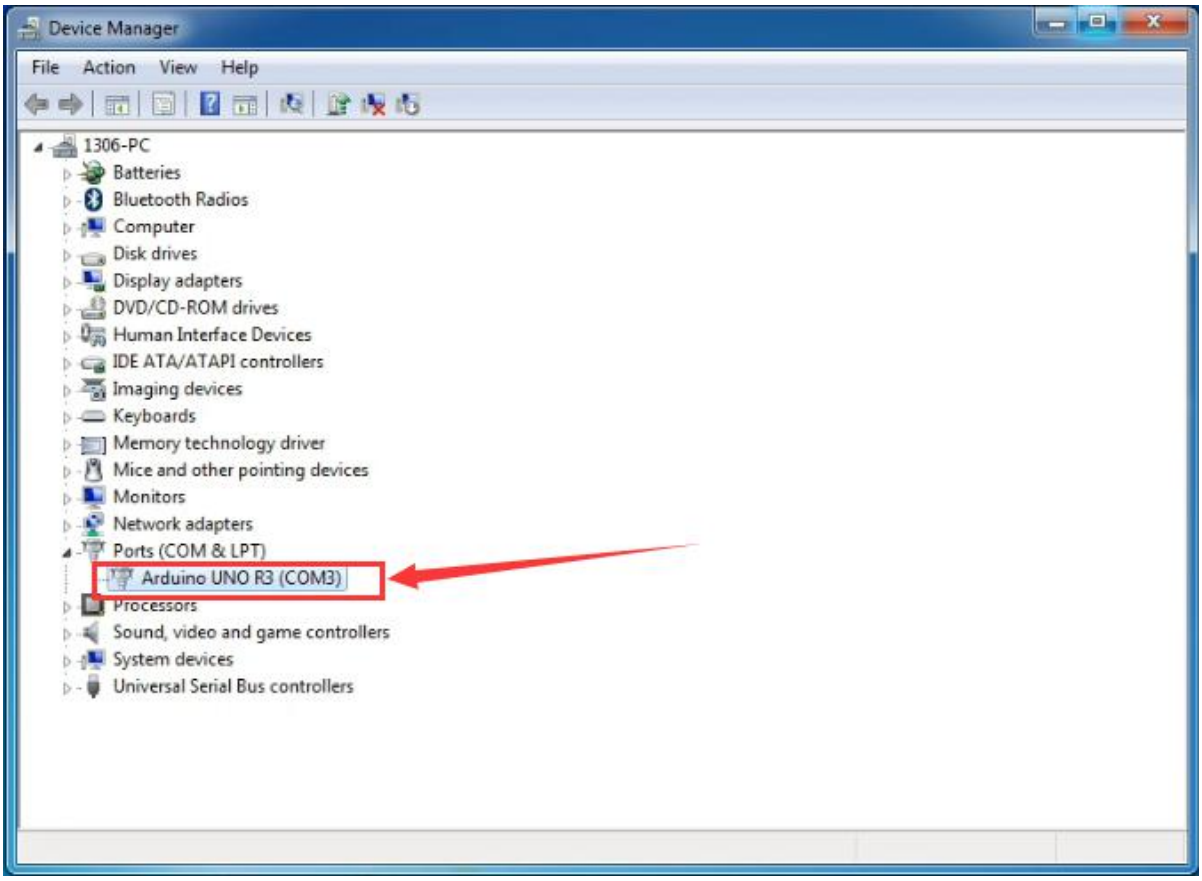
Click "Next" and you may get a security warning, if so, allow the software to be installed. Shown as below.



Once the software has been installed, you will get a confirmation message. Installation completed, click "Close".



Up to now, the driver is installed well. Then you can right click *"Computer"—>"Properties"—>"Device manager"*, you should see the device as the figure shown below.



7. Example Projects

Project 1: Hello world

Overview

This project is very simple. You can use only a micro:bit main board and a USB cable to display the "Hello World!". It is a communication experiment between the micro:bit and PC. This is an entry experiment for you to enter the programming world of micro bit.

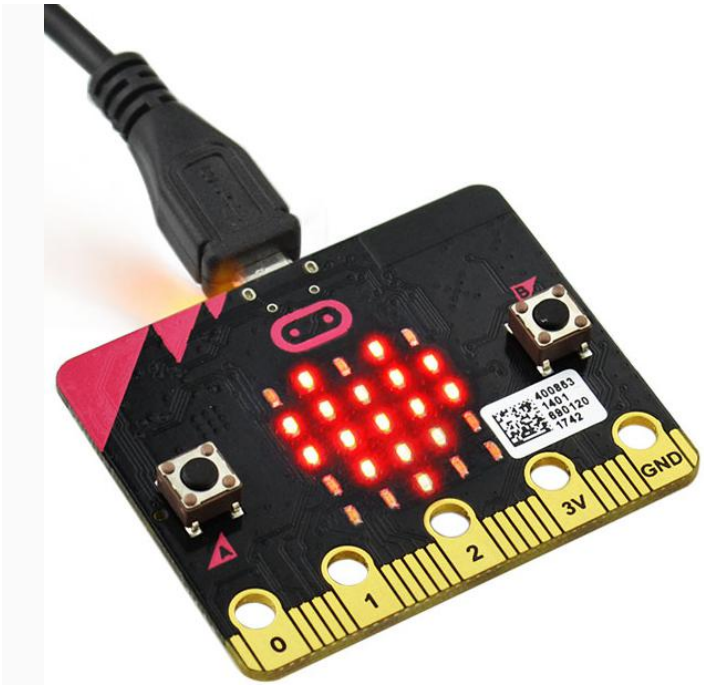
Note that need to use a serial communication software, Arduino IDE. In the above part, you can check the detailed use of Arduino IDE.

Component Required:

- Micro:bit main board*1
- USB cable*1

Connect It Up

Connect the micro:bit to your computer via a micro USB cable.



Test Code

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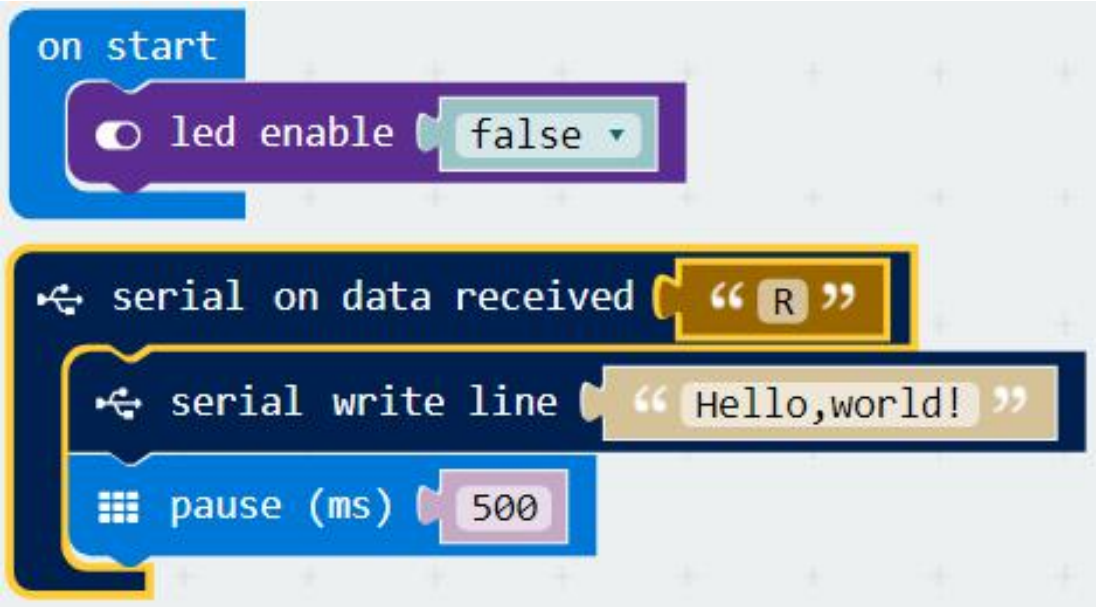
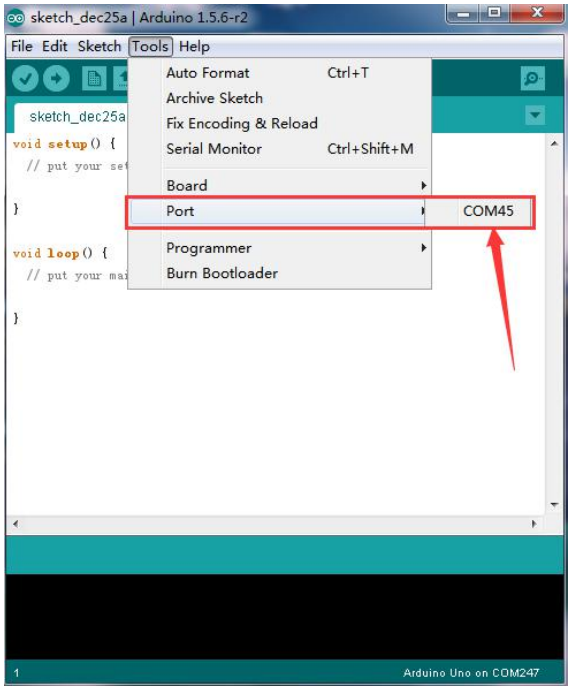


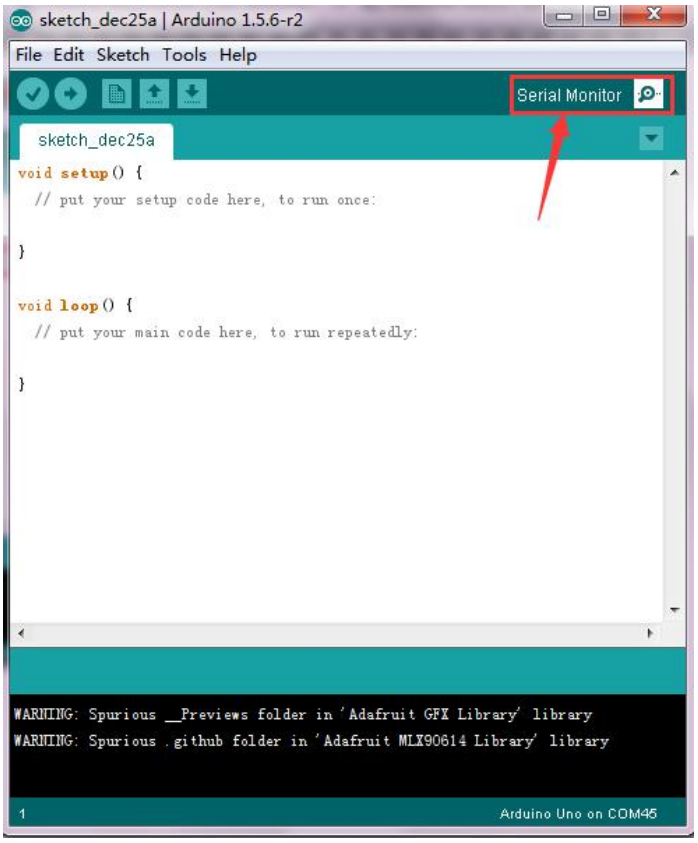
After wiring, send the above code to your micro:bit, then open Arduino IDE.

Example Result

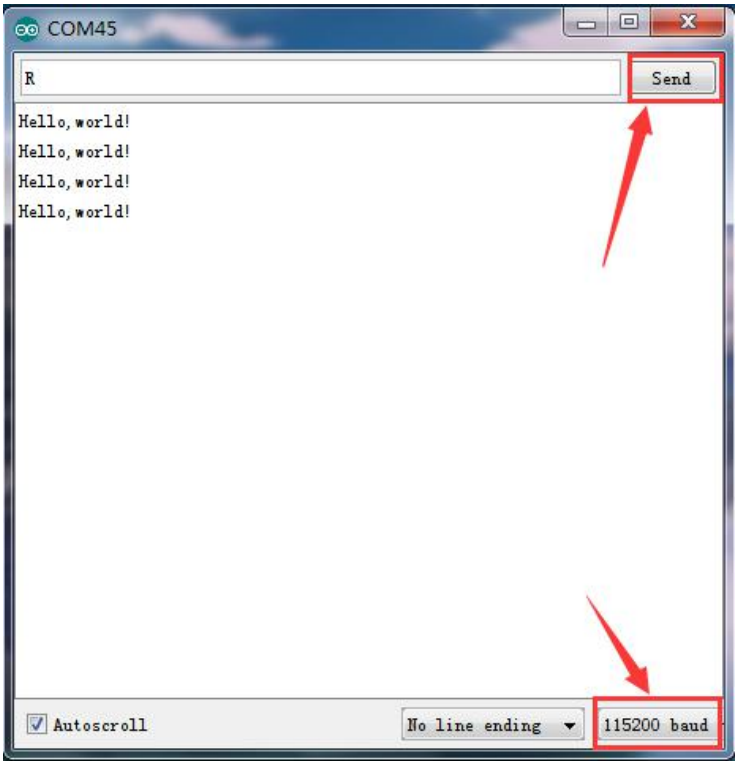
Open Arduino IDE, set well the COM port.



Then open the serial monitor, set the baud rate as 115200 (because the USB-to-serial communication baud rate of micro:bit is 115200).



Enter an "R" and click "Send", you should see "Hello world!" is displayed on the monitor. Shown below. Congrats! The first simple program is finished.



Project 2: LED Blink

Overview

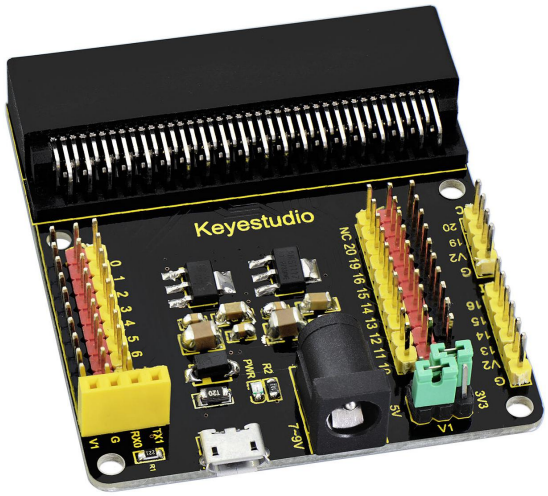
The LED blink is one of the more basic experiments. In the above example use of micro:bit, we have mentioned the 25 LED display of micro:bit. In this project, you will learn how to control an LED blink using a keyestudio digital white LED module and micro:bit sensor shield. Before testing, you should first turn off the 5*5 LED function of micro:bit.

Component Required:

- Micro:bit main board*1
- Keyestudio Micro bit sensor V2 shield*1
- USB Cable*1
- keyestudio Digital White LED Module*1
- Dupont jumper wire*3

Component Introduction

Keyestudio Micro bit Sensor V2 Shield:



This shield is very easy for micro:bit wiring. It breaks out the PI0 ports in the form of 3Pin (GND, VCC, PI0), easy to connect other sensor modules. Also with communication interfaces, like serial port、I2C and SPI pin headers.

You can power the shield via USB connection or external DC power jack (DC7-9V). If power the sensor module, you can control it via two cap V1 and V2 on the shield, with DC3.3V and 5V.

Power the sensor shield with DC 7-9V, and this shield can power the micro:bit and other sensor modules, pretty convenient.

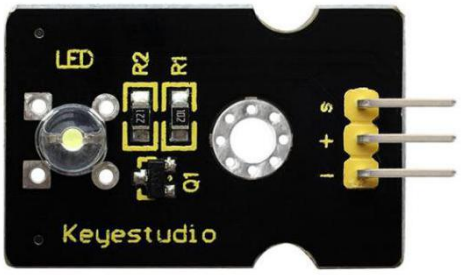
Special note: when connect external sensor module to the shield for working,the operating current of AMS1117-3.3V and NCP1117ST50T3G chip is too large, so it is easy to get hot. Pay special attention to avoid touching the two chips and causing burns.

keyestudio White LED Module:

This white LED light module is ideal for Arduino starters. It can be easily connected to IO/Sensor shield. It enables some light-interactive works.

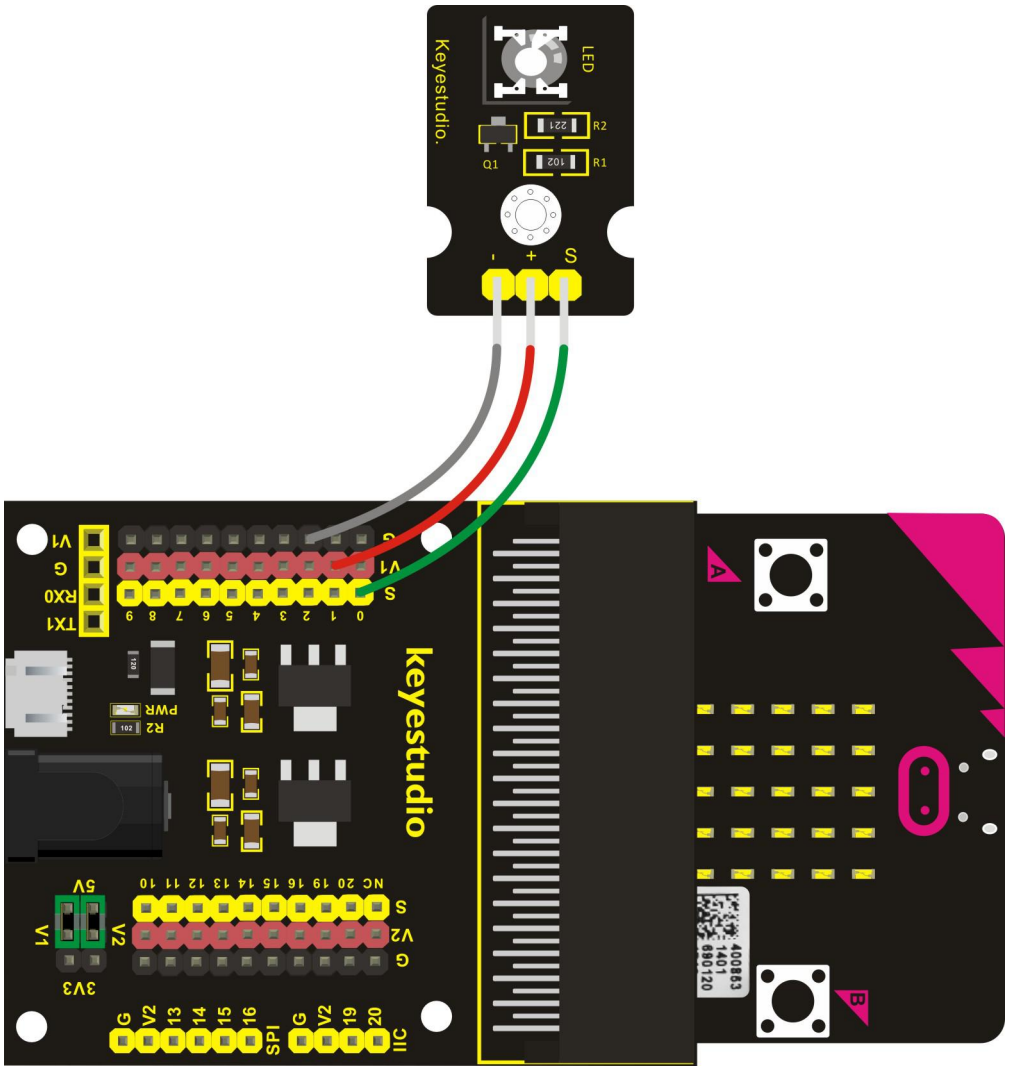
Specifications:

- Type: Digital
- PH2.54 socket
- Size: 30*20mm



Connect It Up

Insert the micro:bit into keyestudio micro:bit sensor V2 shield.Then connect LED module to micro:bit sensor shield, connect the S pin to S pin header, + pin to V1 header, - pin to ground header.



Test Code

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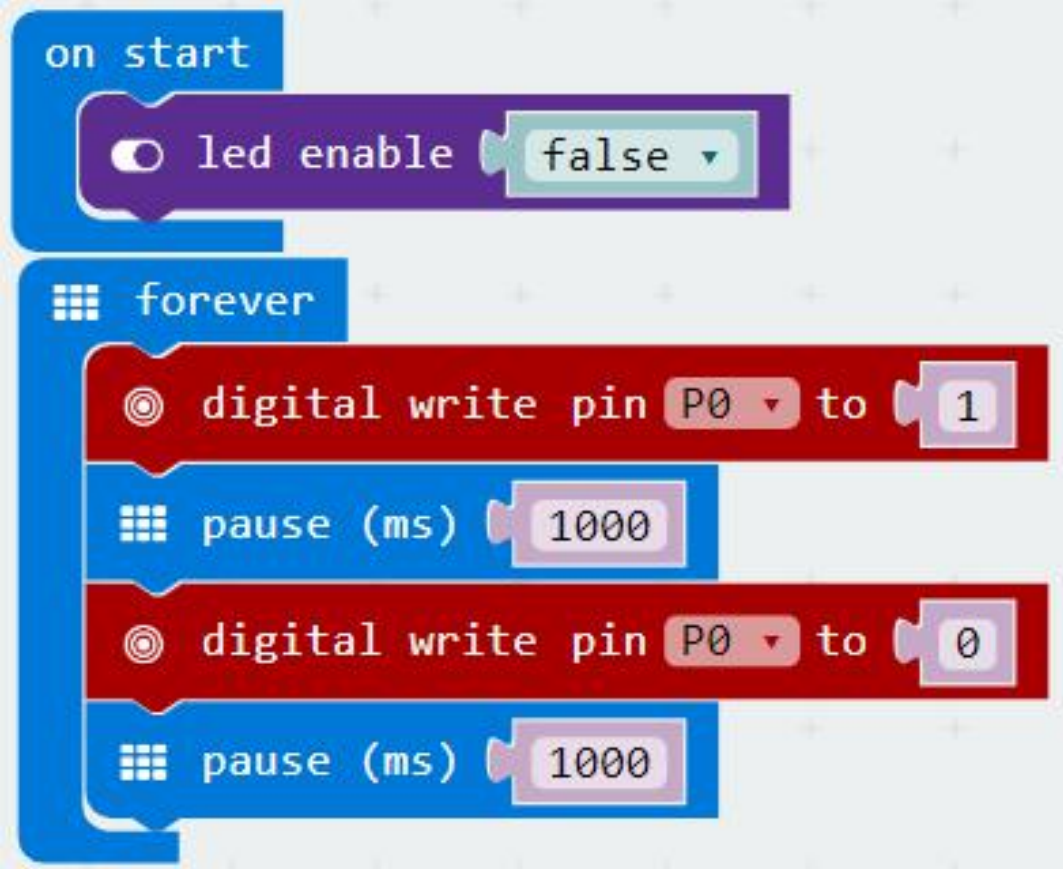


Example Result

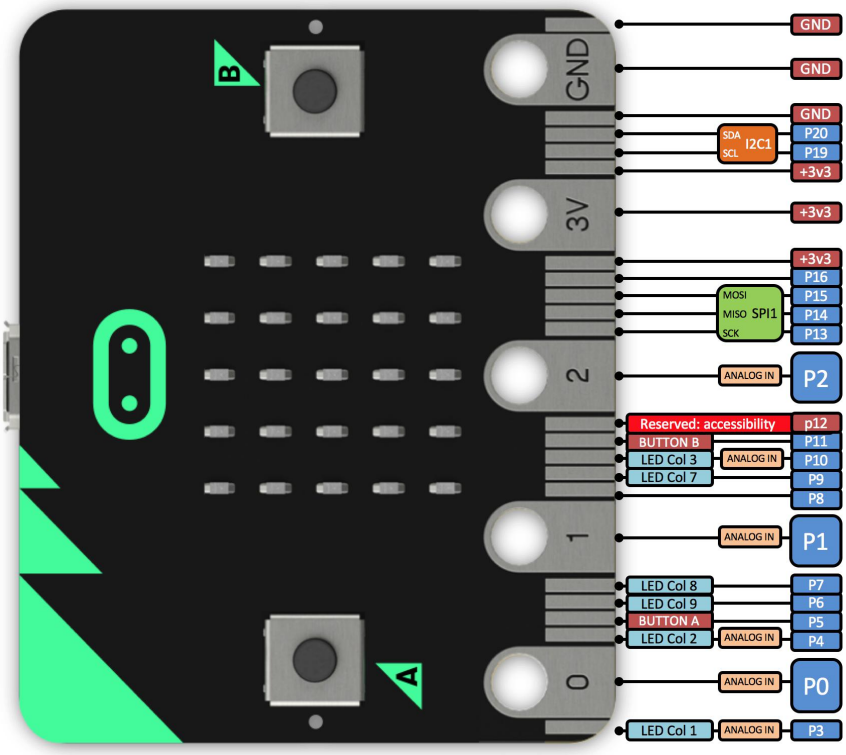
Done wiring and powered up, send the code to micro:bit, you will see an LED blink on the module, with an interval about one second.

Project 3: Breath

Overview

The light breath experiment is a little bit similar to the previous project. This time we connect the keyestudio LED module to the sensor shield. Connect the Signal pin of LED module to P0 of micro:bit. From the Pinout diagram of micro:bit, you can get the P0 can be used as Analog IN.

This lesson you will learn how to control the brightness of LED on the module, gradually becoming brighter and dimming, just like the LED is breathing.



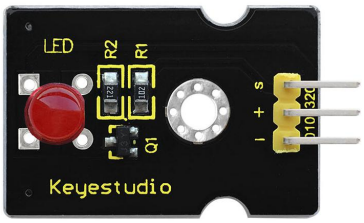
Component Required:

- Micro:bit main board*1
- Keyestudio Micro bit Sensor V2 Shield*1
- USB Cable*1
- keyestudio Piranha LED Module*1
- Dupont jumper wire*3

Component Introduction

Keyestudio Red LED Module:

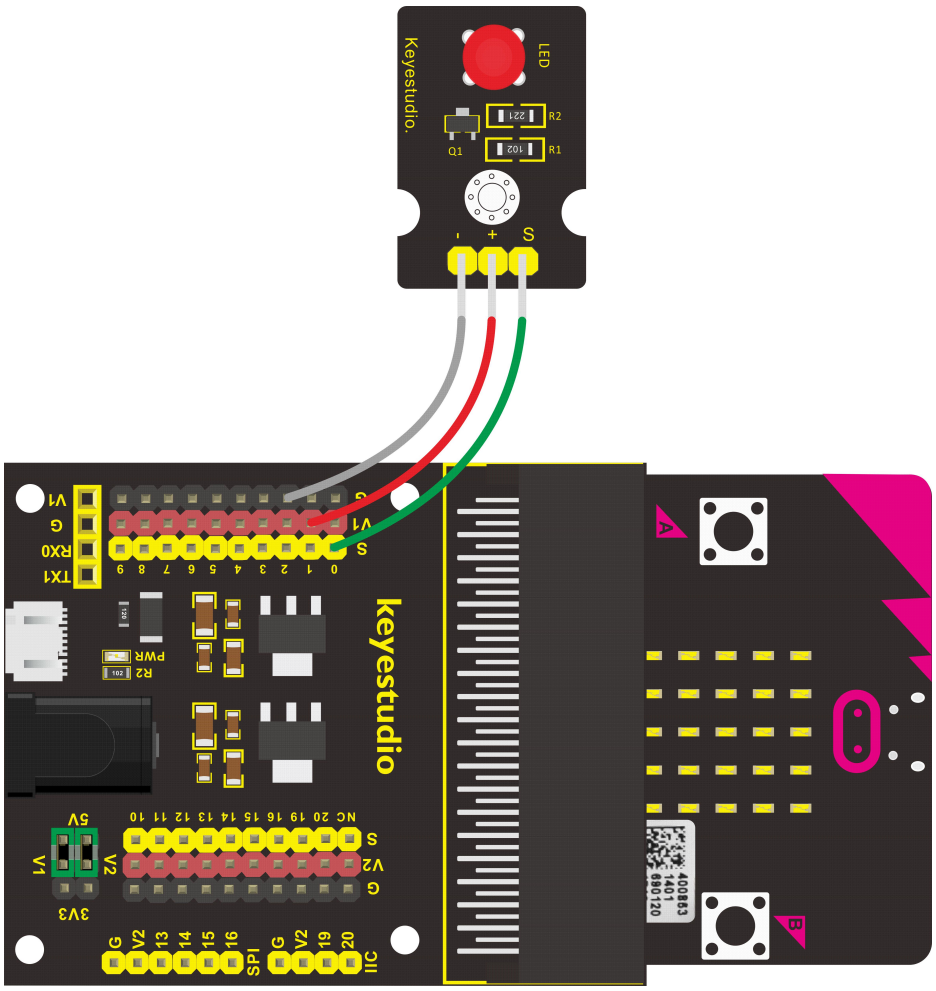
This keyestudio red LED module has 3 Pins; - pin is connected to ground, + pin is connected to VCC（3.3-5V）, S pin is for signal control; you can set the High or Low level to control the LED on and off.



Connect It Up

Insert the micro:bit into keyestudio micro:bit sensor V2 shield.

Then connect LED module to micro:bit sensor shield, connect the S pin to S0 pin header, + pin to V1 header, - pin to ground header.



Test Code

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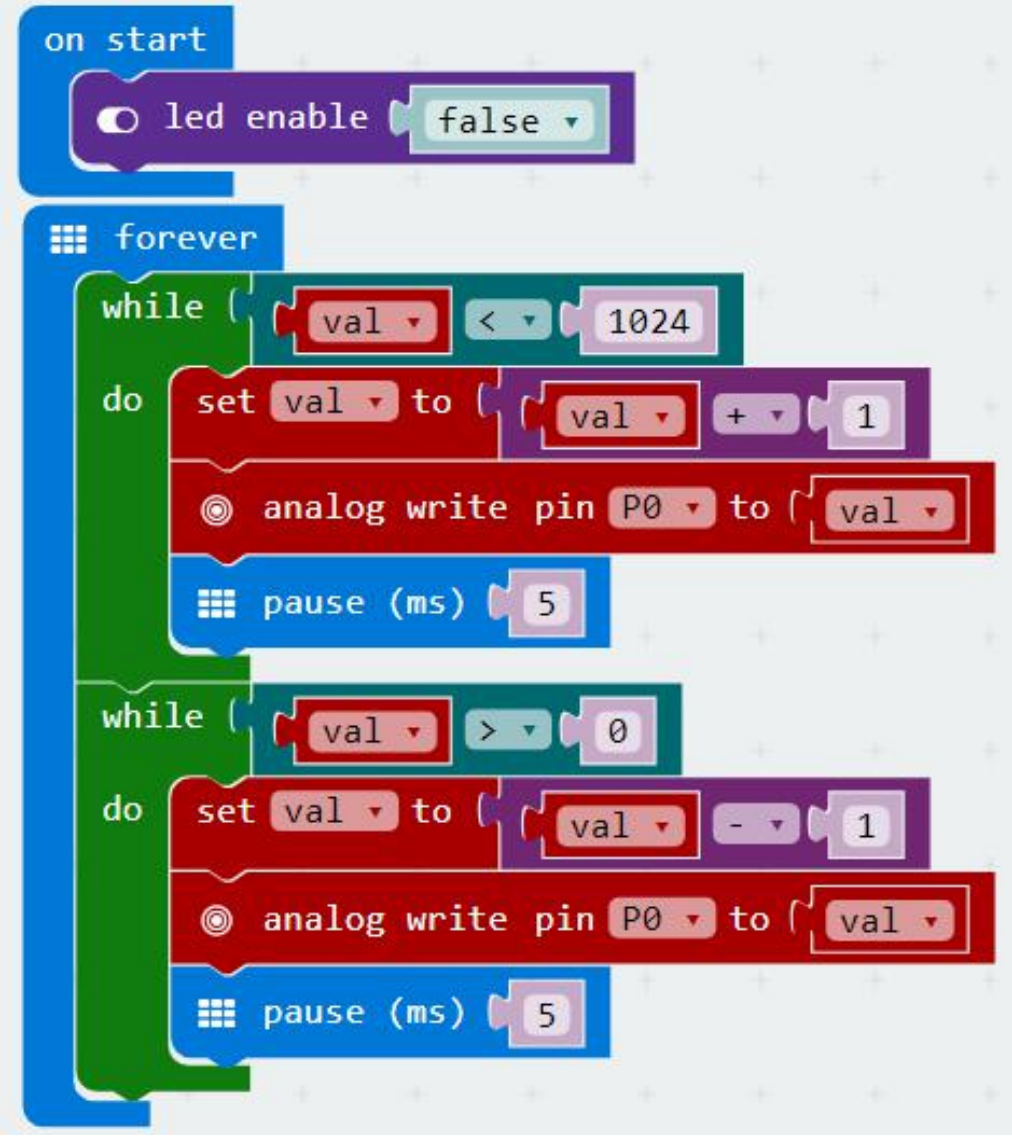


Example Result

Done wiring and powered up, send the code to micro:bit, you should finally see an LED on the module gradually become brighter, then gradually dim, circularly just like the LED is breathing.

Project 4: Blink and Breath

Overview

In this project, we combine the project 2 and project 3. You will learn how to control the LED on the module blink for two times, then breath for two times, circularly. This time we use keyestudio 3W LED module, which has high brightness and can be used as illumination.

Component Required:

- Micro:bit main board*1
- Keyestudio Micro bit Sensor V2 Shield*1
- USB Cable*1
- keyestudio 3W LED Module*1
- Dupont jumper wire*3

Component Introduction

Keyestudio 3W LED Module:

This LED module is of high brightness because the lamp beads it carries is 3w. You can apply this module to Arduino or other projects, ideal for Robot or search and rescue application. For example, intelligent robots can use this module for illumination purpose.

Please note that the LED light can't be exposed directly to human eyes for safety concerns.

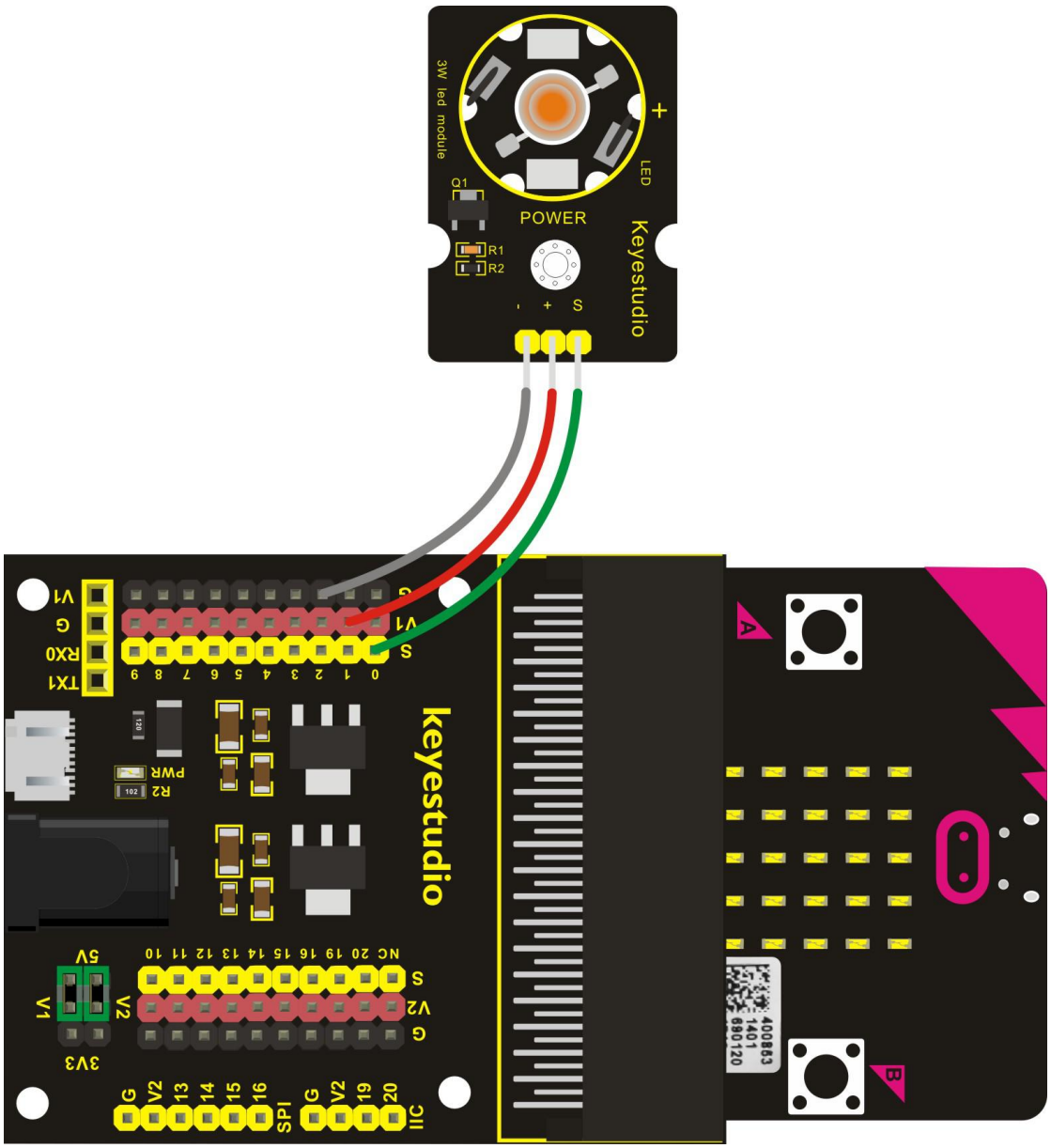
Specifications

Color temperature: 6000~7000K
Luminous flux: 180~210lm
Current: 700~750mA
Power: 3W
Light angle: 140 degree
Working temperature: -50~80℃
Storage temperature: -50~100℃

High power LED module, controlled by IO port of microcontroller
IO Type: Digital
Supply Voltage: 3.3V to 5V

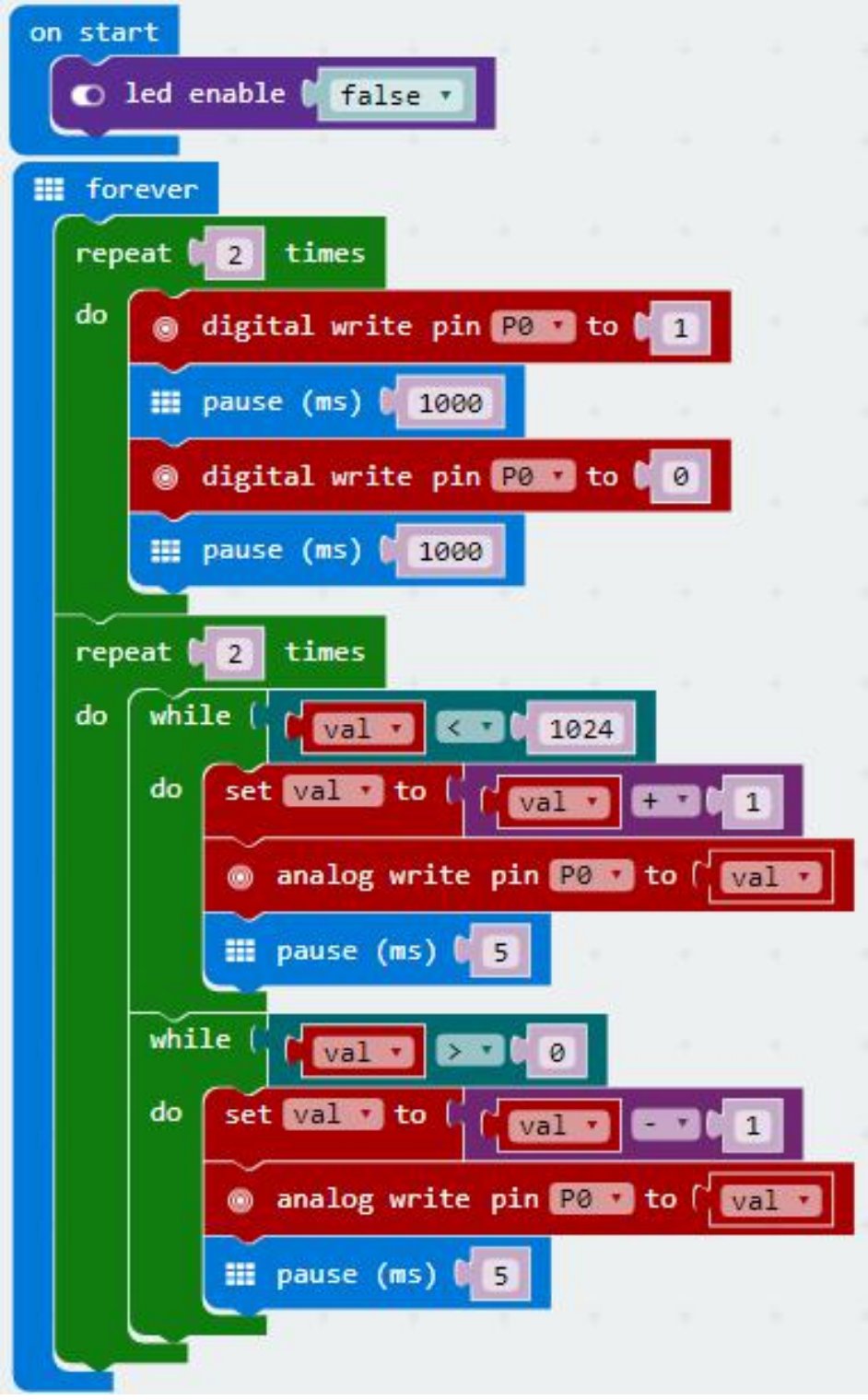
Connect It Up

Insert the micro:bit into keyestudio micro:bit sensor V2 shield.Then connect 3W LED module to micro:bit sensor shield, connect the S pin to S pin header, + pin to V1 header, - pin to ground header.



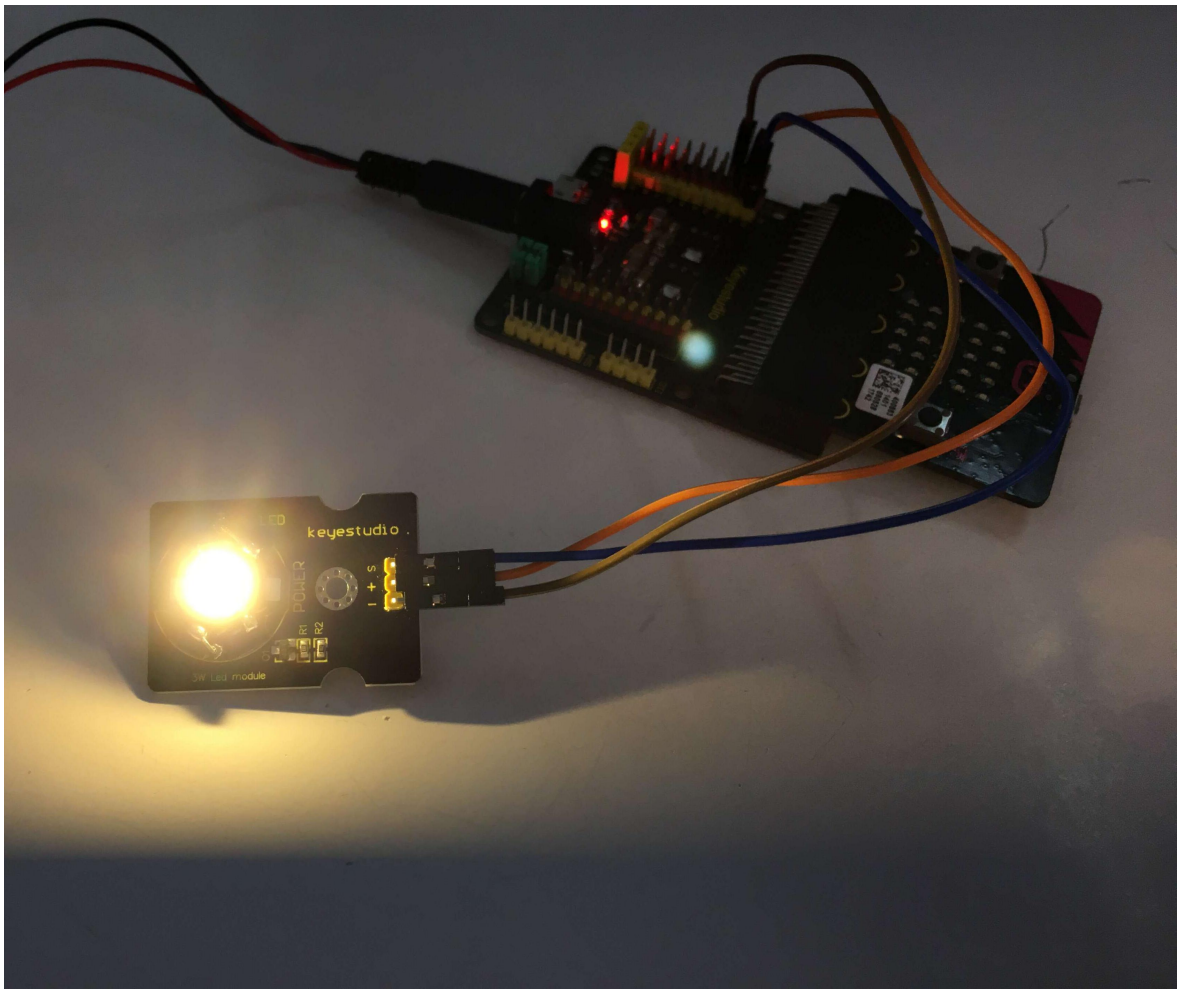
Test Code

If you are not familiar to make code, don't worry. Firstly, you can enter this link:https://makecode.micro:bit.org/reference to know more about micro:bit blocks. Then you can directly enter the https://makecode.micro:bit.org/ to edit your project program. Below is an example code we have done for you as reference.



Example Result

Done wiring and powered up, send the code to micro:bit, you should see the LED on the module firstly blink two times, then breath two times, circularly.



Project 5: Make a Sound

Overview

In this project, you will learn how to generate a sound with keyestudio digital active buzzer module. Here you can refer to LED blink, in this lesson control the buzzer on and off circularly.

Component Required:

- Micro:bit main board*1
- Keyestudio Micro bit Sensor V2 Shield*1
- USB Cable*1
- keyestudio Digital Buzzer Module*1
- Dupont jumper wire*3

Component Introduction

Keyestudio Digital Buzzer Module:

It is the simplest sound making module. You can use High/Low level to drive it. Changing the frequency it buzzes can produce different sounds.

Buzzers can be categorized as active and passive ones. The difference between the two is that an active buzzer has a built-in oscillating source, so it will generate a sound when electrified. The buzzer on this module is an active buzzer.

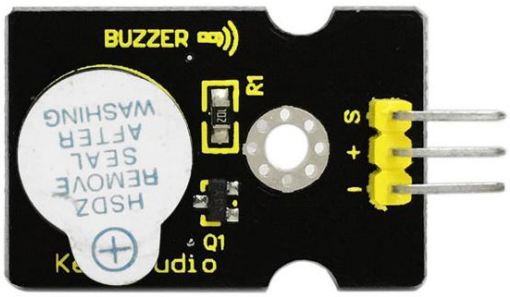
This module is widely used in our daily appliances like PC, refrigerator, telephones, timers and other electronic products for voice devices. etc.

Specifications

Working voltage: 3.3-5v

Interface type: digital

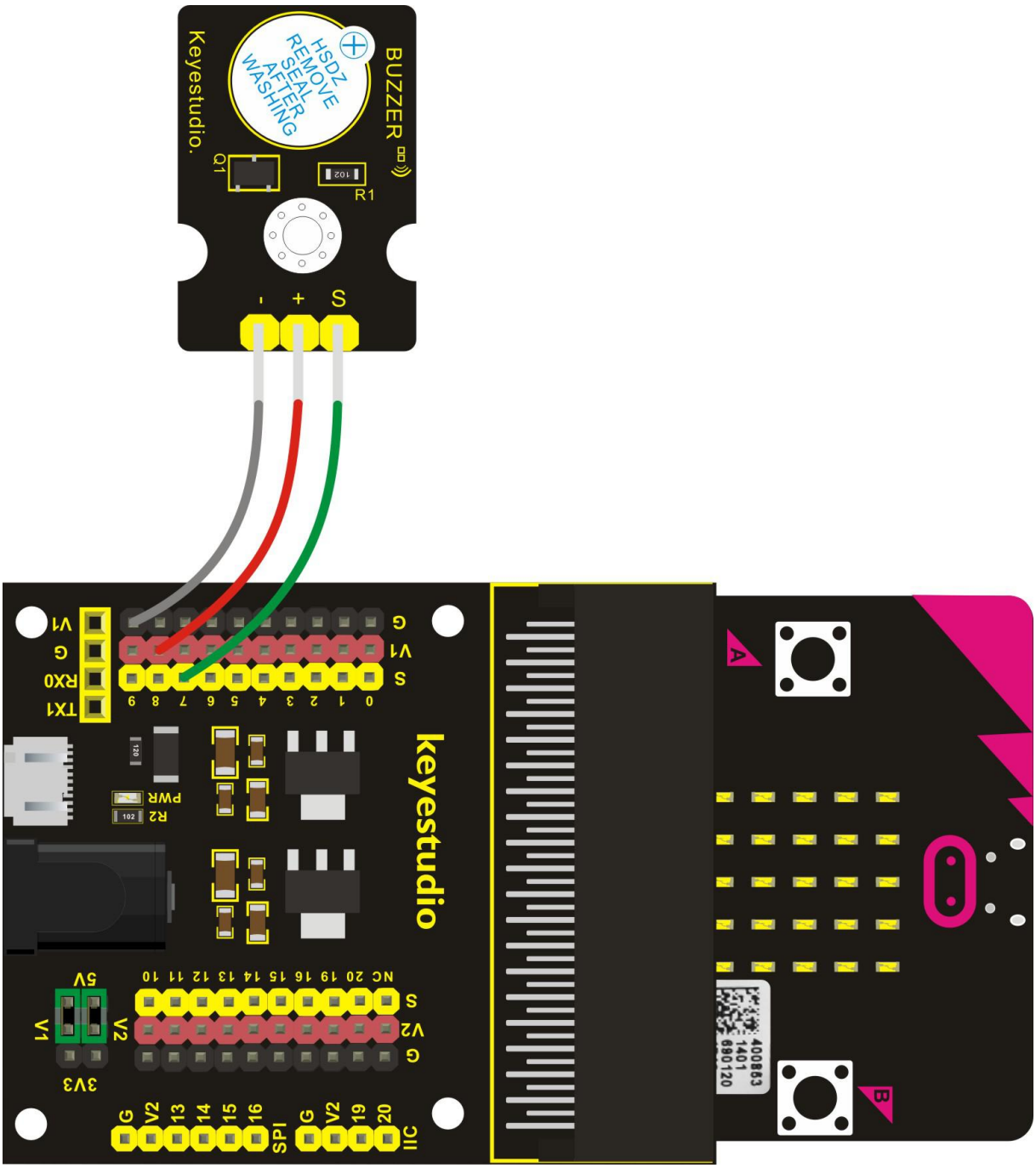
Size: 30*20mm



Connect It Up

Insert the micro:bit into keyestudio micro:bit sensor V2 shield.Then connect buzzer module to micro:bit sensor shield, connect the S pin to S7 pin header (P7 of micro:bit), + pin to V1 header, - pin to ground header.

If input HIGH level to P7 end, buzzer will continue to sound.



Test Code

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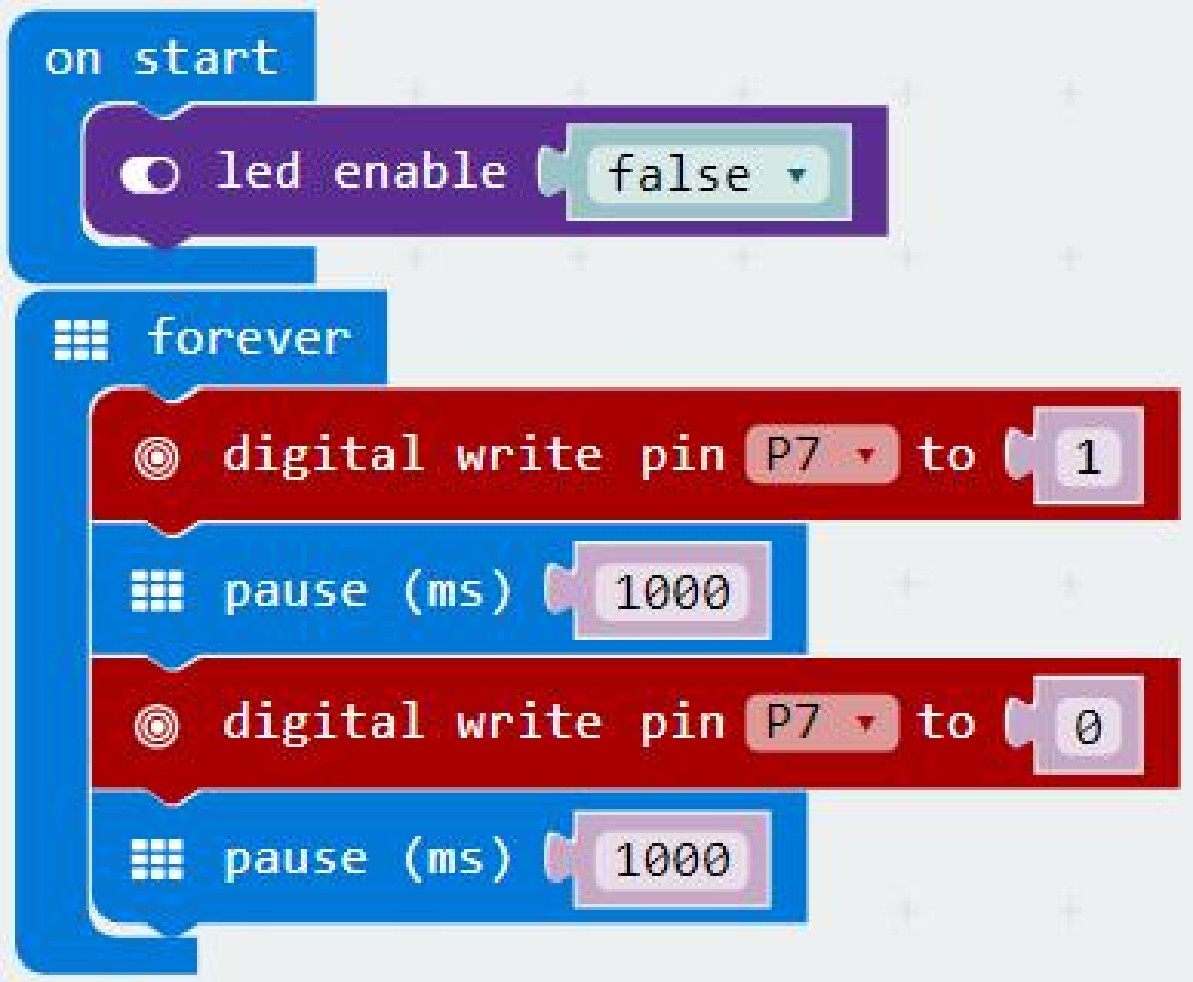


Example Result

Done wiring and powered up, send the code to micro:bit, you should hear the buzzer module sound and then stop, circularly. It seems like the sound is interrupted.

Project 6: Play Music

Overview

In this project, you will learn how to play music with keyestudio passive buzzer module. We are going to complete two experiments.

One is to directly control the High and Low level input of micro:bit P0 end, set two square waves to control the buzzer sound. The other is to use the software's own function, input the square waves of different frequencies and different lengths on the P0 end. Finally make the buzzer module play the song "Ode to Joy".

(The input PIO port can only be P0, can not be other interfaces).

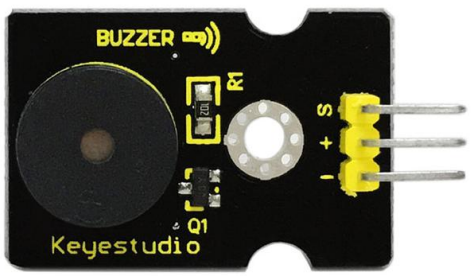
Component Required:

- Micro:bit main board*1
- Keyestudio Micro bit Sensor V2 Shield*1
- USB Cable*1
- keyestudio Passive Buzzer Module*1
- Dupont jumper wire*3

Component Introduction

Passive Buzzer Module:

Buzzers can be categorized as active and passive ones. The difference between the two is that an active buzzer has a built-in oscillating source, so it will generate a sound when electrified. The buzzer used on this module is a passive buzzer. A passive buzzer does not have such a source, so DC signal cannot drive it beep. Instead, you need to use square waves whose frequency is between 2K and 5K to drive it. Different frequencies produce different sounds. You can use micro:bit to code the melody of a song, quite fun and simple.



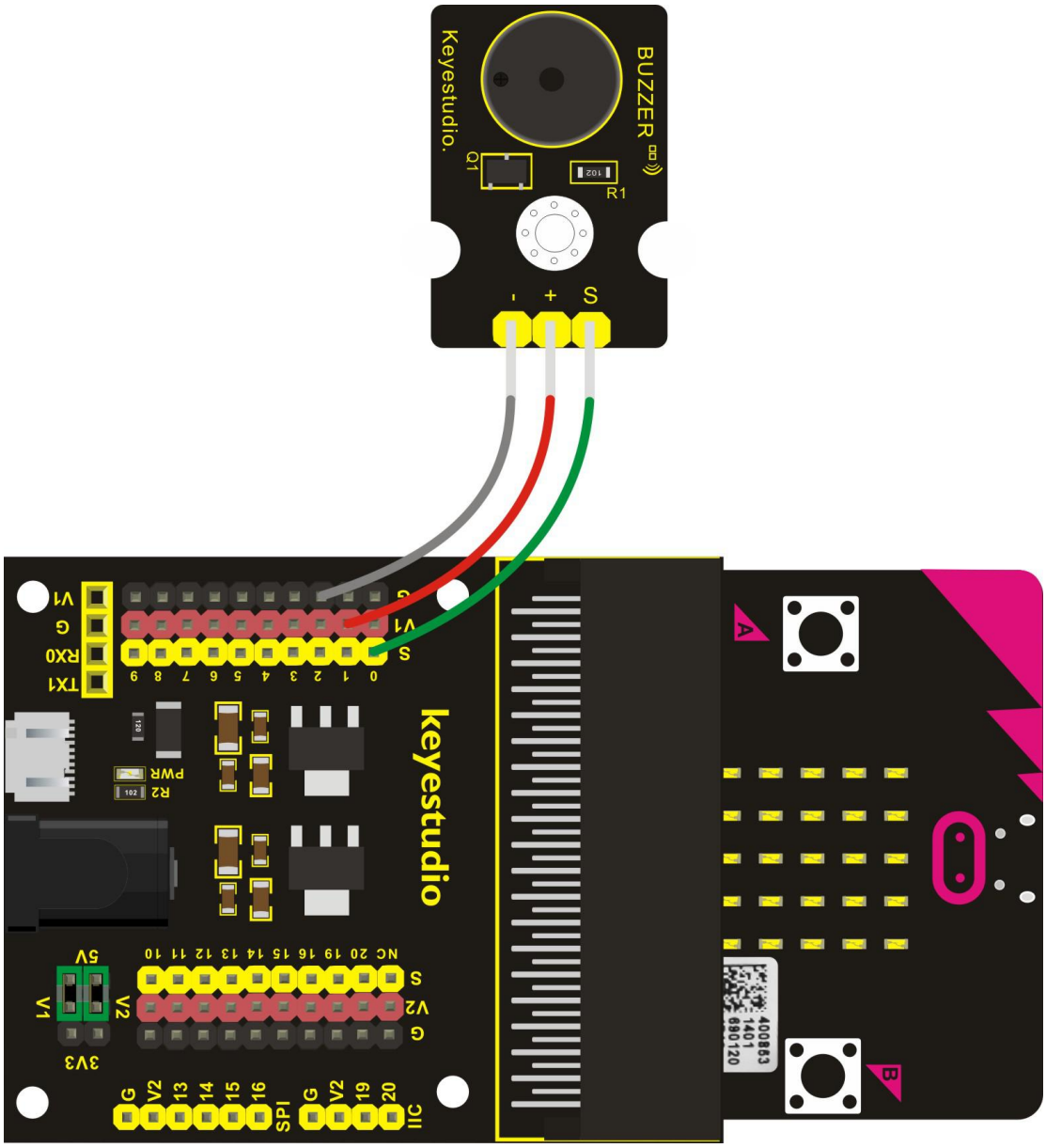
Specifications

Working voltage: 3.3-5V

Interface type: Digital

Connect It Up

Insert the micro:bit into keyestudio micro:bit sensor V2 shield.Then connect passive buzzer module to micro:bit sensor shield, connect the S pin to S0 pin header, + pin to V1 header, - pin to ground header.



Test Code

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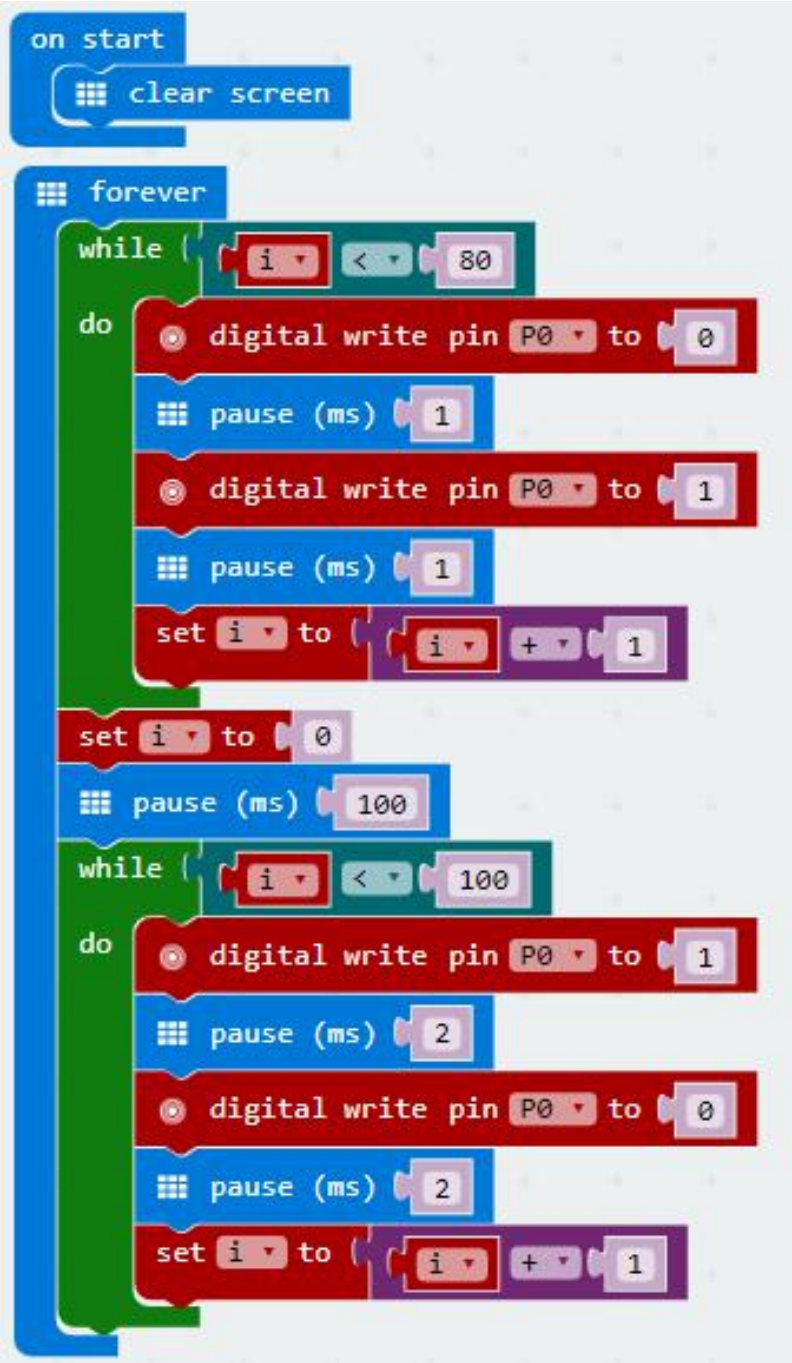
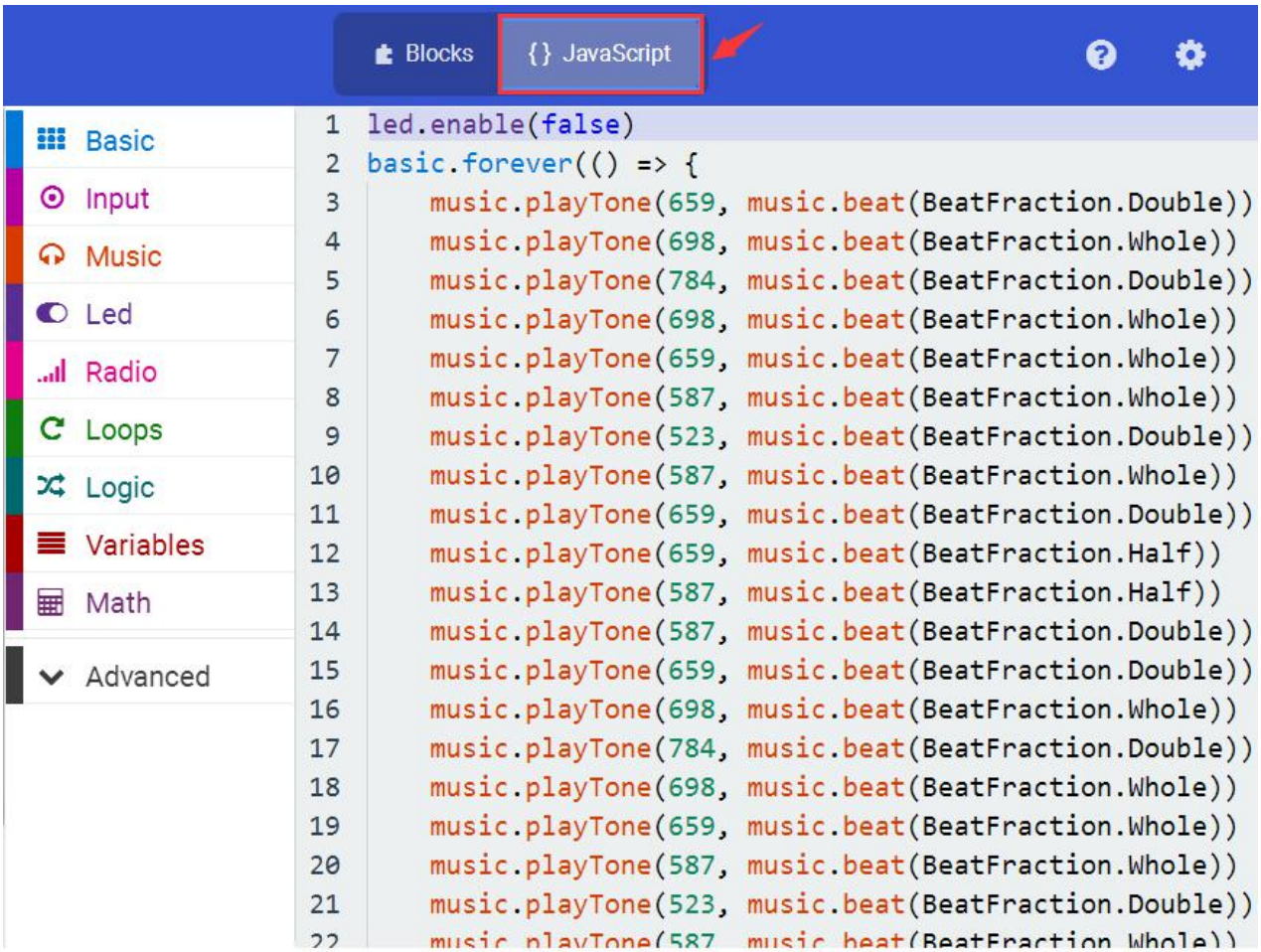
Program 1:



Program 2:


on start
led enable false
forever
play tone High E for 2 beat
play tone High F for 1 beat
play tone High G for 2 beat
play tone High F for 1 beat
play tone High E for 1 beat
play tone High D for 1 beat
play tone High C for 2 beat
play tone High D for 1 beat
play tone High E for 2 beat
play tone High E for 1/2 beat
play tone High D for 1/2 beat
play tone High D for 2 beat
play tone High E for 2 beat
play tone High F for 1 beat
play tone High G for 2 beat
play tone High F for 1 beat
play tone High E for 1 beat
play tone High D for 1 beat
play tone High C for 2 beat
play tone High D for 1 beat
play tone High E for 1 beat
play tone High D for 1 beat
play tone High D for 1/2 beat
play tone High C for 1/2 beat
play tone High C for 2 beat
play tone High D for 2 beat
play tone High E for 1 beat
play tone High C for 1 beat
play tone High D for 1 beat
play tone High E for 1/2 beat
play tone High F for 1/2 beat
play tone High E for 1 beat
play tone High C for 1 beat

Note: on the MakeCode Block webpage, click the icon { } JavaScript, you can see the frequency of each tone as follows.



Example Result

Done wiring and powered up, send the code 1 to micro:bit, you should hear two sounds produced from passive buzzer circularly. If send the code 2 to micro:bit, the buzzer will play the song Ode To Joy! Really amazing. Right? You can try to change the tone to play other music.

Project 7: Changing Color

Overview

In this project, we will use a keyestudio RGB LED module. This Common Anode RGB LED module is a fun and easy way to add some color to your projects. In our program, we will connect the RGB module to micro:bit, then control the P0, P1, P2 Analog Input of micro:bit main board. You will learn how to control the RGB LED on the module firstly show three colors (Red, Green and Blue), then quickly change the color state.

Component Required:

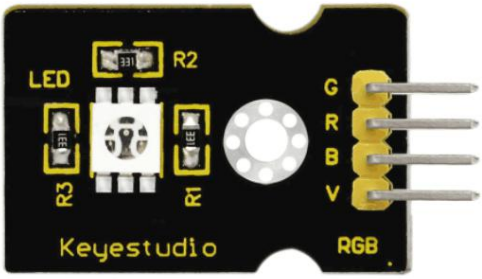
- Micro:bit main board*1
- Keyestudio Micro bit Sensor V2 Shield*1
- USB Cable*1
- keyestudio RGB LED Module*1
- Dupont jumper wire*4

Component Introduction

RGB LED Module:

RGB comes from the initials of three additive primary colors, red, green, and blue. RGB LEDs are like 3 regular LEDs in one, how to use and connect them is not much different. They come mostly in 2 versions: Common Anode or Common Cathode. Common Anode uses 5V on the common pin, while Common Cathode connects to ground.

This keyestudio RGB LED module is Common Anode. It can be seen as separate LEDs. LEDs have three different color-emitting diodes that can combined to create all sorts of colors. This RGB LED module is very easy for wiring, with a fixed hole that you can mount it on your any devices.



Specifications

Light Color: red, green and blue

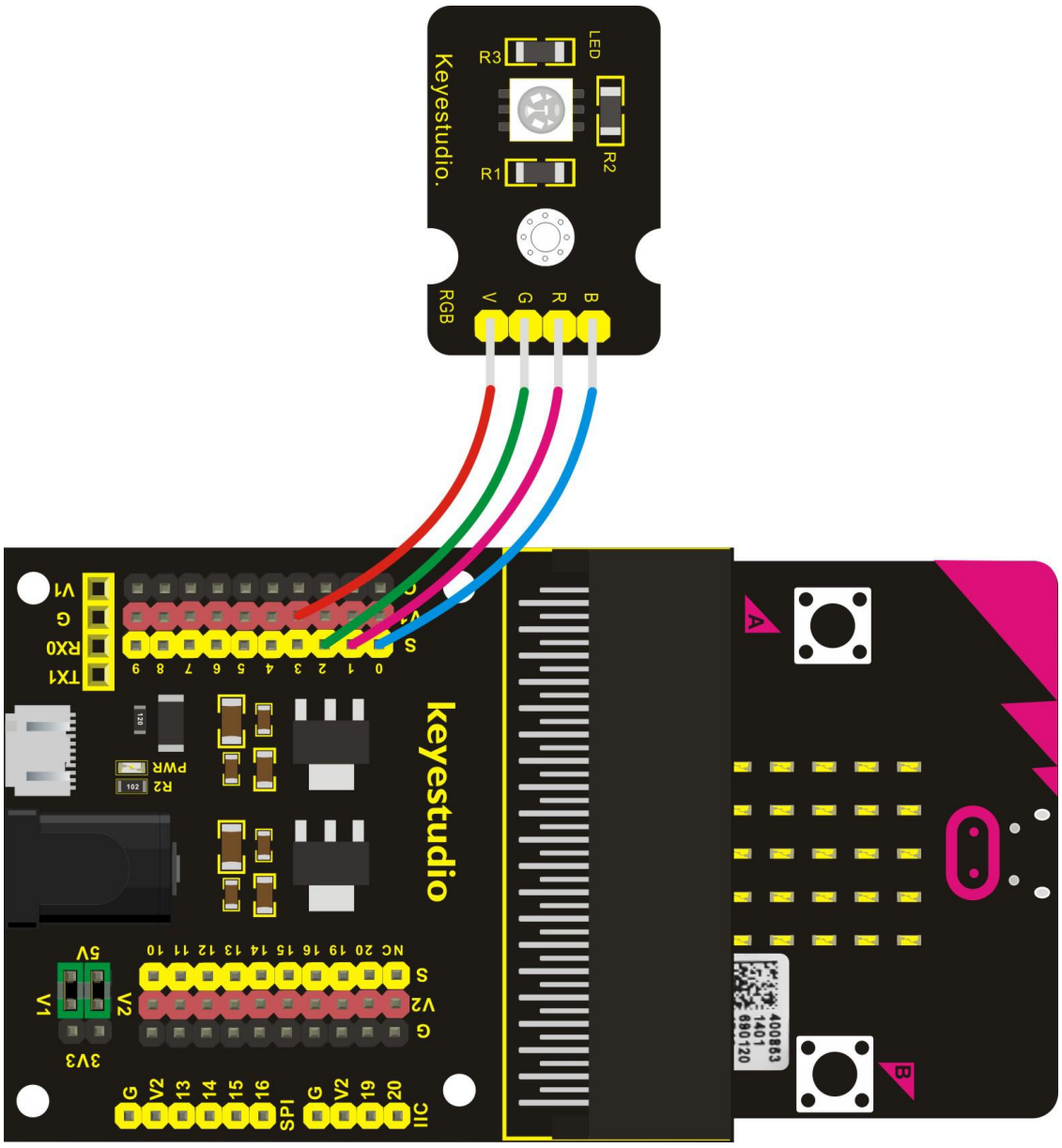
Brightness: High

Voltage: 5V

Input: digital level

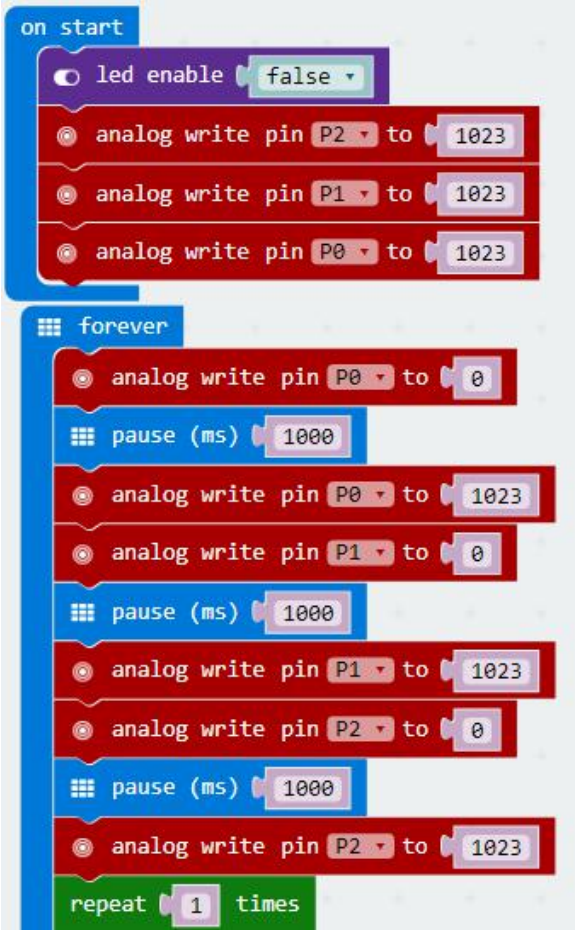
Connect It Up

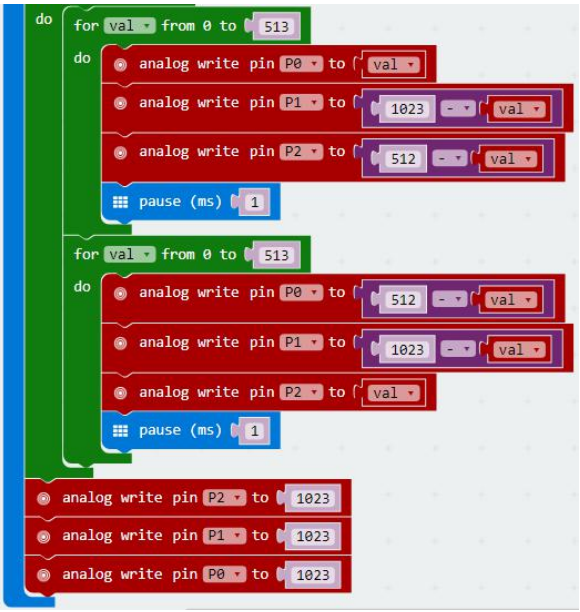
Insert the micro:bit into keyestudio micro:bit sensor V2 shield.Then connect RGB LED module to micro:bit sensor shield, separately connect the B, R,G pin to P0, P1, P2 Analog Input header, ground pin to ground.



Test Code

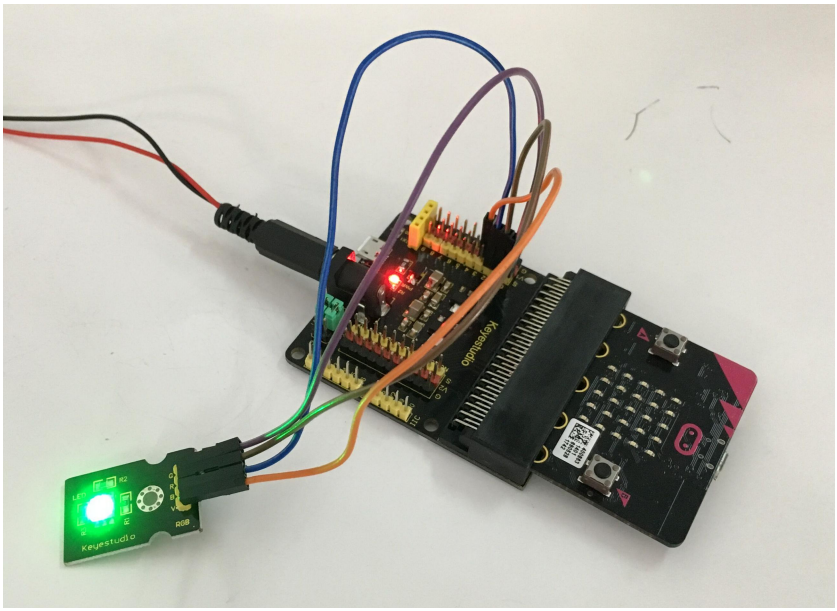
If you are not familiar to make code, don't worry. Firstly, you can enter this link:https://makecode.micro:bit.org/reference to know more about micro:bit blocks. Then you can directly enter the https://makecode.micro:bit.org/ to edit your project program. Below is an example code we have done for you as reference.

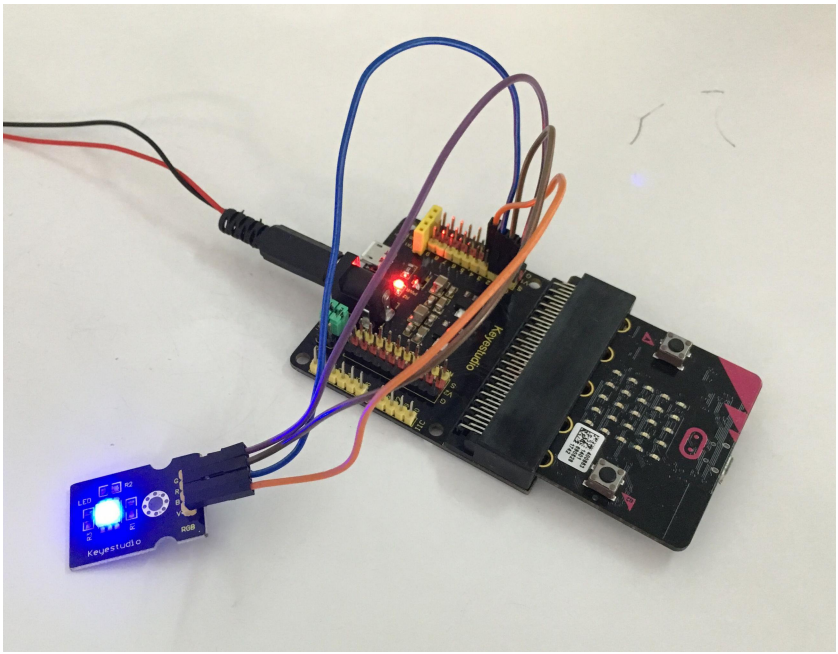




Example Result

Done wiring and powered up, send the code to micro:bit, you should see the RGB module firstly show three colors, separately red, green and blue light. Then change the color quickly and circularly.





Project 8: Button Control

Overview

When design the circuit, button switch is a commonly used component. The micro:bit main board has two built-in buttons, however, sometimes still need to use external button when design the circuit. So in this project, you will learn how to use our push button module to control 5*5 LED of micro:bit display different images.

Component Required:

- Micro:bit main board*1
- Keyestudio Micro bit Sensor V2 Shield*1
- USB Cable*1
- keyestudio Digital Push Button*1
- Dupont jumper wire*3

Component Introduction

Digital Push Button Module:

This is a basic button module. Buttons are a type of commonly used components to control electronic devices. Usually they are used as switches to connect or disconnect circuits to control the operation of electronic devices or other devices. This module integrates a push button on it and with three connection pins. It is very convenient for you connect it to other IO shields.

Features:

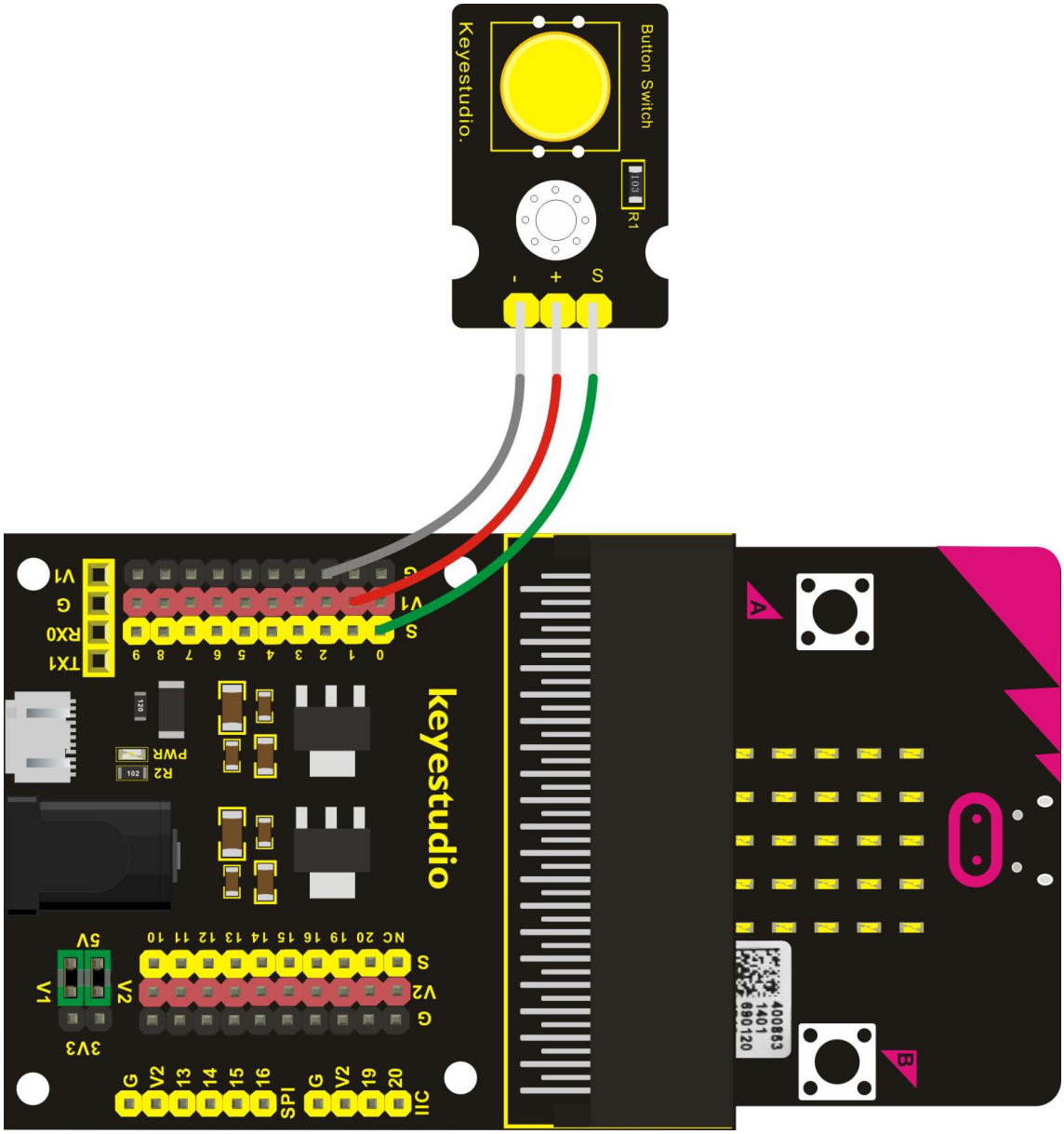
- Voltage range from 3.3V to 5V
- Large button with yellow cap
- High-quality connection pin
- Clear interface label
- Easy to plug and operate
- With a fixed hole that you can fix it on any devices

Specifications:

- Supply Voltage: 3.3V to 5V
- Interface: Digital
- Dimensions: 30*20mm

Connect It Up

Insert the micro:bit into keyestudio micro:bit sensor V2 shield.Then connect button module to micro:bit sensor shield, connect S pin to S0 pin header, + pin to V1 header, - pin to ground. Shown below.



Test Code

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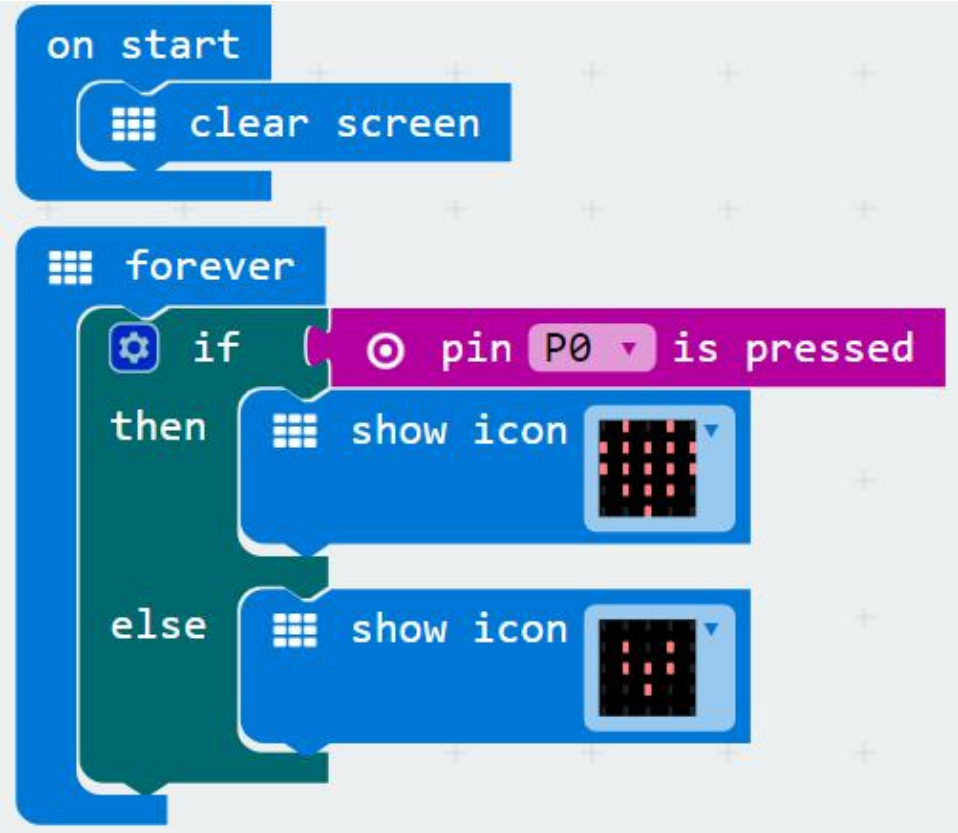


Example Result

Done wiring and powered up, send the code to micro:bit. When press the button on the module, you should see the LED matrix of micro:bit show the icon like a heart. Otherwise, it will show the icon like this.

Project 9: Tilt Control

Overview

When design the circuit, sometimes you will need to test whether an object is tilted left or right, so in this case you can use our tilt sensor. In this project, you will learn how to use our digital tilt sensor to control 5*5 LED of micro:bit display different images.

Component Required:

- Micro:bit main board*1
- Keyestudio Micro bit Sensor V2 Shield*1
- USB Cable*1
- keyestudio Digital Tilt Sensor*1
- Dupont jumper wire*3

Component Introduction

Tilt Sensor:

This keystudio digital tilt sensor mainly integrates a tilt sensor. The tilt sensor is a component that can detect the tilting of an object.

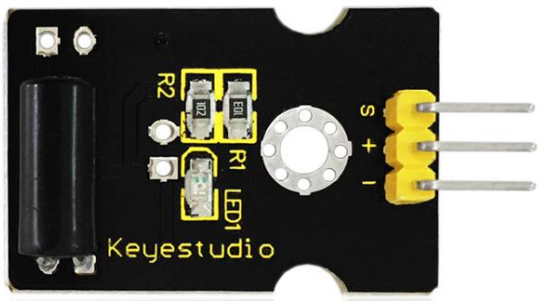
The principle is very simple. It mainly uses the ball in the switch changing with different angle of inclination to achieve the purpose of triggering circuits. When the ball in tilt switch runs from one end to the other end because of external force shaking, the tilt switch will conduct, or it will break.

Specifications:

Supply Voltage: 3.3V to 5V

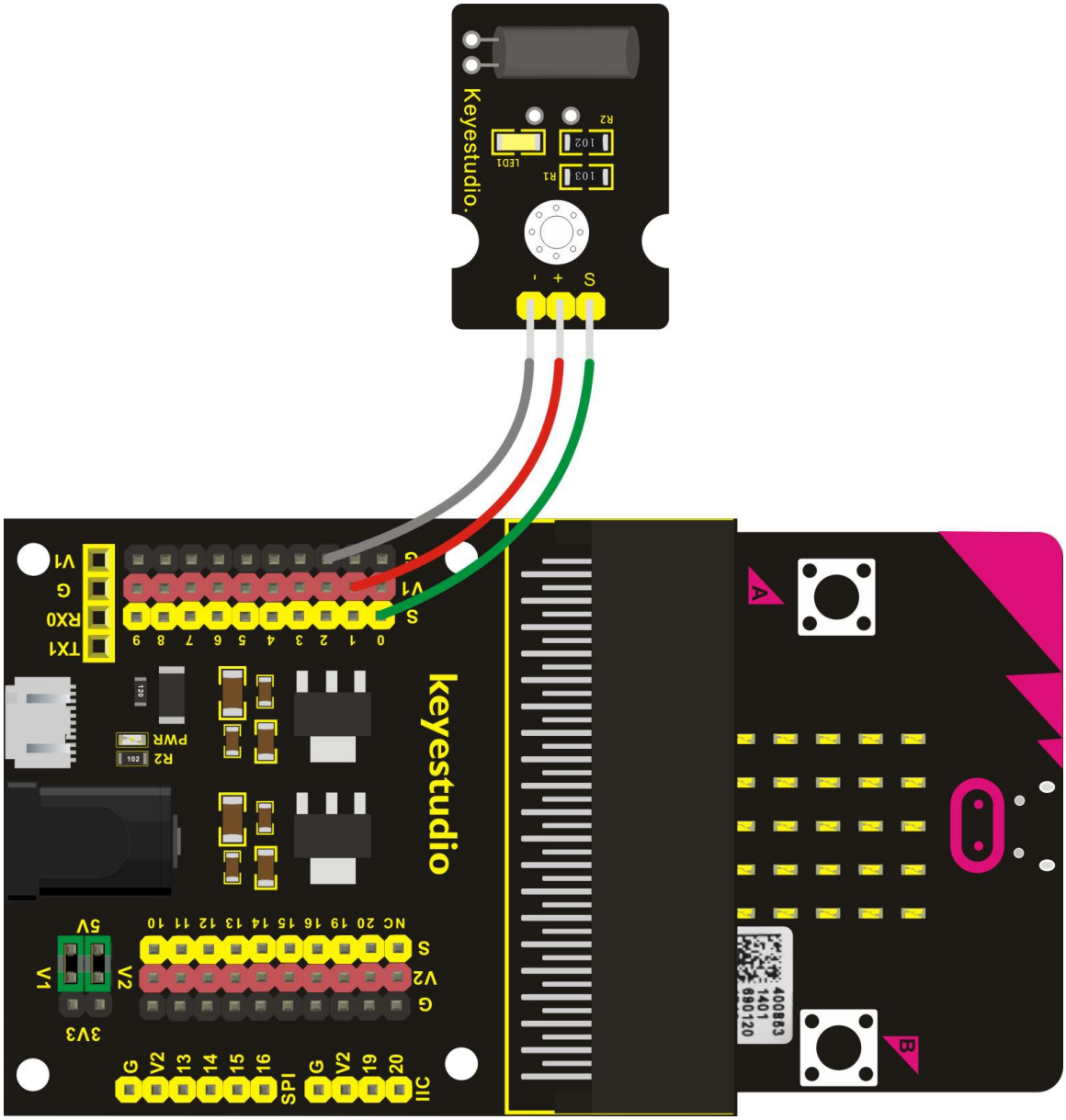
Interface: Digital

Size: 30*20mm



Connect It Up

Insert the micro:bit into keyestudio micro:bit sensor V2 shield.Then connect tilt module to micro:bit sensor shield, connect S pin to S0 pin header, + pin to V1 header, - pin to ground. Shown below.



Test Code

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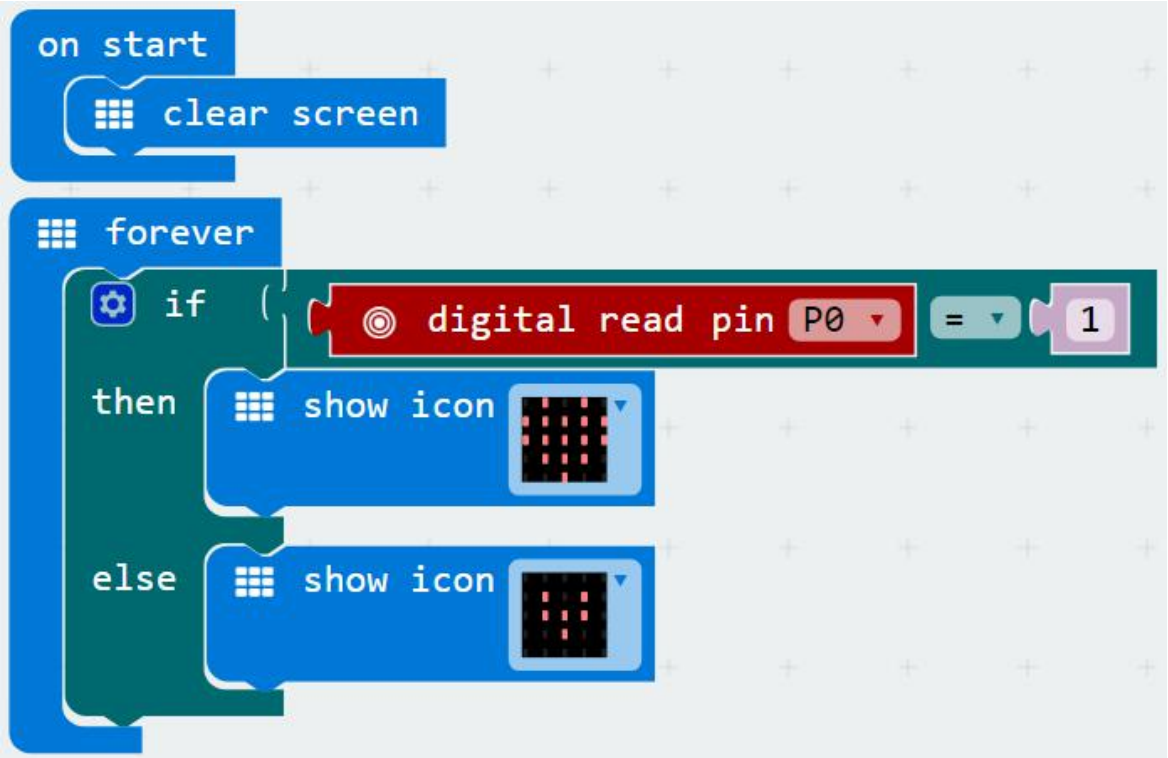
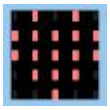
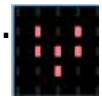
as you like.



Example Result

Done wiring and powered up, send the code to micro:bit. When tilt the sensor to the left, you should see the LED matrix of micro:bit show the icon like a heart.  If tilted to the right, it will show the icon like this. 

Project 10: Light Interrupter

Overview

In daily life, we often need to implement the function of counting and speed measurement. How to achieve these functions? You can easily match photo-interrupter module with microcontroller via code debugging. In this lesson, we connect a keyestudio photo-interrupter module to micro:bit sensor shield, then control 5*5 LED of micro:bit show different images.

Component Required:

- Micro:bit main board*1
- Keyestudio Micro bit Sensor V2 Shield*1
- USB Cable*1
- keyestudio Photo Interrupter Module*1
- Dupont jumper wire*3

Component Introduction

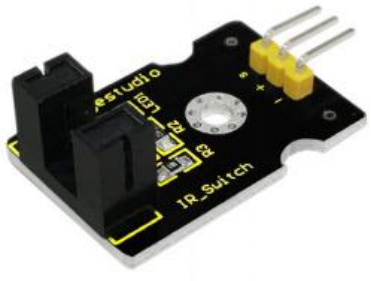
Photo Interrupter Module:

A photo-interrupter is a sensor that arranges light-emitting component and light-receiving component face-to-face and packages them together. It applies the principle that light is interrupted when an object passes through the sensor. Therefore, photo-interrupters are widely used in many fields like speed measurement, positioning and counting, small household appliances, optical limit switches, object detection and so on.

During the test, if let an object continue to block the notch of photo-interrupter sensor, the module's signal end will continuously appear High and Low level changes, then we can get the motion state of object through calculating the signal data, thus implement the counting and Speed measurement function.

Features:

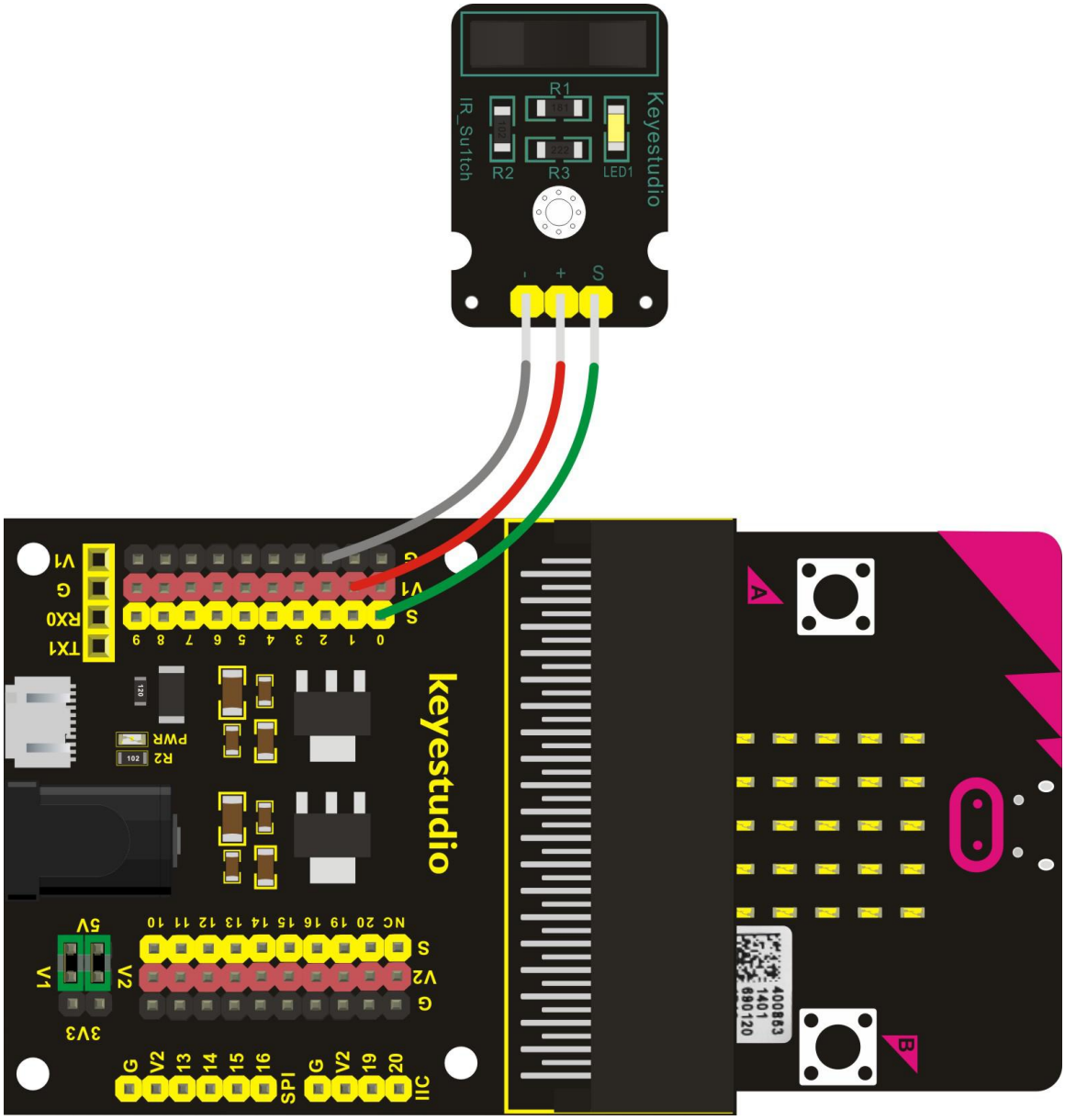
- Support quick response; highly sensitive



- With power light and 3-pin interface
- Supply Voltage: 3.3V to 5V
- Interface: Digital
- Size: 30*20mm

Connect It Up

Insert the micro:bit into keyestudio micro:bit sensor V2 shield.Then connect light interrupter module to micro:bit sensor shield, connect S pin to S0 pin header, + pin to V1 header, - pin to ground. Shown below.



Test Code

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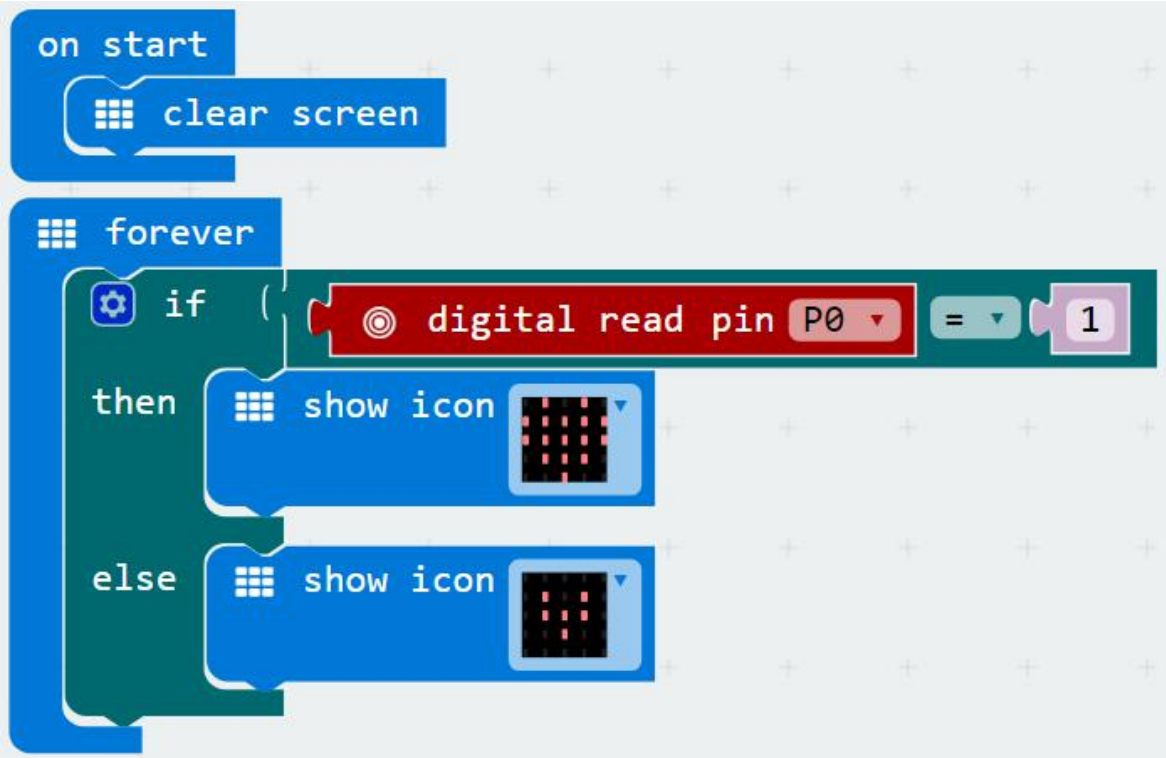
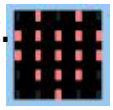
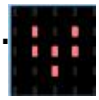
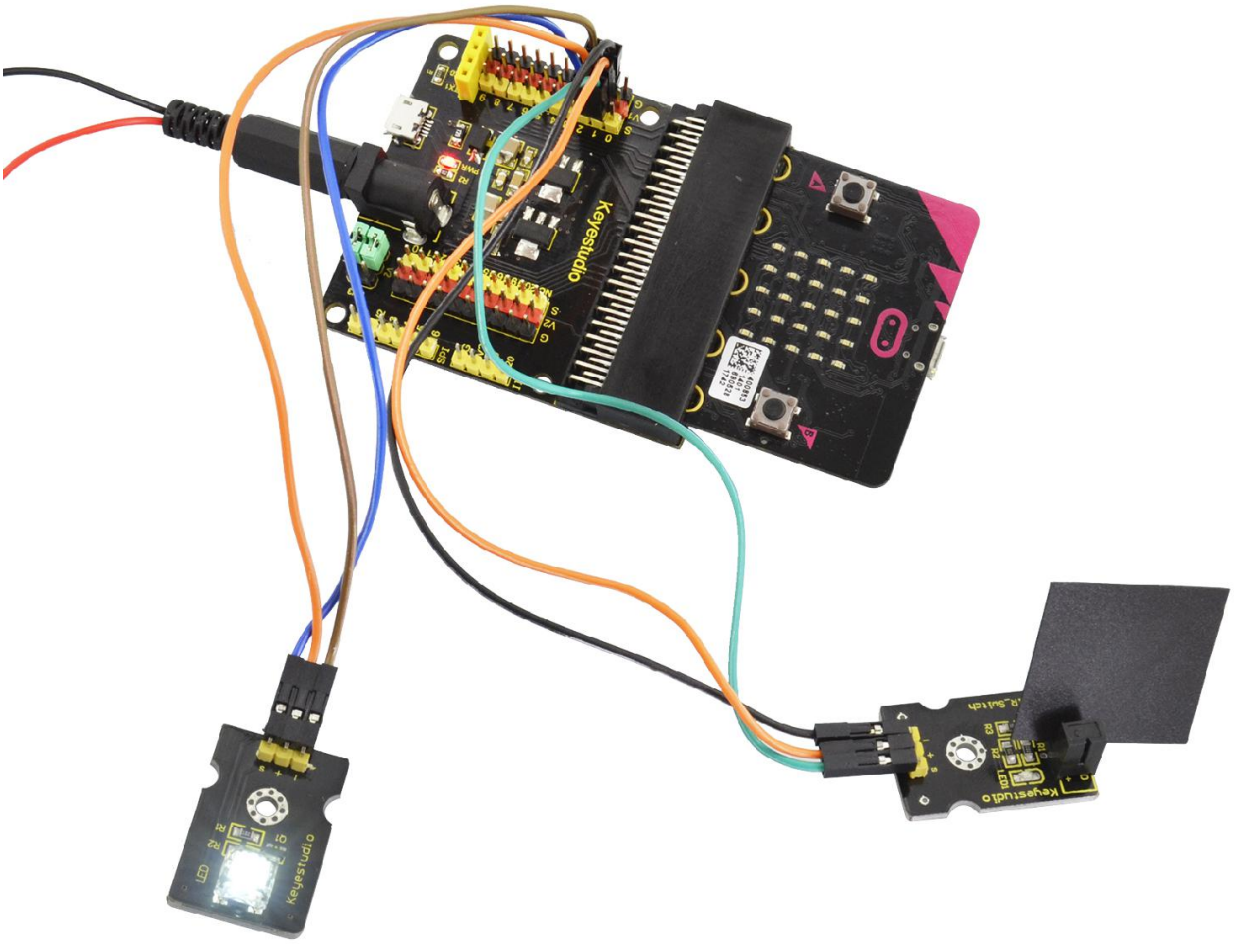


Example Result

Done wiring and powered up, send the code to micro:bit. When cover the notch of sensor with a piece of paper, you should see the LED matrix of micro:bit show the icon like a heart.  Or else, it will show the icon like this. 

Extension Experiment

In the experiment, use the photo-interrupter module to control an LED module on and off. Pick up a black paper in the notch of photo-interrupter, LED on, or else LED off.



Project 11: Capacitive Touch

Overview

In the above project 8, we have done a button control experiment. This time, we are going to replace the button switch with a capacitive touch sensor. In this project, you will learn how to use keyestudio touch sensor to control 5*5 LED of micro:bit show different images.

Component Required:

- Micro:bit main board*1
- Keyestudio Micro bit Sensor V2 Shield*1
- USB Cable*1
- keyestudio Capacitive Touch Sensor*1
- Dupont jumper wire*3

Component Introduction

Capacitive Touch Sensor:

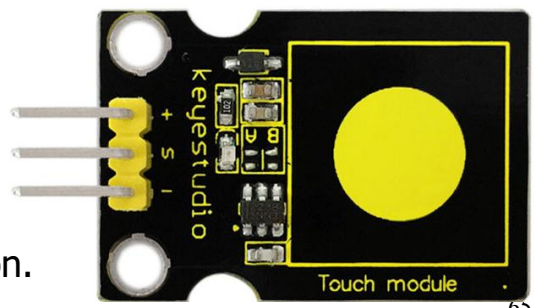
The module is based on a touch detection IC. This module allows you to remove the troubles of conventional push-type buttons. It has low power consumption and wide working voltage.

Powered on, the module requires the stable time about 0.5sec, at the moment all functions are banned to conduct self-calibration, do not touch the key, the calibration cycle is about 4.0sec.

It can be applied to the waterproof electrical, button replacement, etc.

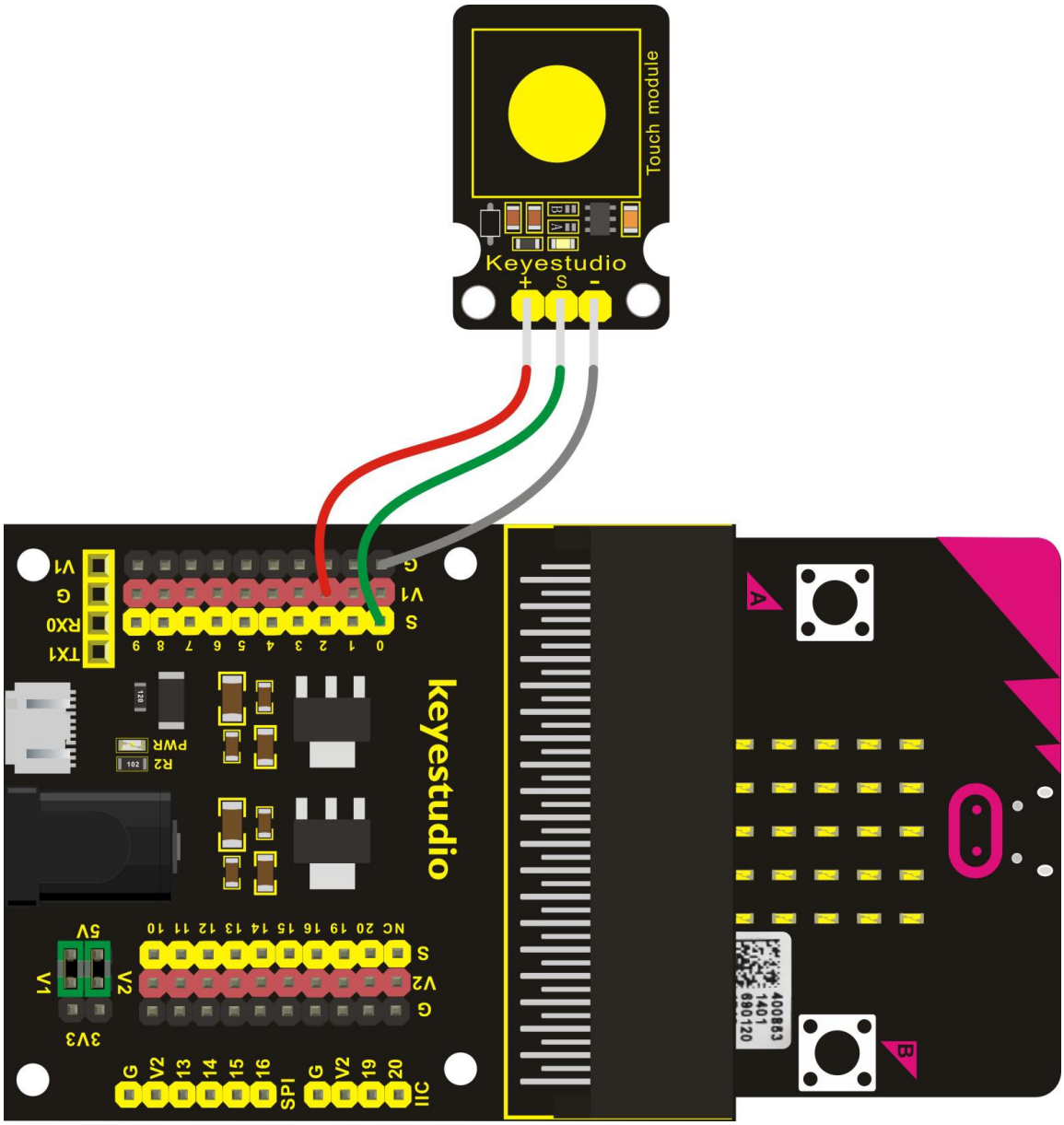
Module features are as follows:

- Jog type: the initial state is low, high touch, do not touch is low (similar touch of a button feature);
- Low power consumption;
- Power supply for 3.3 ~ 5V DC;
- Smooth touch surface
- 2 positioning holes for easy installation.



Connect It Up

Insert the micro:bit into keyestudio micro:bit sensor V2 shield.Then connect touch sensor to micro:bit sensor shield, connect S pin to S0 pin header, + pin to V1 header, - pin to ground. Shown below.



Test Code

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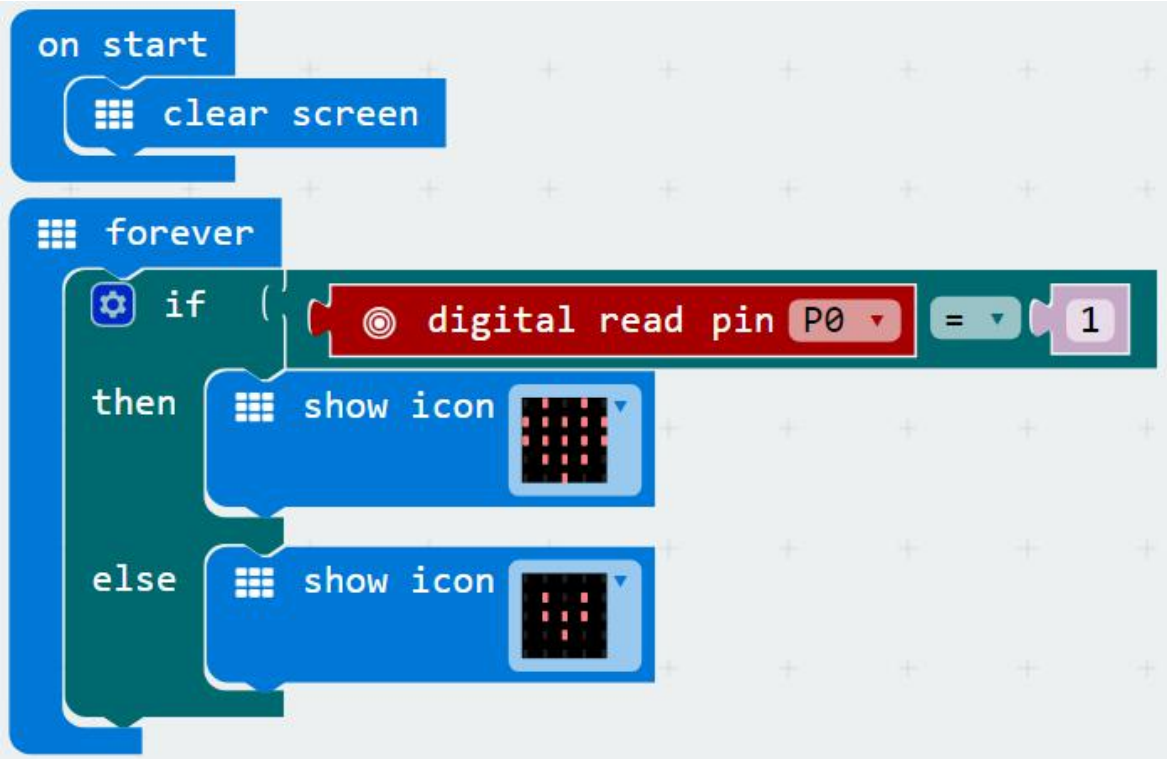
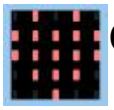
https://makecode.micro:bit.org/ to edit your project program. Below is an example code we have done for you as reference. You can change the icon as you like.



Example Result

Done wiring and powered up, send the code to micro:bit. When touch the sensing area of sensor, you should see the LED matrix of micro:bit show the icon like a heart.  Or else, it will show the icon like this. 

Project 12: Traffic Light

Overview

When walking at the crossroad, you can see the traffic light command the orderly movement of pedestrians and vehicles. So how is the traffic light controlled to operate? In this project, we will connect a traffic light module to our sensor shield, controlling traffic light blink with micro:bit. You will learn how to simulate the running of traffic light.

Component Required:

- Micro:bit main board *1
- Keyestudio Micro bit Sensor V2 Shield *1
- USB Cable *1
- Keyestudio Traffic Light Module *1
- Dupont jumper wire *4

Component Introduction

Traffic Light Module:

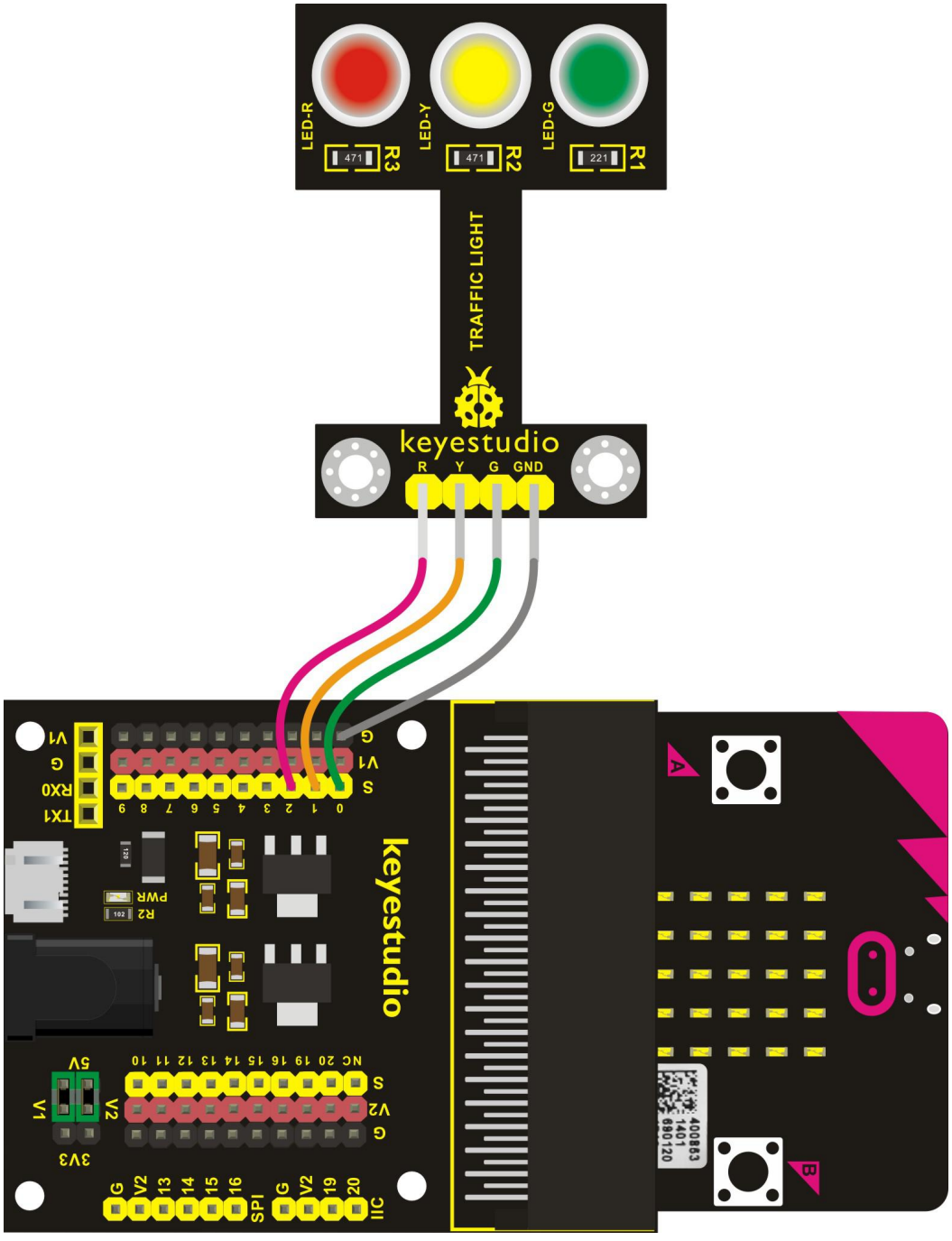
When learning the microcontroller, you may usually use three separate LEDs (red, green and yellow) to simulate the traffic light blinking. In this way you may need more wire connection. We specially design this traffic light module, which is very convenient for wiring. It has integrated three LEDs (red, green and yellow) together on the module. Also breaks out four pin interfaces. There are two positioning holes for easy installation.

Specifications:

Working Voltage: 3.3-5V
Interface Type: Digital
PH2.54 Socket

Connect It Up

Insert the micro:bit into keyestudio micro:bit sensor V2 shield.Then connect traffic light module to micro:bit sensor shield, separately connect R, Y,G pin to S2, S1,S0 pin header, GND pin to ground. Shown below.



Test Code

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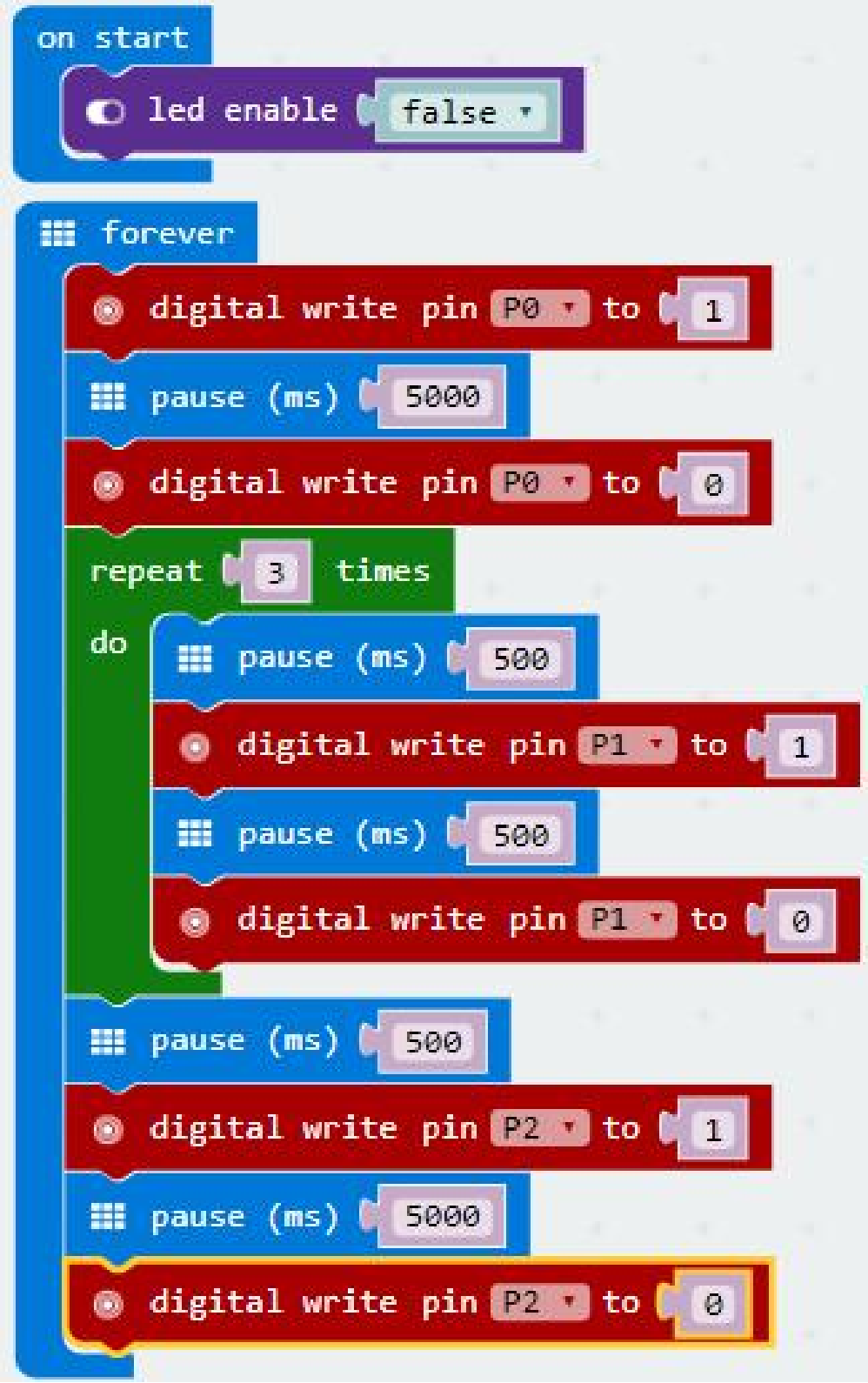
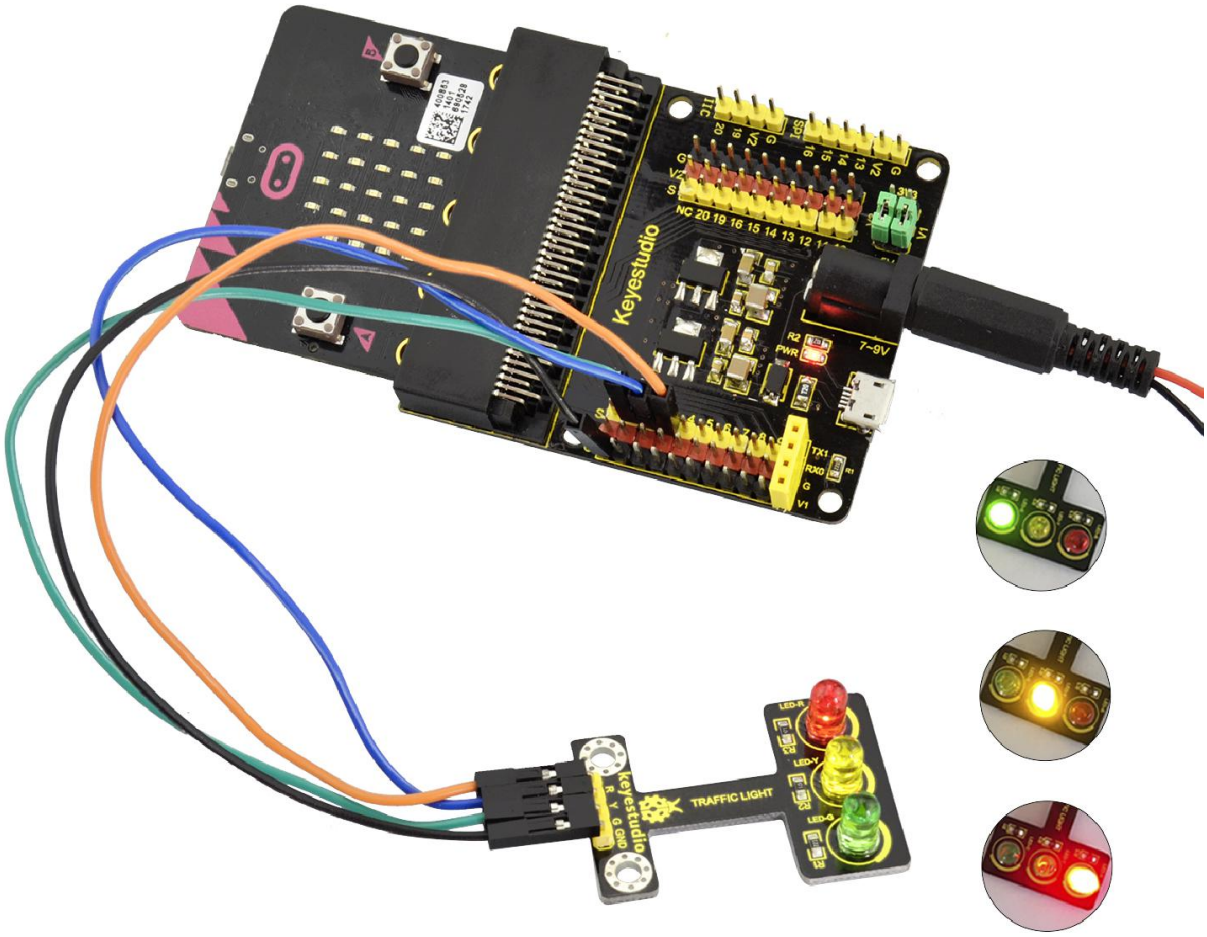


Example Result

Done wiring and powered up, send the code to micro:bit, eventually you should see the green LED lights 5 seconds then off, and yellow LED starts to blink 3 times with an interval of 0.5 second, then off, followed by red LED lights up for 5 seconds then off. Up to this moment, green LED lights again, forming a loop cycle.



Project 13: Magnetic Detection

Overview

In this project, you will learn how to use our hall magnetic sensor to control 5*5 LED of micro:bit display different images.

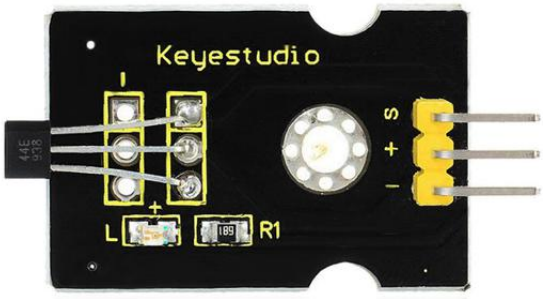
Component Required:

- Micro:bit main board*1
- Keyestudio Micro bit Sensor V2 Shield*1
- USB Cable*1
- keyestudio Hall Magnetic Sensor*1
- Dupont jumper wire*3

Component Introduction

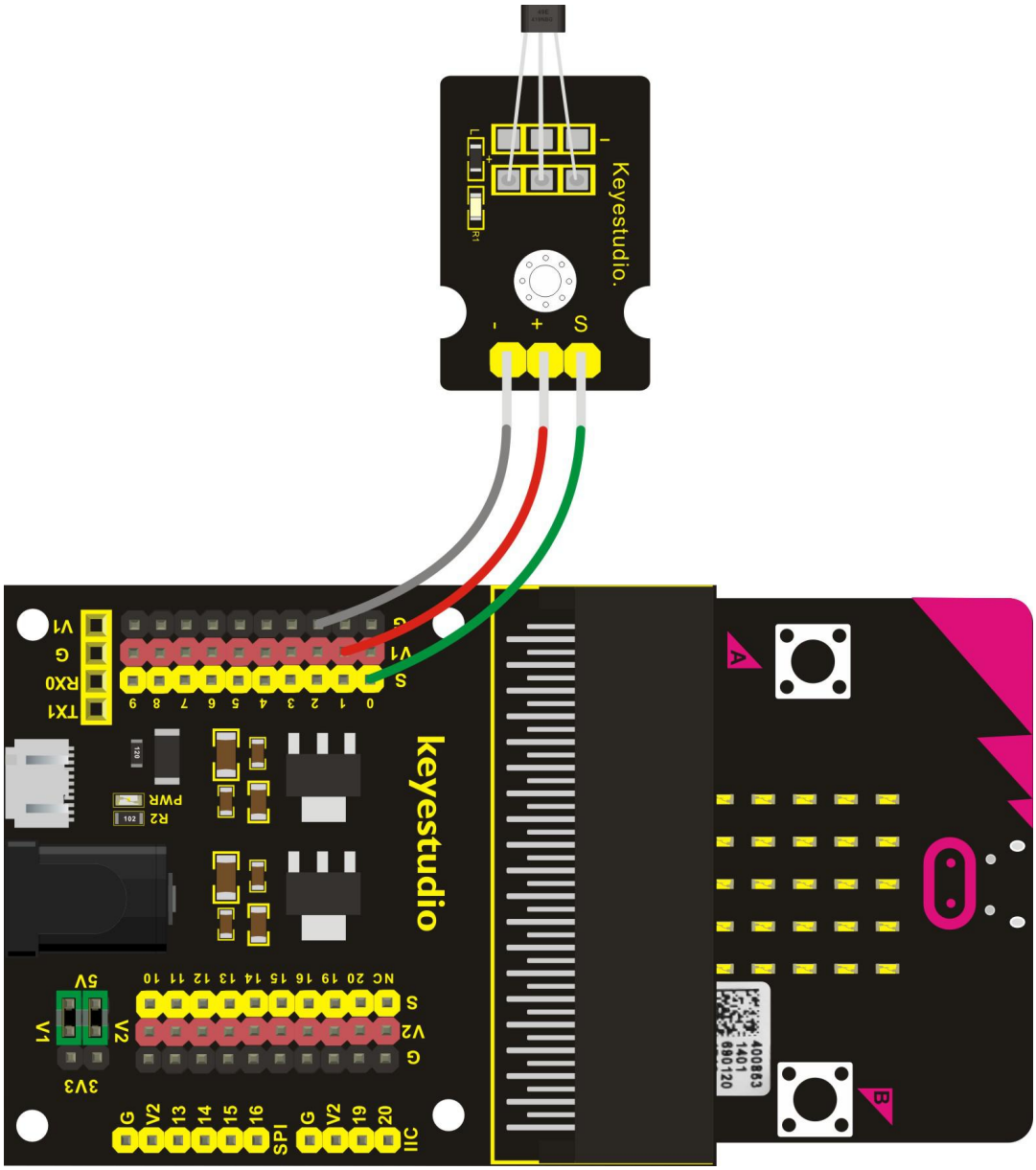
Hall Magnetic Sensor:

The main component used in this sensor is A3144E. This hall magnetic sensor can be used to detect a magnetic field, outputting Digital signal. It can sense the magnetic materials within a detection range up to 3cm.
Note that it can only detect whether exists a magnetic field nearby but can not detect the strength of magnetic field.



Connect It Up

Insert the micro:bit into keyestudio micro:bit sensor V2 shield.Then connect magnetic sensor to micro:bit sensor shield, connect S pin to S0 pin header, + pin to V1 header, - pin to ground. Shown below.



Test Code

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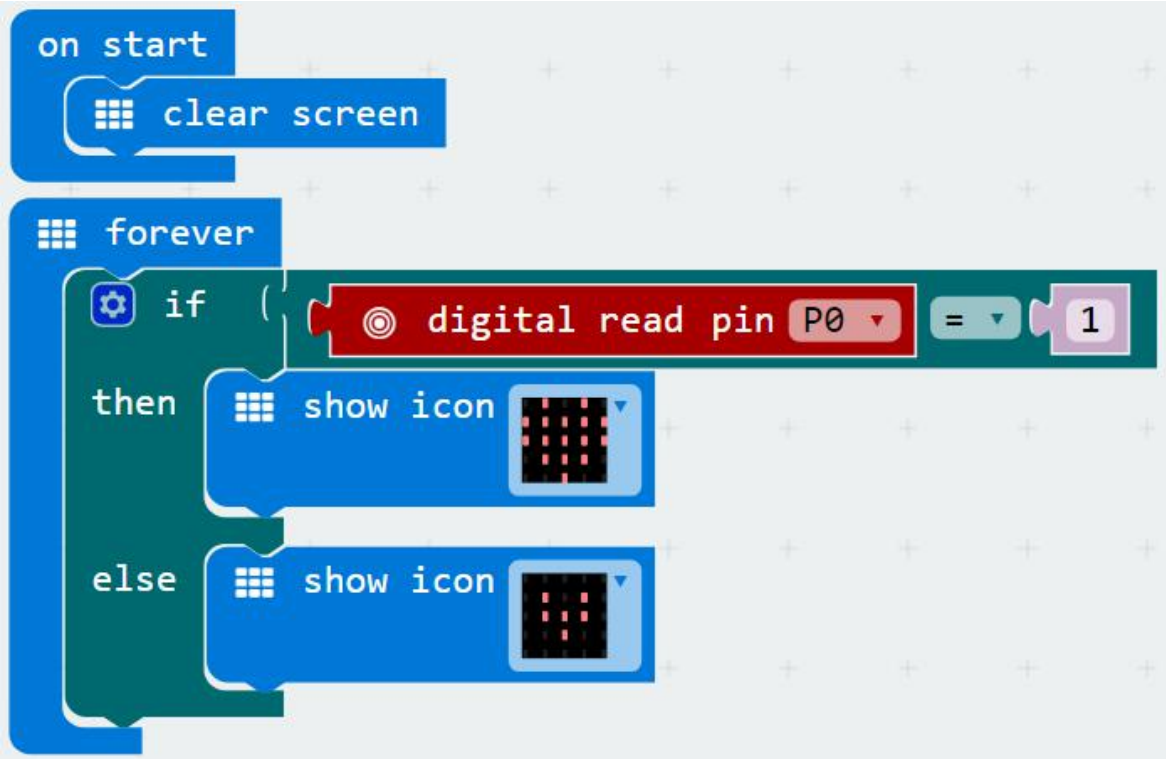
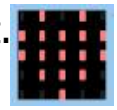
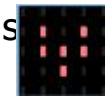


Example Result

Done wiring and powered up, send the code to micro:bit. You can place a magnetic bead near the sensor. When the sensor detects a magnetic field nearby, you should see the LED matrix of micro:bit show the icon like a heart.  Or else, it will show the icon like this 

Project 14: Follow Black Line

Overview

When doing DIY experiments, you perhaps see such a smart car that can follow a black line and not beyond the black area. How can achieve this? Yeah, make use of line tracking sensors. In this project, we will use a tracking sensor combined with micro:bit to detect an object or a black line. You can get the result shown on the LED display of micro:bit.

Component Required:

- Micro:bit main board*1
- Keyestudio Micro bit Sensor V2 Shield*1
- USB Cable*1
- keyestudio Line Tracking Sensor*1
- Dupont jumper wire*3

Component Introduction

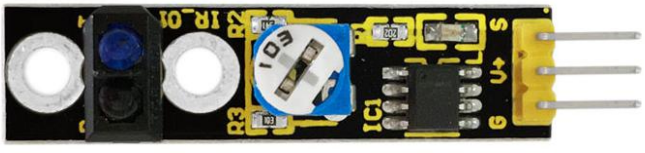
Line Tracking Sensor:

The tracking sensor is actually an infrared sensor, which can detect a black line. The component used in the sensor is TCRT5000 infrared tube.

Its working principle is to use the different reflectivity of infrared light to the color, then convert the strength of the reflected signal into a current signal. When sensor detects a black line, the infrared rays are not emitted or the intensity of emitted ray back are not sufficiently strong, so that the sensor's signal terminal outputs a High level. Otherwise, output a Low level.

In this way, we can judge the detected color by High or Low level of the sensor's signal terminal.

Note: on the module, you can rotate the potentiometer to make the LED between on and off state. The sensitivity is the best.



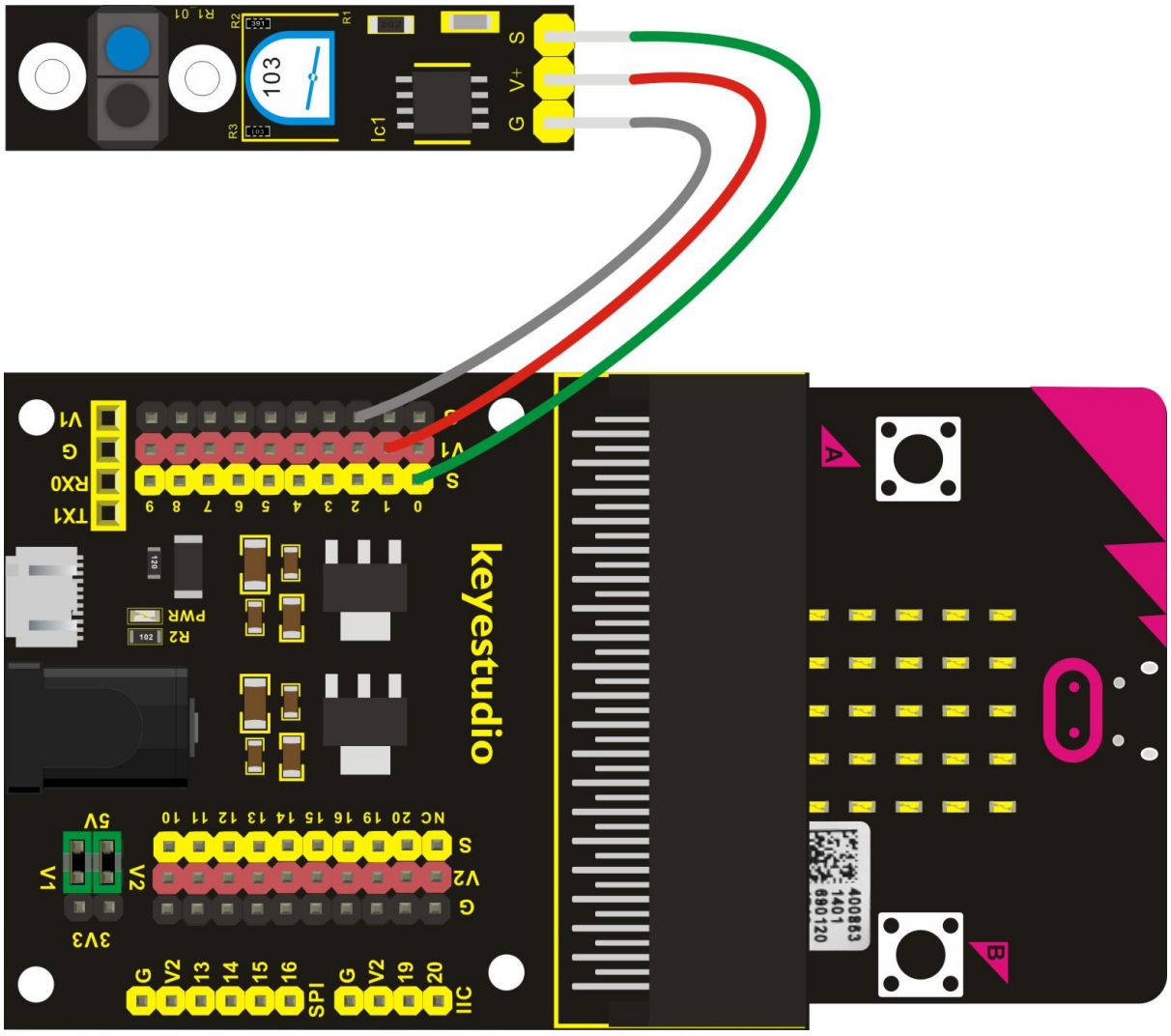
Specifications:

- Power supply: +5V

- Operating current: <10mA
- Operating temperature range: 0℃ ~ + 50℃
- Output interface: 3Pin interface
- Output Level: TTL level
- Detection Height: 0-3 cm

Connect It Up

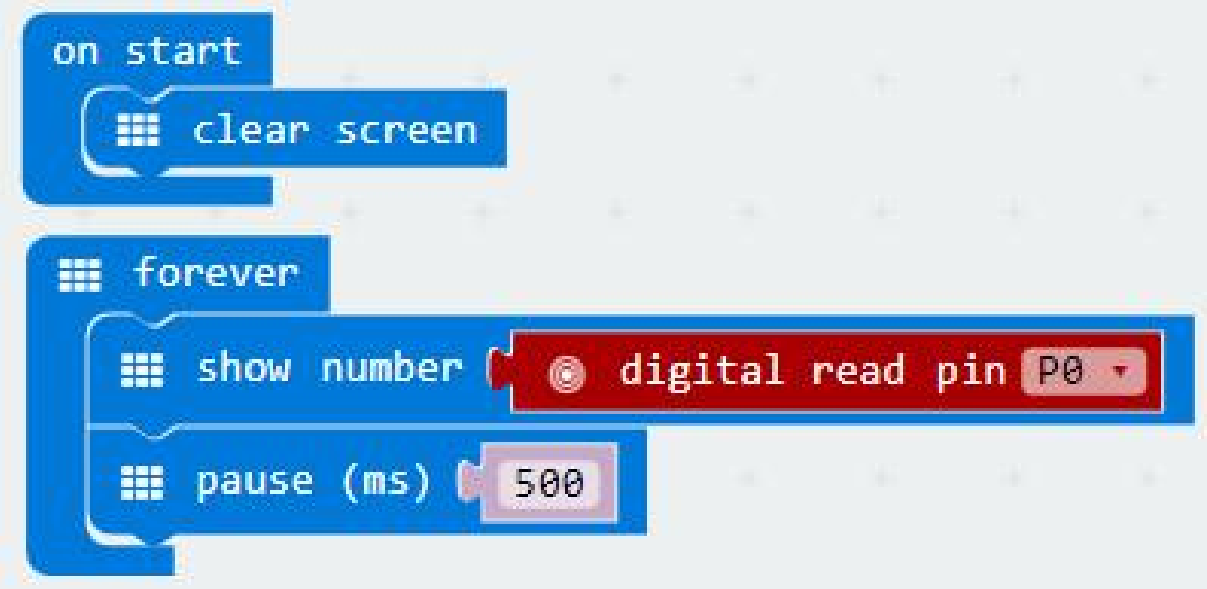
Insert the micro:bit into keyestudio micro:bit sensor V2 shield.Then connect tracking sensor to micro:bit sensor shield, connect S pin to S0 pin header, V pin to V1 header, G pin to ground. Shown below.



Test Code

If you are not familiar to make code, don't worry. Firstly, you can enter this

link:https://makecode.micro:bit.org/reference to know more about micro:bit blocks. Then you can directly enter the https://makecode.micro:bit.org/ to edit your project program. Below is an example code we have done for you.



Example Result

Done wiring and powered up, send the code to micro:bit. When sensor detects no object or detects a black line, the infrared rays are not emitted or the intensity of emitted ray back are not sufficiently strong, so that the sensor's signal terminal will output a High level, LED on the micro:bit will show the number 1. Or else show the number 0.

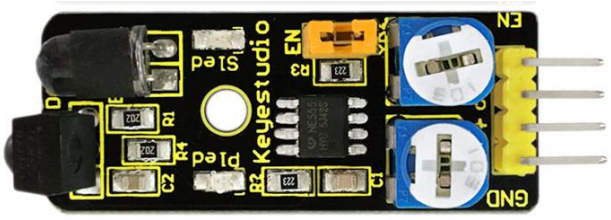
Project 15: Obstacle Avoidance

Overview

When doing DIY experiments, you perhaps see such a smart car that can automatically avoid an obstacle ahead. How can achieve this? Yeah, make use of infrared obstacle avoidance sensors. In this project, we will use a obstacle sensor combined with micro:bit to detect an object ahead and automatically avoid it. You can get the result shown on the LED display of micro:bit.

Component Required:

- Micro:bit main board*1
- Keyestudio Micro bit Sensor V2 Shield*1
- USB Cable*1
- keyestudio Obstacle Detector Sensor*1
- Dupont jumper wire*3



Component Introduction

Obstacle Avoidance Sensor:

The infrared obstacle detector sensor is actually a distance-adjustable obstacle avoidance sensor.

It has a pair of infrared transmitting and receiving tubes. The transmitter emits an infrared ray of a certain frequency. When the detection direction encounters an obstacle (reflecting surface), the infrared rays are reflected back, and receiving tube will receive it. At this time, the signal terminal will output Low level.

If no obstacle detected, the infrared ray emitted is weakened by the distance it travels and eventually disappears, so receiving tube cannot receive it and signal end of sensor will output High level.

In this case, it can judge whether there is an obstacle ahead or not.

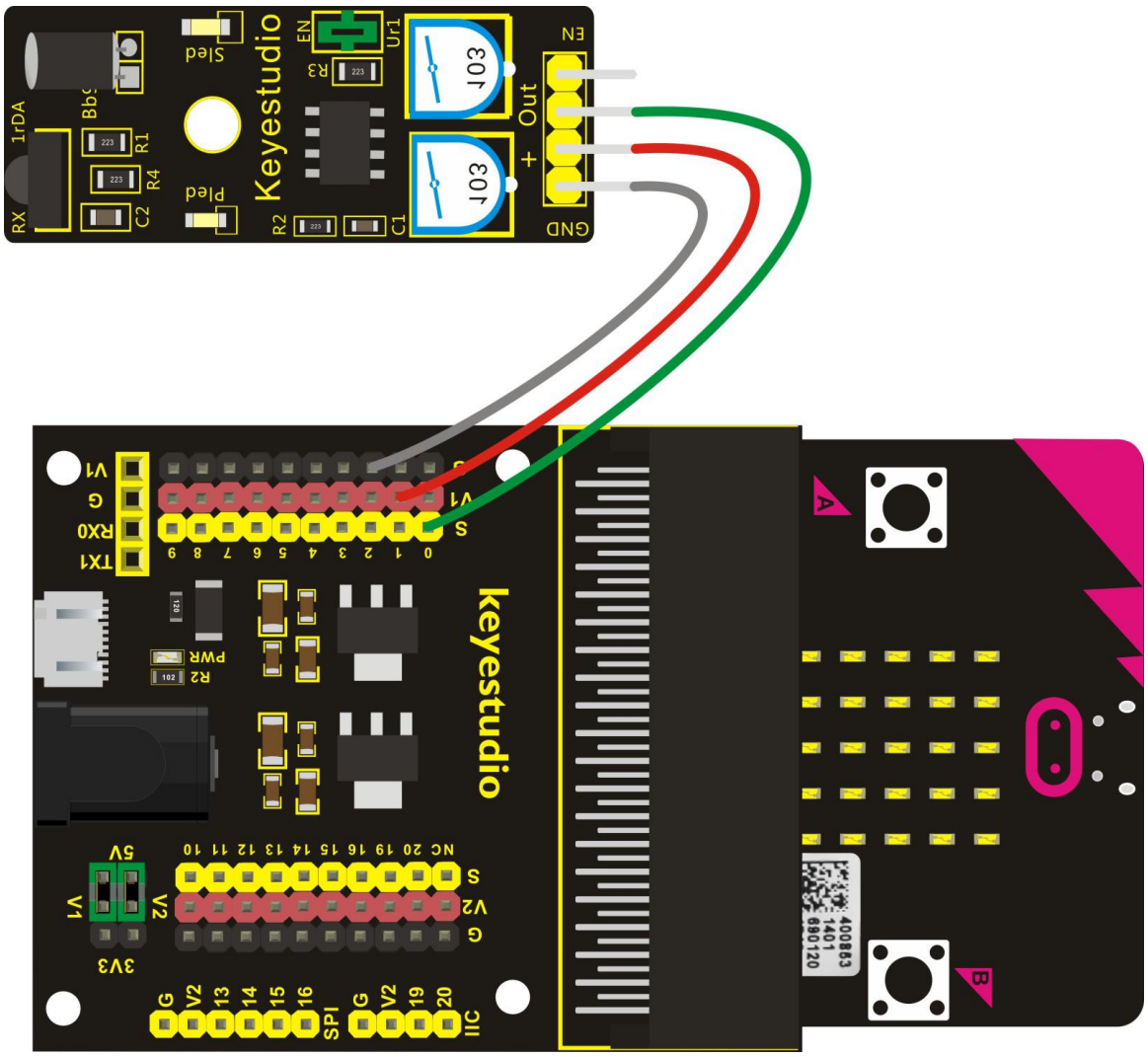
You can rotate the potentiometer knob on the sensor to adjust the detection distance. The effective distance is 2-40cm and working voltage is 3.3V-5V.

Specifications:

- Working voltage: DC 3.3V-5V
- Working current: ≥20mA
- Working temperature: －10℃ to＋50℃
- IO Interface: 4Pin interface (-/+/S/EN)
- Output signal: TTL voltage
- Detection distance: 2-40cm

Connect It Up

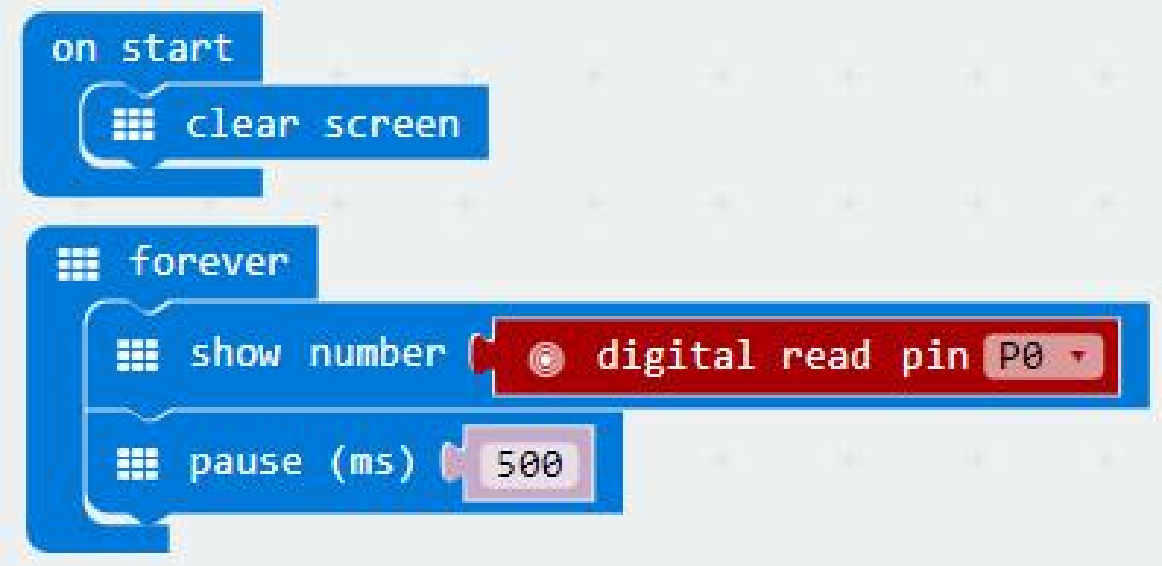
Insert the micro:bit into keyestudio micro:bit sensor V2 shield.Then connect obstacle detector sensor to micro:bit sensor shield, connect Out pin to S0 pin header, + pin to V1 header, GND pin to ground. Shown below.



Note: for obstacle sensor, you can rotate the two potentiometers on the sensor to adjust its sensitivity. Rotate the potentiometer near the infrared transmitter tube clockwise to the end, and then adjust the potentiometer near the infrared receiver. Sled light is turned off and keeps the critical point to be lit. The sensing distance is the longest.
The effective distance of the sensor is within 2-40 cm.

Test Code

If you are not familiar to make code, don't worry. Firstly, you can enter this link:https://makecode.micro:bit.org/reference to know more about micro:bit blocks. Then you can directly enter the https://makecode.micro:bit.org/ to edit your project program. Below is an example code we have done for you.



Example Result

Done wiring and powered up, send the code to micro:bit. When sensor detects an object ahead, its signal terminal will output a Low level, and LED matrix on the micro:bit will show the number 0. Or else show the number 1.

Project 16: Someone Comes

Overview

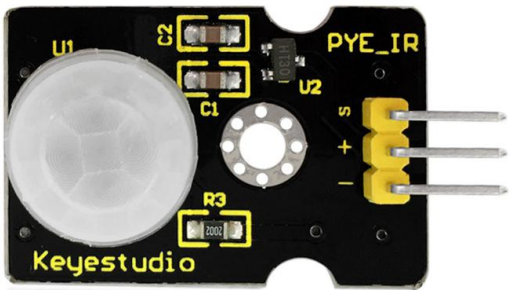
You may see such a lens in a film or television. When someone wants to attack a target, but not close to the target, they were directly found and the alarm sounded. When some special forces go to the target, they will be covered with moist mud, so that they will not be discovered by the other party. Why ?

Originally, the human body will emit a certain wavelength of infrared rays of about 10um. The relevant sensors are installed near the targets that are being attacked to sense the infrared rays emitted by the human body and then alarm. After the mud is applied, the sensors can not sense the infrared rays emitted by the human body.

In this project, you will learn how to use a PIR motion sensor and micro:bit to detect whether there is someone move nearby. Finally show the different images on 25 LED matrix of micro:bit.

Component Required:

- Micro:bit main board*1
- Keyestudio Micro bit Sensor V2 Shield*1
- USB Cable*1
- keyestudio PIR Motion Sensor*1
- Dupont jumper wire*3



Component Introduction

PIR Motion Sensor:

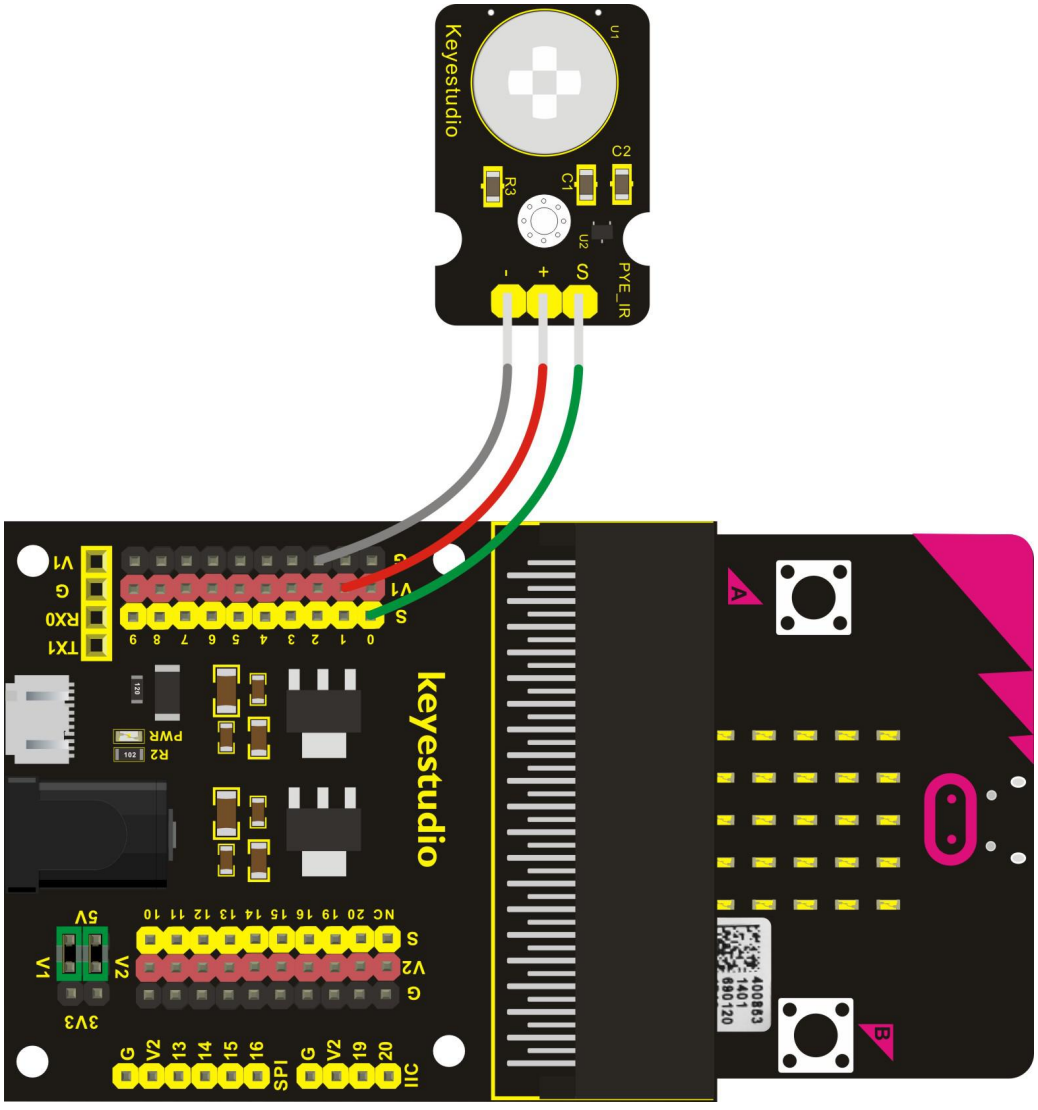
This sensor can detect infrared signals from a moving person or moving animal nearby, and output High level at signal end. If no detected, output Low level. Note that it can only detect the moving human body, do not detect the body in static. And the detection distance is 3m at most.

Specifications:

1. Input Voltage: 3.3 ~ 5V, Maximum for 6V
2. Working Current: 15uA
3. Working Temperature: -20 ~ 85 ℃
4. Output Voltage: High 3V, Low 0V
5. Output Delay Time (High Level): About 2.3 to 3 seconds
6. Detection Angle: 100°
7. Detection Distance: 3 meters
8. Output Indicator LED (if output HIGH, it will be ON)
9. Limit Current for Pin: 100mA

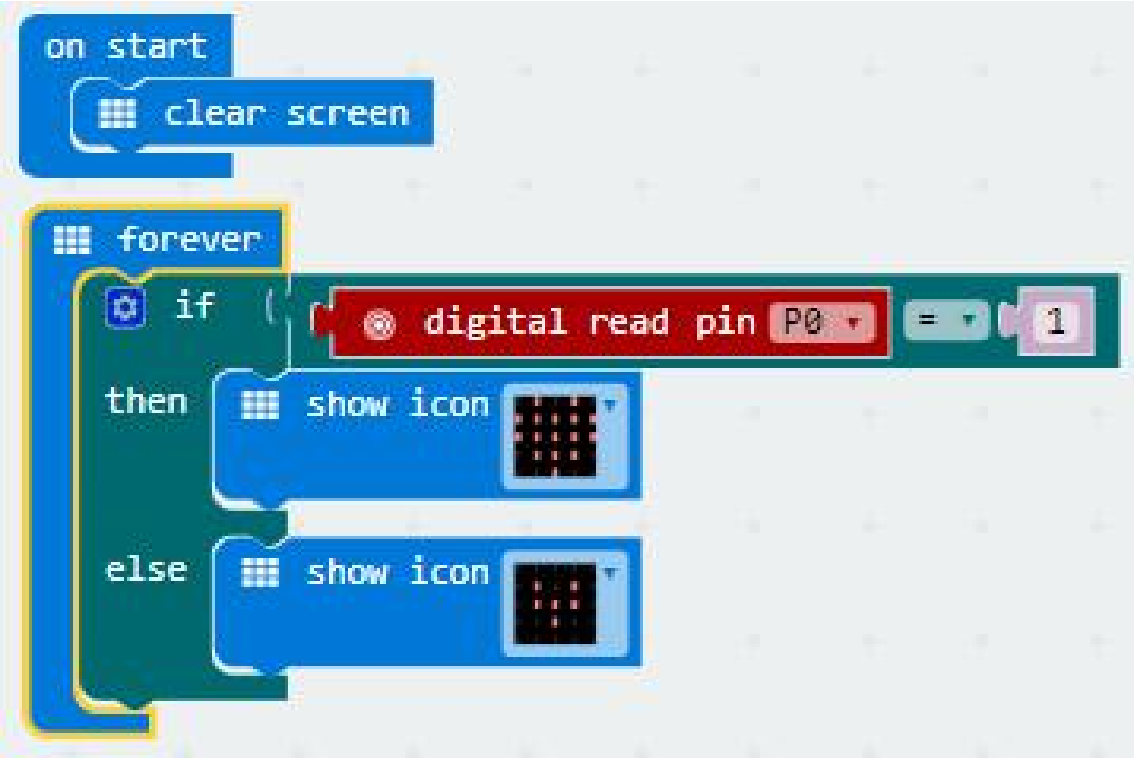
Connect It Up

Insert the micro:bit into keyestudio micro:bit sensor V2 shield.Then connect PIR motion sensor to micro:bit sensor shield, connect S pin to S0 pin header, + pin to V1 header, - pin to ground. Shown below.

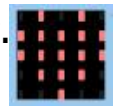
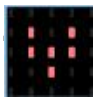


Test Code

If you are not familiar to make code, don't worry. Firstly, you can enter this link:https://makecode.micro:bit.org/reference to know more about micro:bit blocks. Then you can directly enter the https://makecode.micro:bit.org/ to edit your project program. Below is an example code we have done for you.



Example Result

Done wiring and powered up, send the code to micro:bit. When sensor detects the movement of someone nearby, 25 LED matrix of micro:bit will show the icon like a heart.  Or else, show the icon like this 

Project 17: Fire Alarm

Overview

In daily life, it is often seen that a fire broke out without any precaution. It will cause great economic and human loss. So how can we avoid this situation? Right, install a flame sensor and a speaker in those places that easily break out a fire. When the flame sensor detects a fire, the speaker will alarm people quickly to put out the fire.

So in this project, you will learn how to use a flame sensor and an active buzzer module to simulate the fire alarm system.

Component Required:

- Micro:bit main board*1
- Keyestudio Micro bit Sensor V2 Shield*1
- USB Cable*1
- keyestudio Flame Sensor*1
- keyestudio Digital Buzzer Module*1
- Dupont jumper wire*6

Component Introduction

Flame Sensor:

This flame sensor can be used to detect fire or other light sources with wavelength stands at 760nm ~ 1100nm. Its detection angle is about 60°. You can rotate the potentiometer on the sensor to control its sensitivity. Adjust the potentiometer to make the LED at the critical point between on and off state. The sensitivity is the best.

In the fire-fighting robot game, the flame sensor plays an important role in probing the fire source.

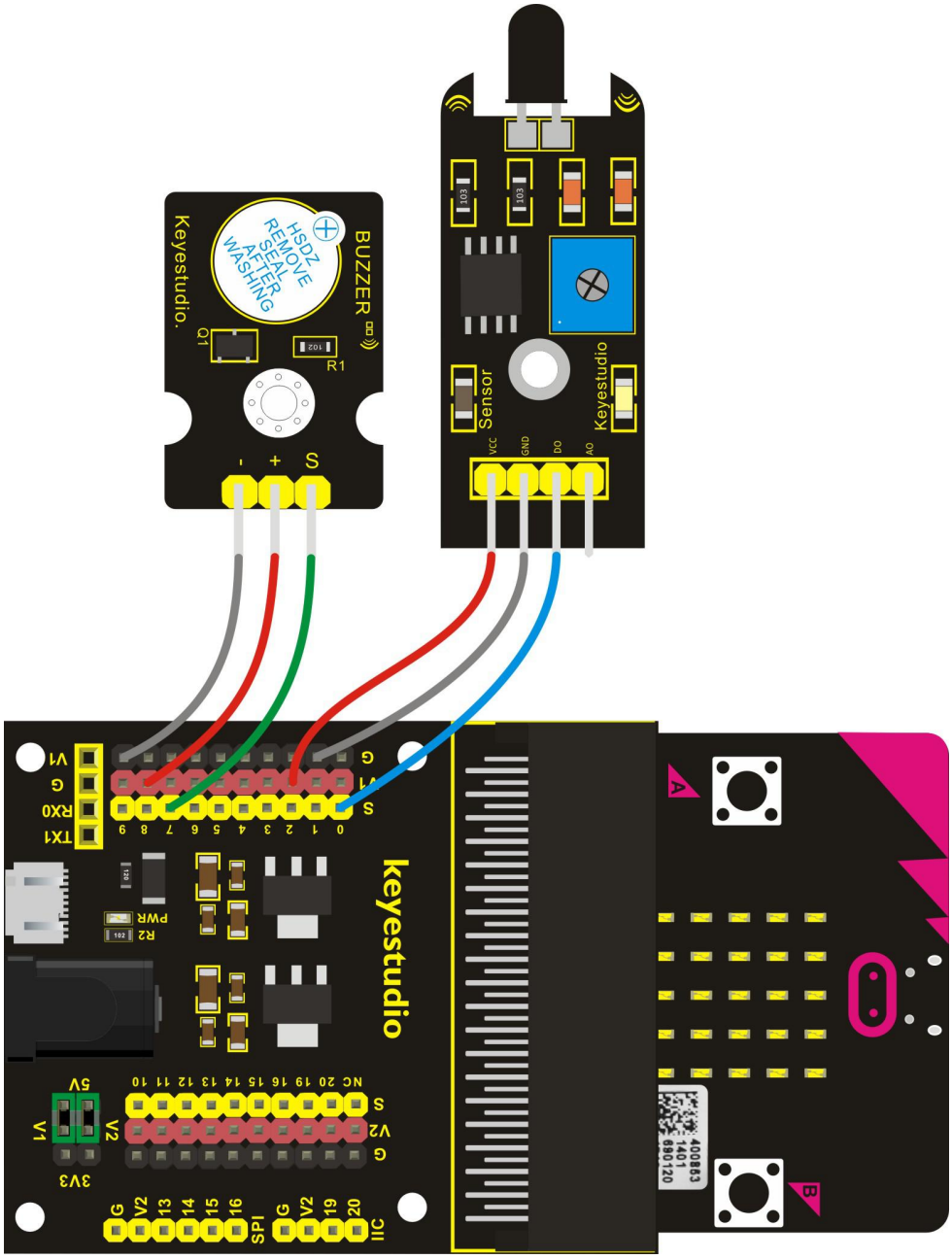
Specifications:

- Supply Voltage: 3.3V to 5V
- Detection angle: about 60°

- Detection range: 20cm (4.8V) ~ 100cm (1V)
- Spectral Bandwidth: 760nm to 1100nm
- Operating temperature: -25℃ to 85℃
- Interface: Digital

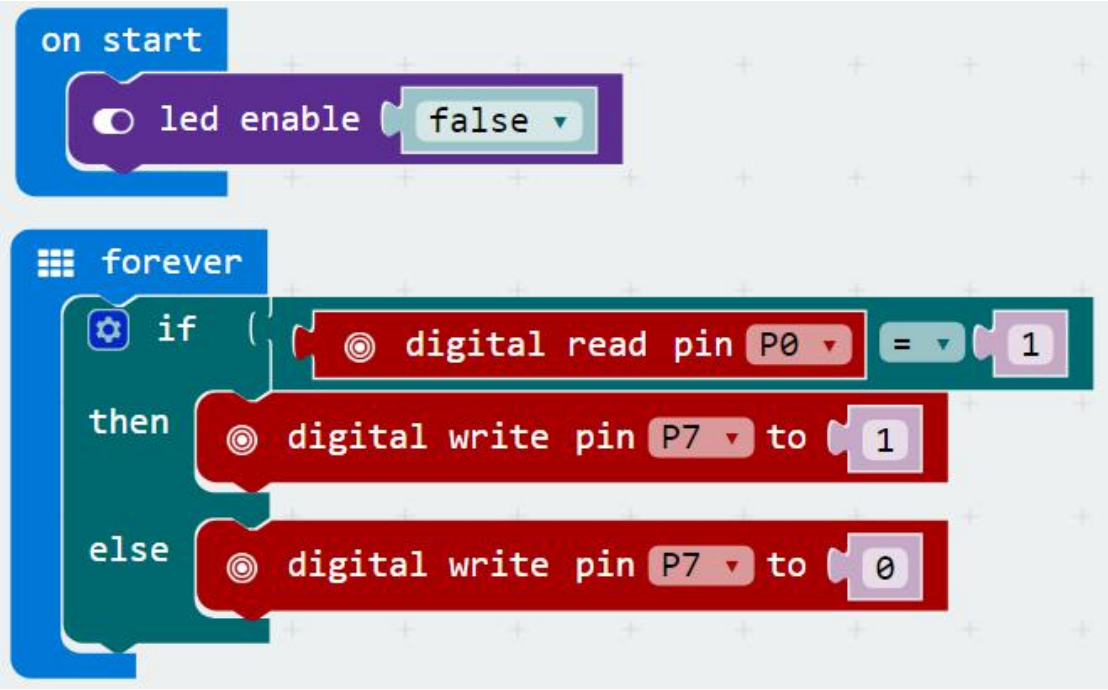
Connect It Up

Insert the micro:bit into keyestudio micro:bit sensor V2 shield.Then separately connect the buzzer and flame sensor to keyestudio micro:bit sensor shield. Shown as below diagram.



Test Code

If you are not familiar to make code, don't worry. Firstly, you can enter this link:https://makecode.micro:bit.org/reference to know more about micro:bit blocks. Then you can directly enter the https://makecode.micro:bit.org/ to edit your project program. Below is an example code we have done for you.



Example Result

Done wiring and powered up, send the code to micro:bit. When flame sensor detects the fire nearby, the buzzer module will sound immediately. If no fire detected, the buzzer not beeps.

Project 18: To The Top

Overview

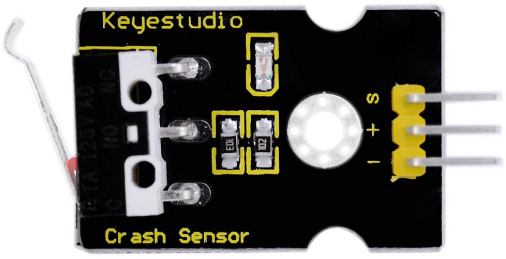
During the DIY, we may usually use a machine-3D printer. You can use it to print any elements with different structures. And limit switch is essential in the printing, which mainly provides the information whether XYZ axis of printer reach the boundary point.

Keyestudio crash sensor is a limit switch, available for 3D printer. It is in essence the same as button module. When printer reaches the top to crash the spring plate of module, module outputs Low level. If loosen the spring plate, module outputs High.

In this lesson, you will learn how to use a collision sensor and a digital buzzer module to simulate the 3D printer limit.

Component Required:

- Micro:bit main board*1
- Keyestudio Micro bit Sensor V2 Shield*1
- USB Cable*1
- keyestudio Crash Sensor*1
- keyestudio Digital Buzzer Module*1
- Dupont jumper wire*6



Component Introduction

Crash Sensor:

Crash sensor, also known as electronic switch, is a digital on-off input module. The features are as follows:

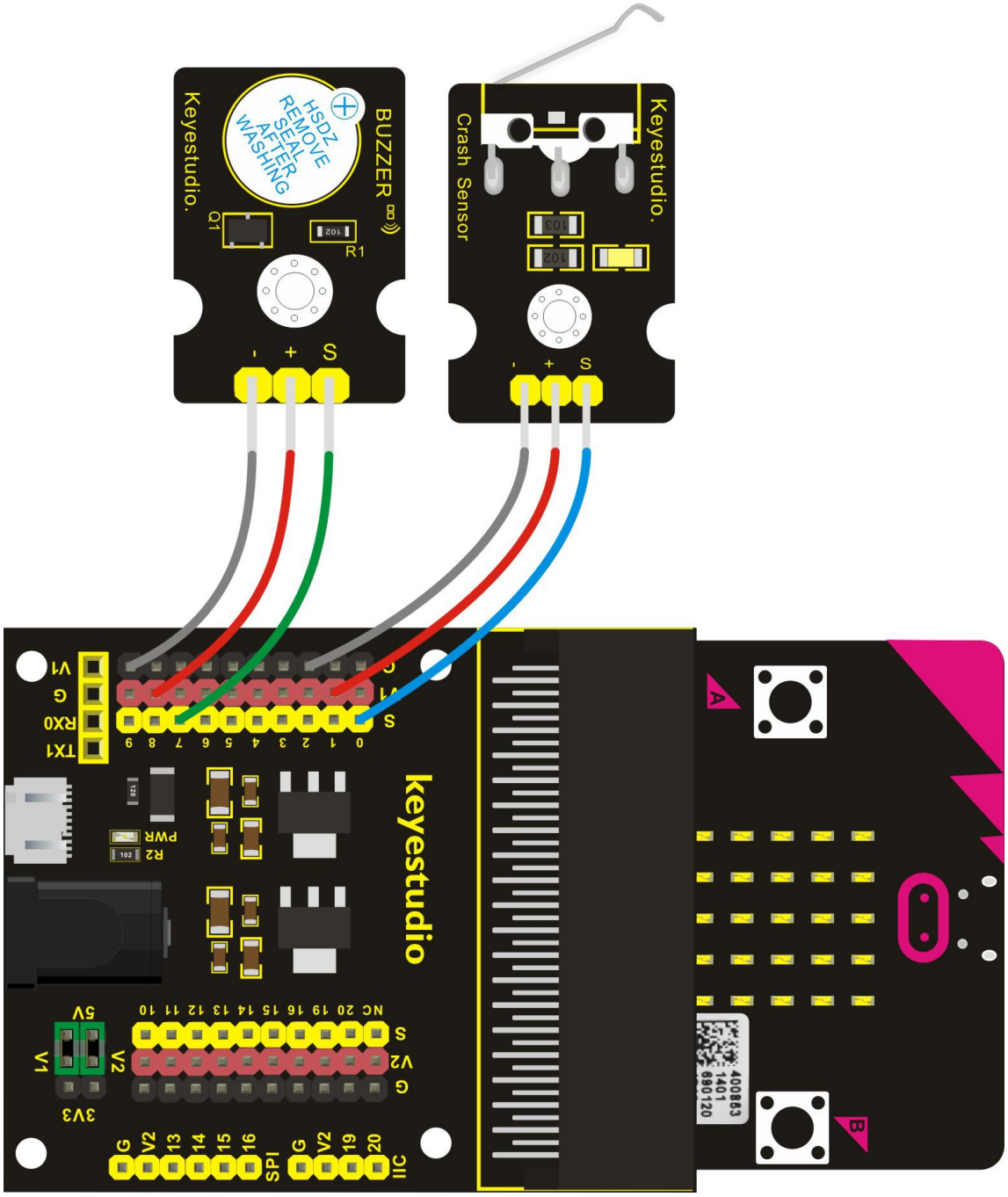
1. When collision happens upfront of where crash module is installed, module outputs low level signal; no collision, outputs high level signal.
2. With a mounting hole, convenient for fixation on any devices.
3. PCB size: 3.1cm * 2.1cm
4. With switch indicator light, if there is collision, LED on; if no collision, LED off.

Pin definition

- Positive pin (+): 3V-12V power supply
- Negative pin (-): ground
- Signal pin (S): High-Low level output

Connect It Up

Insert the micro:bit into keyestudio micro:bit sensor V2 shield.Then separately connect the active buzzer and crash sensor to keyestudio micro:bit sensor shield. Shown as below diagram.



Test Code

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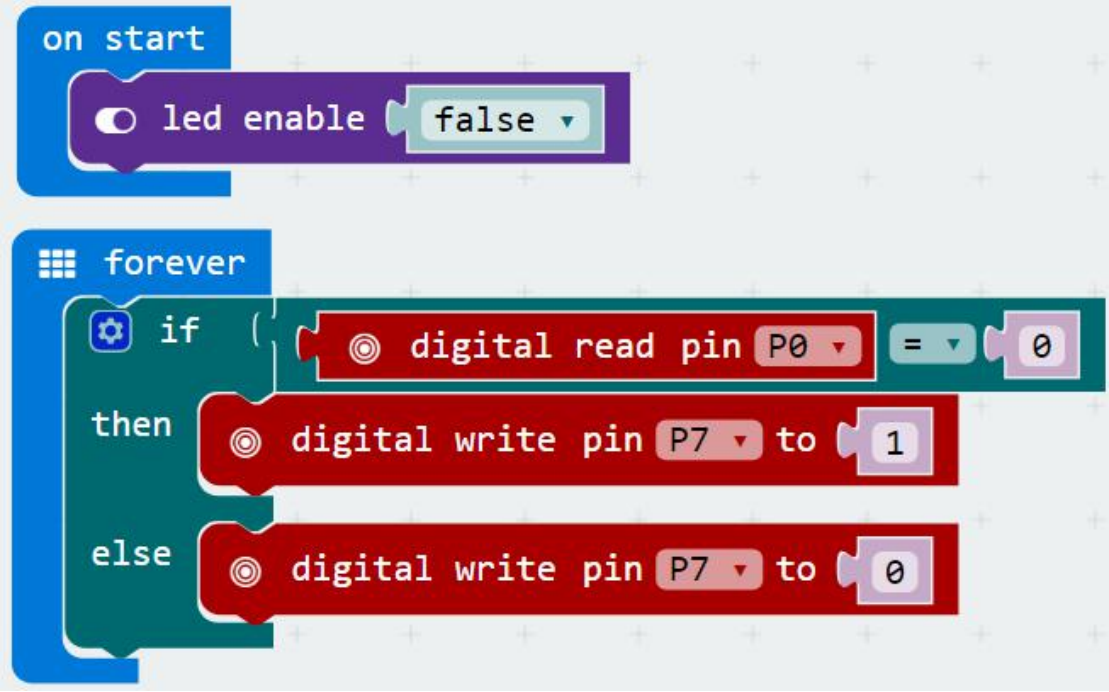


Example Result

Done wiring and powered up, send the code to micro:bit. When the spring plate of crash sensor is pressed, the buzzer module will beep, otherwise buzzer will not sound.

Project 19: Magnetic Switch

Overview

In this project, you will learn how to use a keyestudio reed switch module and micro:bit to detect the magnetic field. Finally show the result on the 25 LED matrix of micro:bit. Actually in the project 13, we have used a hall magnetic sensor to detect whether there is magnetic field nearby. So what is the differences between hall magnetic sensor and reed switch module? You can check it in component introduction below.

Component Required:

- Micro:bit main board*1
- Keyestudio Micro bit Sensor V2 Shield*1
- USB Cable*1
- keyestudio Reed Switch Module*1
- Dupont jumper wire*3

Component Introduction

Reed Switch Module:

The keyestudio reed switch module is mainly composed of a reed switch. The reed switch is a mechanical magnetic switch, a passive device. Its working principle is that the magnetic field magnetizes its reed, so that it can be turned on and off to achieve the switch effect. However, since it is a contact type switch, its working life is limited, and it is easy to be damaged during transportation and installation.

The main component used in keyestudio Hall Magnetic Sensor is the A3144E, which is an electronic magnetic device, active device. And the output form is a switch type. It uses magnetic fields and Hall effects for contactless control purposes. Since the Hall element itself is a chip, its working life is theoretically unlimited.

Reed switch has been widely applied in household appliances, cars,

communication, industry, health care and security areas.

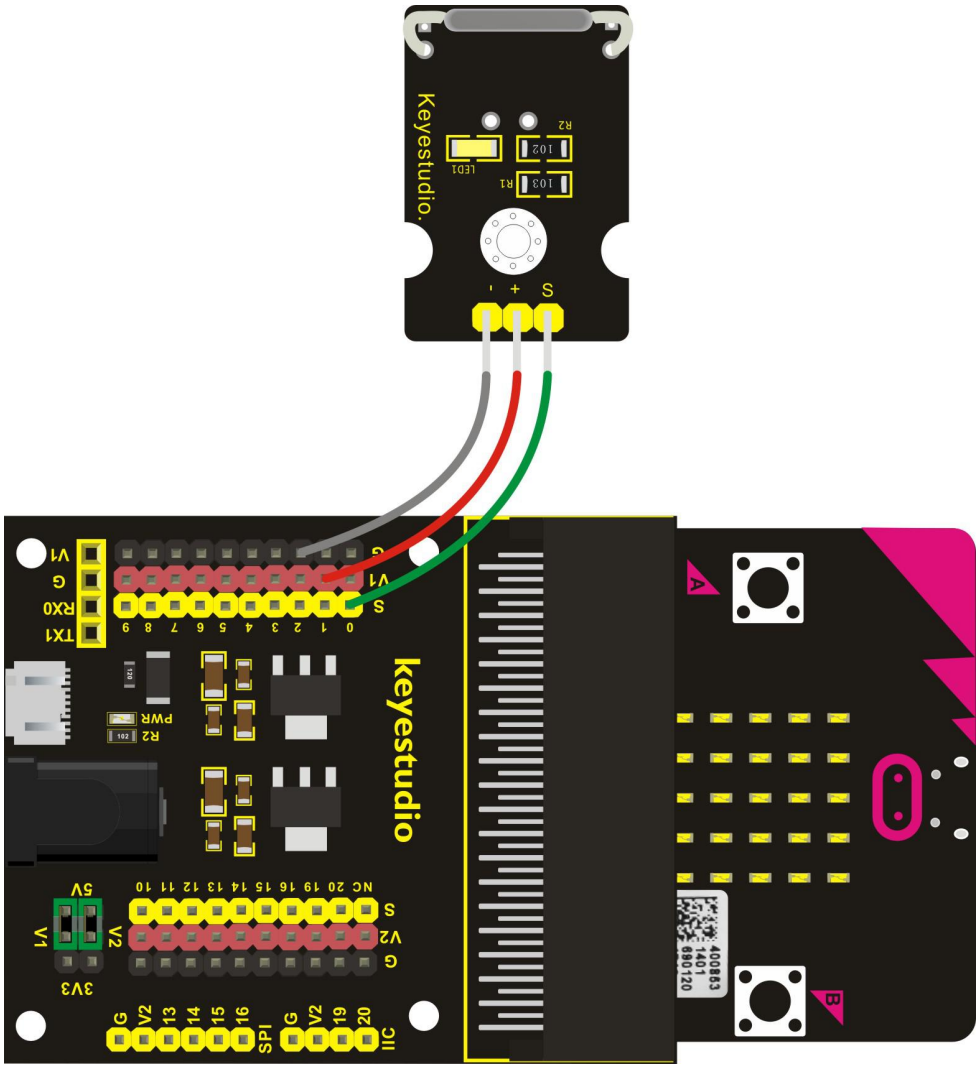
Furthermore, it can also be applied to other sensors and electric devices such as liquidometer, door magnet, reed relay and more.

Specifications

- Working voltage: DC 3.3V-5V
- Working current: ≥20mA
- Working temperature: －10℃ to＋50℃
- Detection distance: ≤10mm
- IO Interface: 3Pin (-/+/S)

Connect It Up

Insert the micro:bit into keyestudio micro:bit sensor V2 shield.Then connect the reed switch sensor to keyestudio micro:bit sensor shield. Shown as below diagram.



Test Code

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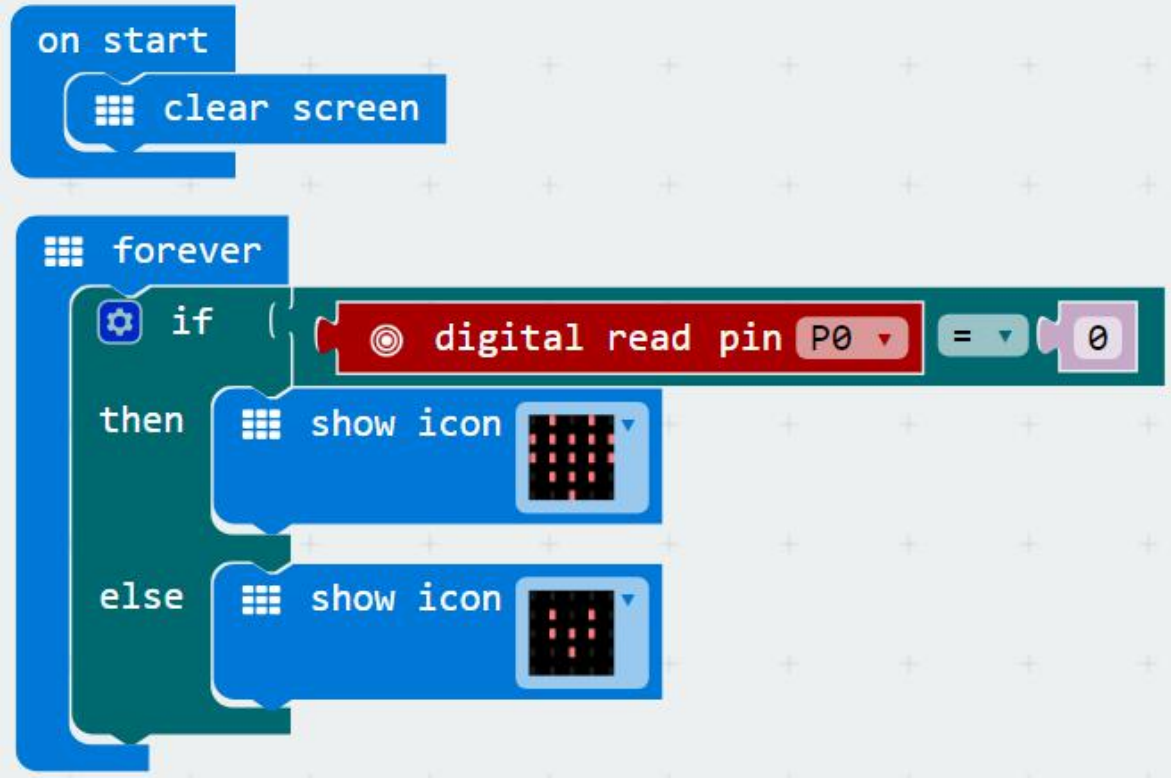
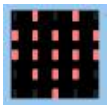
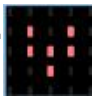
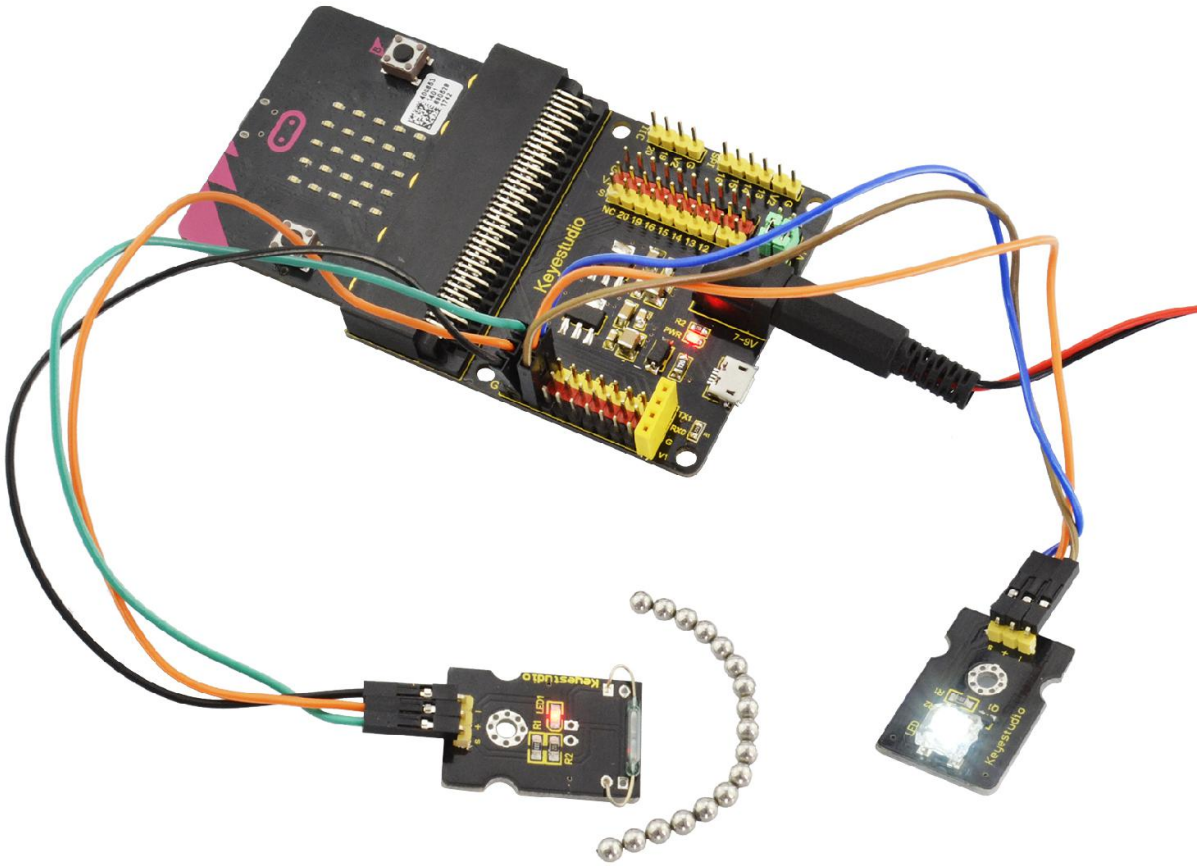


Example Result

Done wiring and powered up, send the code to micro:bit. When the reed sensor detects a magnetic field nearby, you should see the LED matrix of micro:bit show the icon like a heart.  Or else, it will show the icon like this. 

Extension Experiment:

Use a magnetic module to detect whether there is a magnetic field, controlling an LED module on and off. Place some magnetic beads near the sensor, if magnetic field detected, LED module on, otherwise LED off.



Project 20: Relay

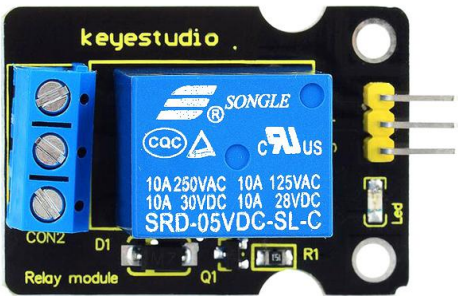
Overview

In daily life, we generally use 220V AC to drive the electrical equipment. Sometimes we will use the switch to control the electrical appliance. If directly connect the switch to the 220V AC circuit, once electric leakage happened, people are in danger. Considered with safety, we particularly design this keyestudio single relay with terminal block of NO (normally open) and NC (normally closed), which is active at High.

In this project, you will learn how to use our relay module and micro:bit to control an LED module on and off. (note that for easy wiring, the circuit does not add 220V voltage, still use 5V.)

Component Required:

- Micro:bit main board*1
- Keyestudio Micro bit Sensor V2 Shield*1
- USB Cable*1
- keyestudio Single Relay Module*1
- keyestudio White LED Module*1
- Dupont jumper wire*6



Component Introduction

Single Relay Module:

This module uses a high-quality SONGLE 5V relay. The relay output is by a light-emitting diode, can be controlled through digital IO. It can be used to control lighting, electrical and other devices of high current or voltage.

When supply high voltage to S end, the relay is driven, that is, normally open (NO) connected, normally closed (NC) disconnected.

When supply low voltage to S end, the relay is turned off, that is, NO is disconnected, and NC connected.

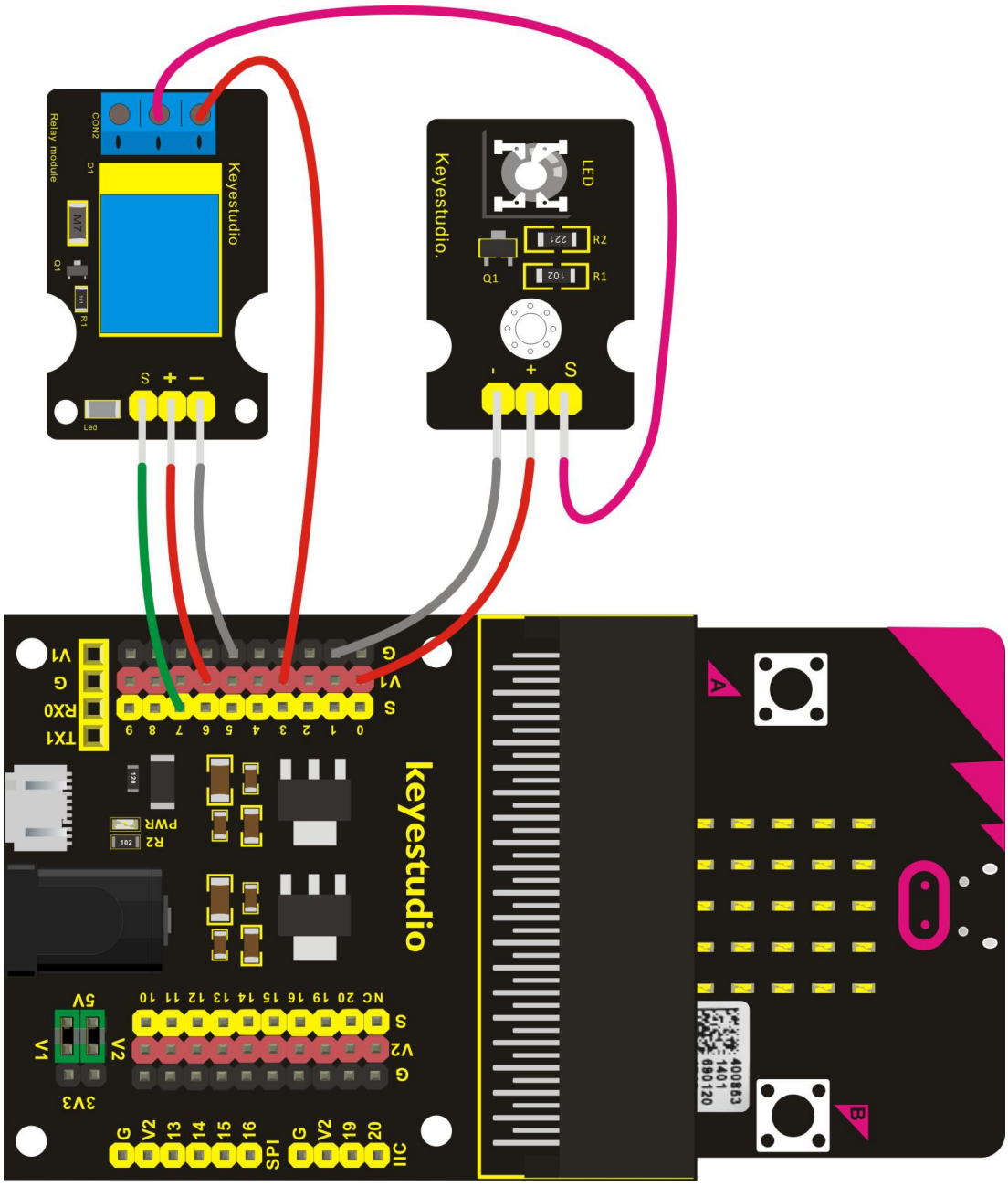
In this way, we connect the 220V AC circuit to NO or NC terminal block, more safe and convenient through 5V voltage control.

Specifications:

- Type: Digital
- Rated current: 10A (NO) 5A (NC)
- Maximum switching voltage: 150VAC 24VDC
- Interface: Digital
- Control signal: TTL level
- Rated load: 8A 150VAC (NO), 10A 24VDC (NO), 5A 250VAC (NO/NC), 5A 24VDC (NO/NC)
- Maximum switching power: AC1200VA DC240W (NO), AC625VA DC120W (NC)
- Contact action time: 10ms
- Size: 40*28mm
- Weight: 15g

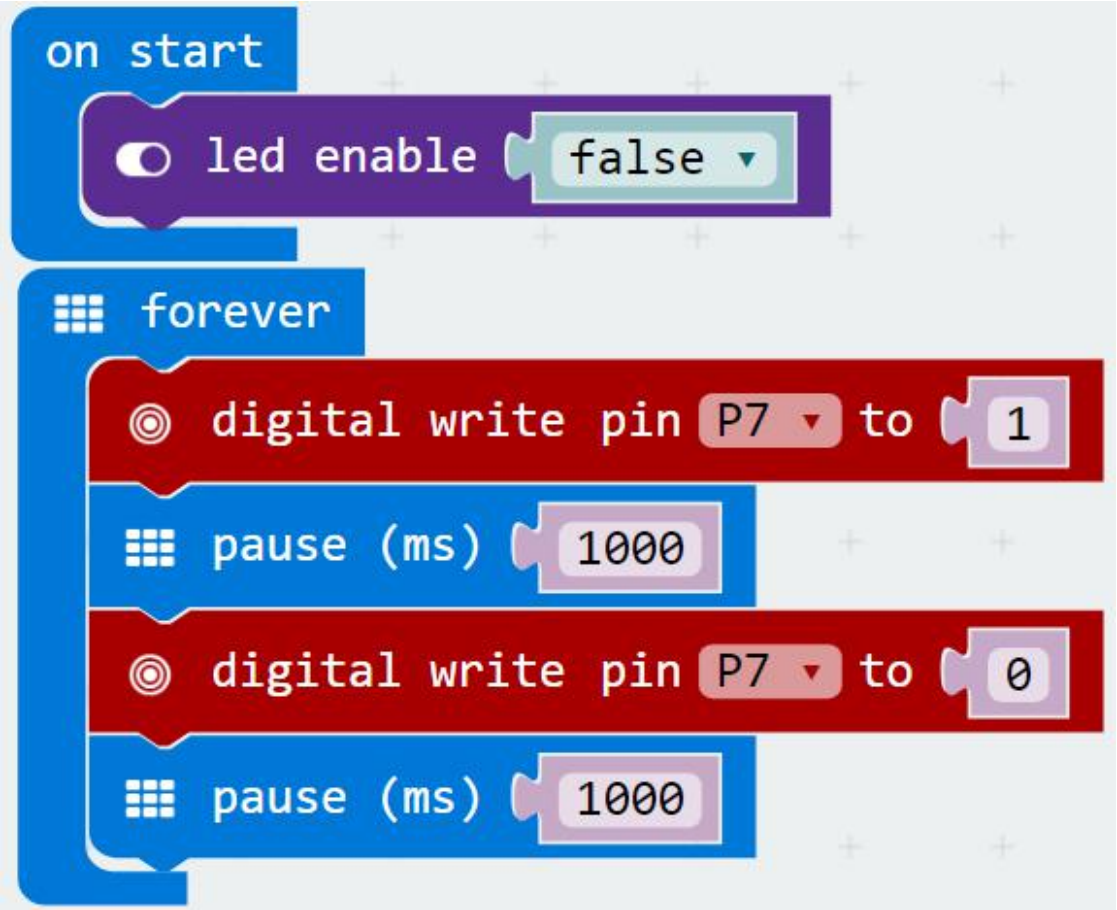
Connect It Up

Insert the micro:bit into keyestudio micro:bit sensor V2 shield.Then separately connect both single relay module and white LED module to keyestudio micro:bit sensor shield. Shown as below diagram.



Test Code

If you are not familiar to make code, don't worry. Firstly, you can enter this link:https://makecode.micro:bit.org/reference to know more about micro:bit blocks. Then you can directly enter the https://makecode.micro:bit.org/ to edit your project program. Below is an example code we have done for you.



Example Result

Done wiring and powered up, send the code to micro:bit.

When relay is connected, LED module lights up, and then relay is disconnected, LED module is off, with an interval of one second, repeatedly.

Project 21: Ultrasonic Ranging

Overview

Ultrasonic sensor is great for all kind of projects that need distance measurements, avoiding obstacles as examples.

In this project, you will learn how to use a ultrasonic module and micro:bit to detect the distance between the module and an obstacle ahead.

Component Required:

- Micro:bit main board*1
- Keyestudio Micro bit Sensor V2 Shield*1
- USB Cable*1
- keyestudio Ultrasonic Module*1
- Dupont jumper wire*4

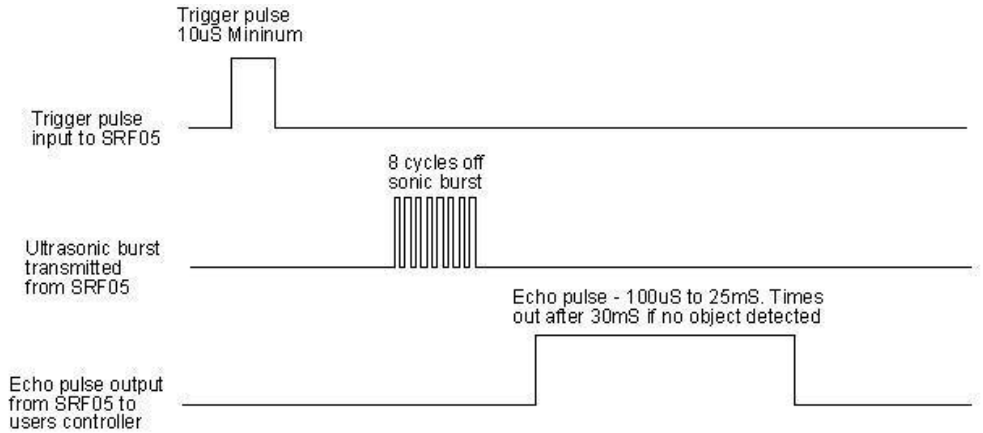
Component Introduction

Ultrasonic Module:

This Ultrasonic detector module HC-SR04 can provide 2cm-450cm non-contact measurement distance, and its ranging accuracy is up to 3mm. It includes an ultrasonic transmitter, receiver and control circuit.

Ultrasonic module will emit the ultrasonic waves after trigger signal. When the ultrasonic waves encounter an object and are reflected back, the module outputs an echo signal, so it can determine the distance of object from the time difference between trigger signal and echo signal.

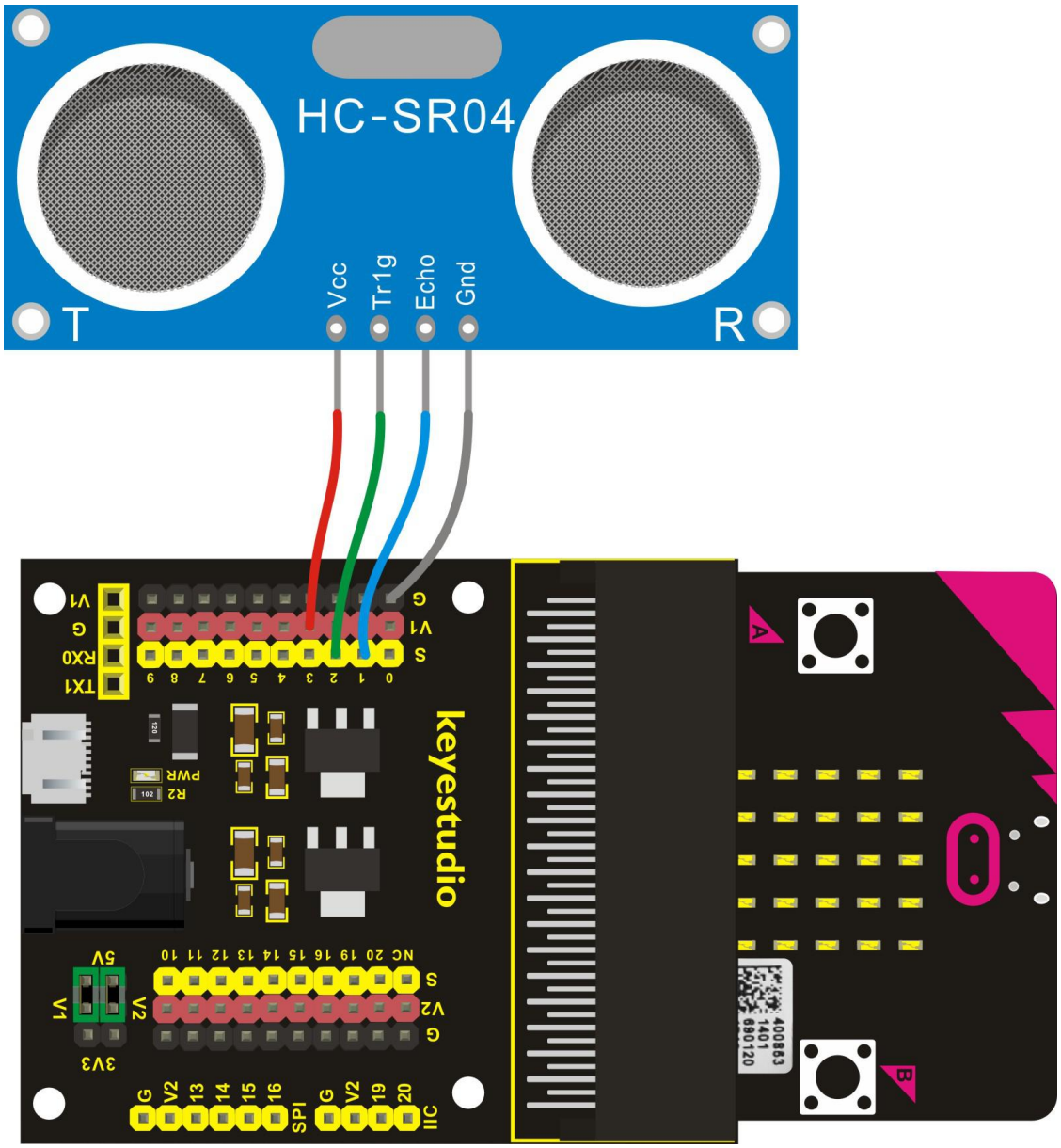
The basic principle of work as follows:



1) First pull down the TRIG, and then trigger it with at least 10us high level signal;
2) After triggering, the module will automatically transmit eight 40KHZ square waves, and automatically detect whether there is a pulse signal back.
3) If there is a signal back, through the ECHO to output a high level, the duration time of high level is actually the time from sending ultrasonic to returning back.
Test distance = high level duration * velocity of sound (340m/s) * 0.5

Parameters:
Working voltage: 0.5V(DC)
Working current: 15mA
Detecting range: 2-450cm
Detecting angle: 15 degrees
Input trigger pulse: 10us TTL Level
Output echo signal: output TTL level signal(HIGH), proportional to range.

Connect It Up
Insert the micro:bit into keyestudio micro:bit sensor V2 shield.Then connect the ultrasonic module to keyestudio micro:bit sensor shield. Shown as below diagram.



Test Code

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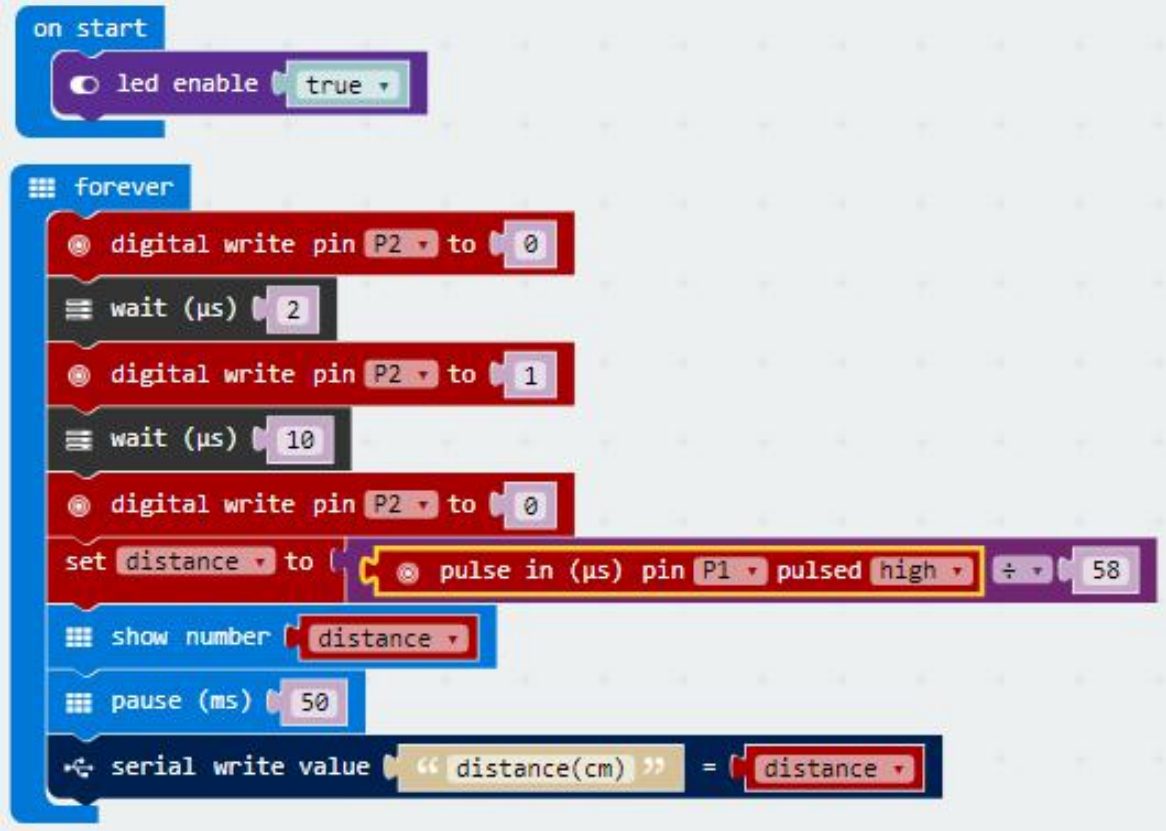
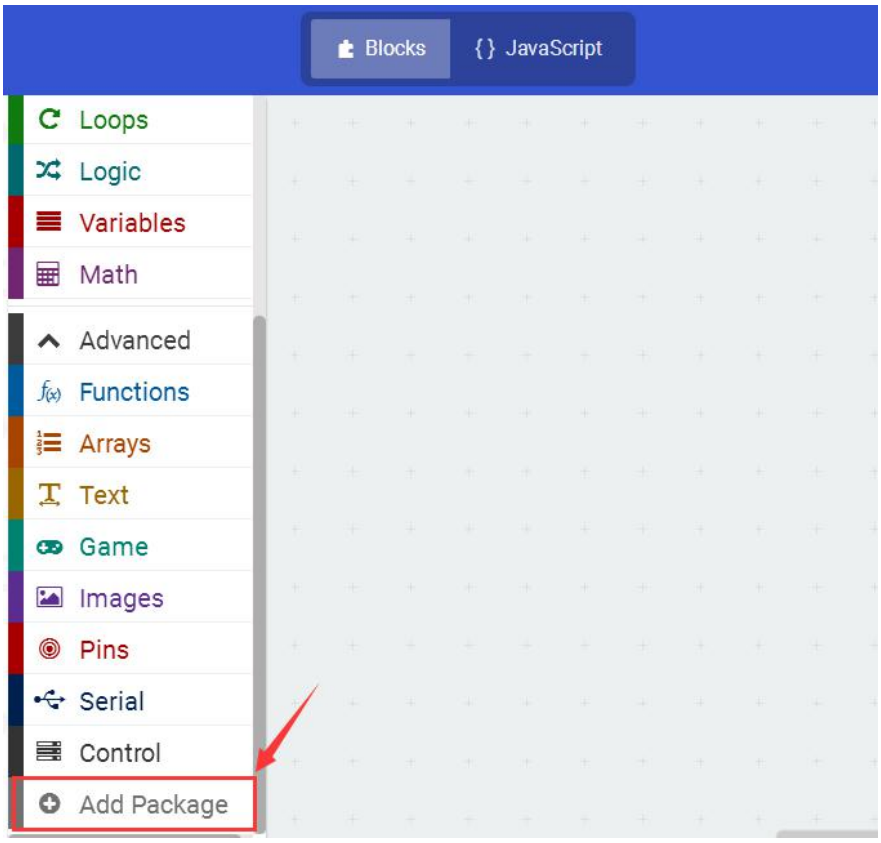
Code 1:

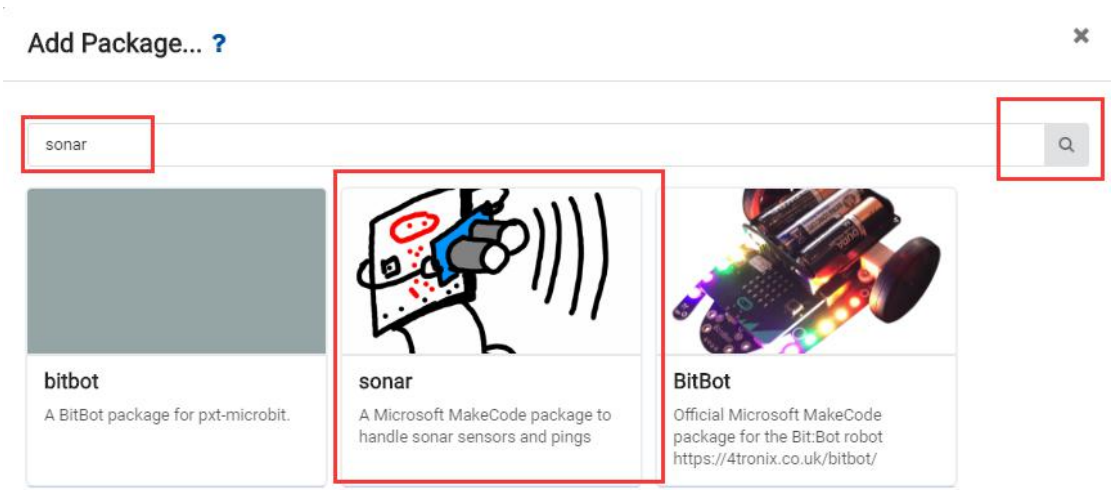


Code 2:

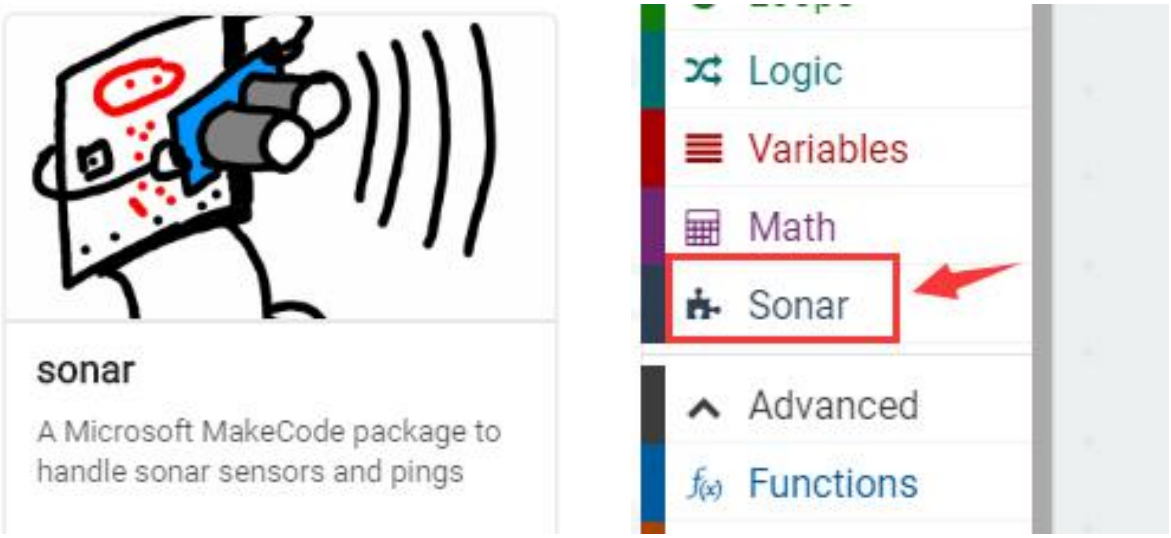
Here you should add the package to set the code. Shown as follows:



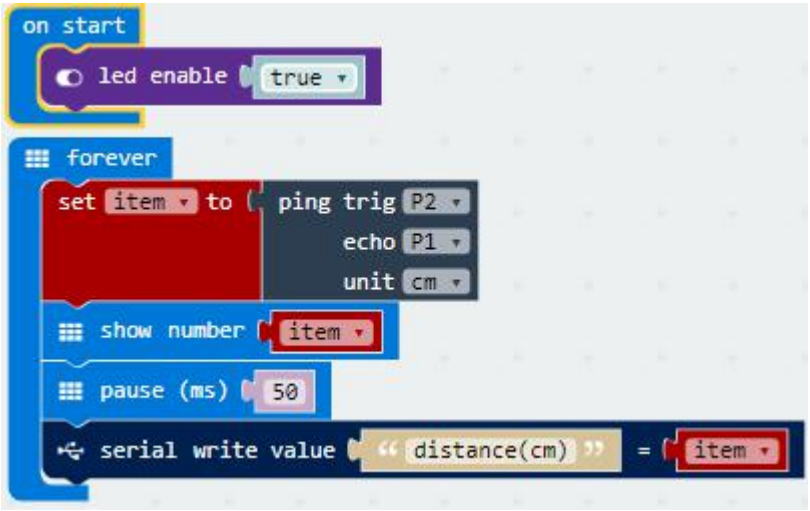
Then on the bar search the **sonar**, you should see as below.



Click the **sonar** to download the package, finally you should see the Sonar module added on the Editor Block.

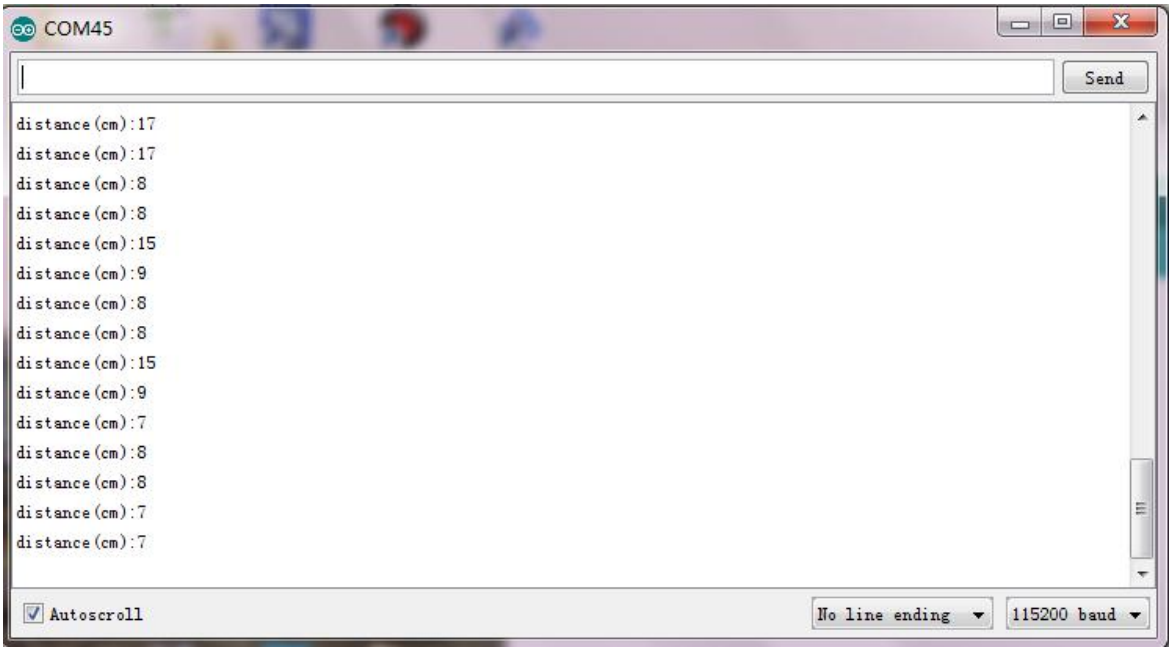


The Code is as follows:



Example Result

Done wiring and powered up, send the above two codes to micro:bit. You can get the same distance data. And you should see the distance data on the LED matrix of micro:bit. Or you can open the serial monitor of Arduino IDE to get the data. Shown as below.



Project 22: Light Brightness

Overview

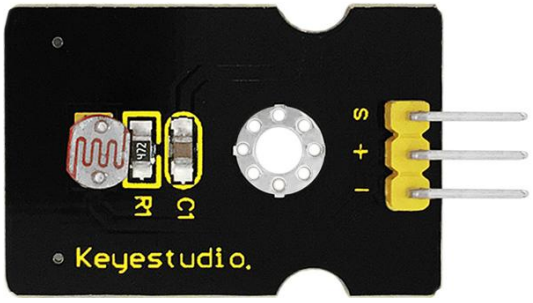
It is seen that sensors are everywhere in our daily life. Some public street lights automatically light up during the day and automatically go out at night. Why?In fact, those lights make use of a photosensitive element that can measure the brightness of external light.

In the evening, when outside brightness becomes lower, the street light is automatically controlled to be turned on. When it is bright during the day, the street light is automatically turned off.

In this project, you will learn how to use our keyestudio photocell sensor and micro:bit to control the brightness of external light. Show the result on 5*5 LED of micro:bit or serial monitor of Arduino software.

Component Required:

- Micro:bit main board*1
- Keyestudio Micro bit Sensor V2 Shield*1
- USB Cable*1
- keyestudio Photocell Sensor*1
- Dupont jumper wire*3



Component Introduction

Photocell Sensor:

A photoresistor or light-dependent resistor (LDR) or photocell is a light-controlled variable resistor. Its principal is very simple.

The resistance of photoresistor changes with incident light intensity. If the incident light intensity is high, the resistance decreases; if the incident light intensity is low, the resistance increases.

This keyestudio photocell sensor is a semiconductor, integrated with a photoresistor, easy to use and very convenient for wiring. It has features of high sensitivity, quick response, spectral characteristic and R-value consistence.

It can be applied in light-sensitive detector circuits, intelligent switch design and light- and dark-activated switching circuits.

Specifications:

Interface type: analog

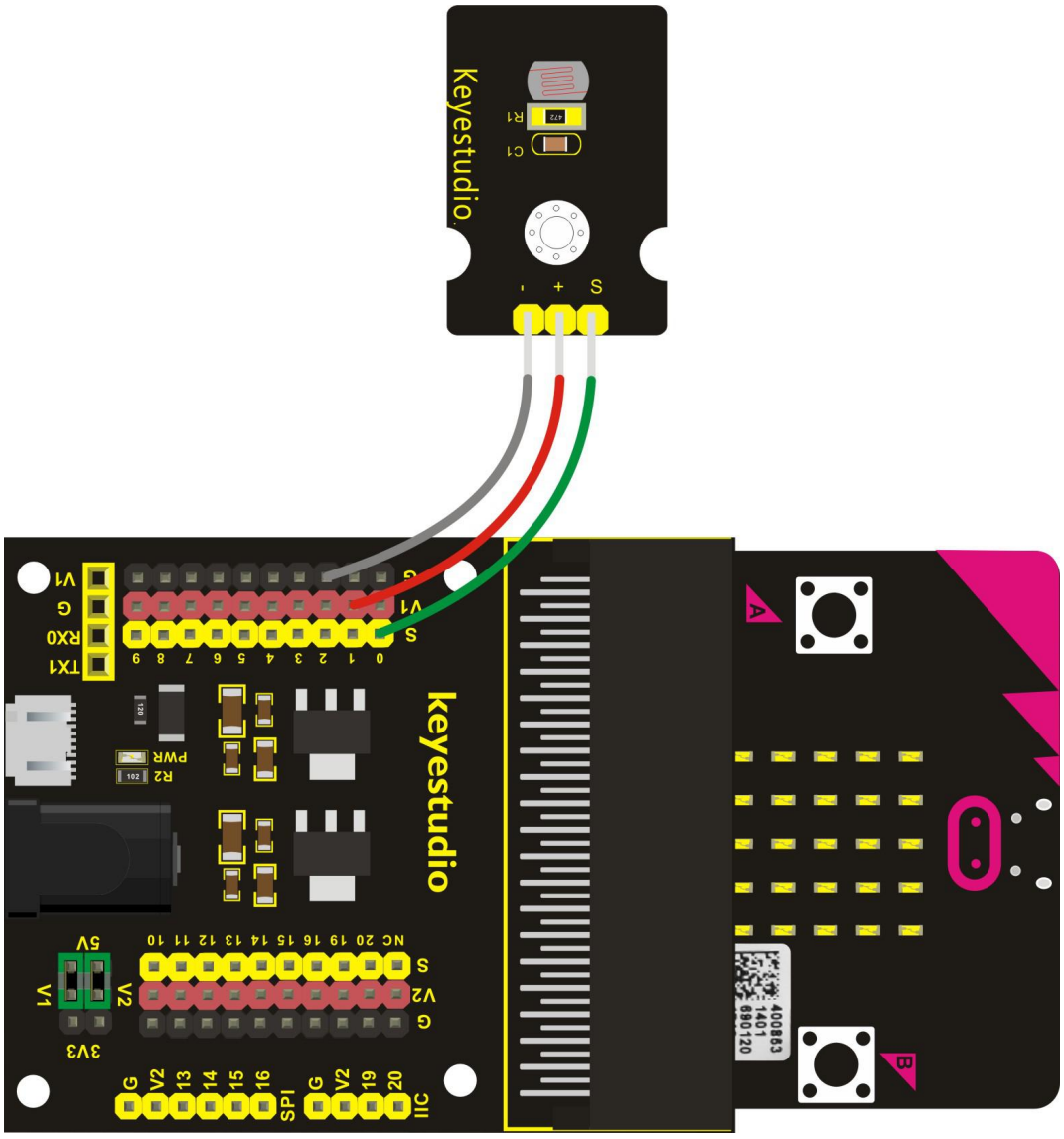
Working voltage: 5V

Size: 30*20mm

Connect It Up

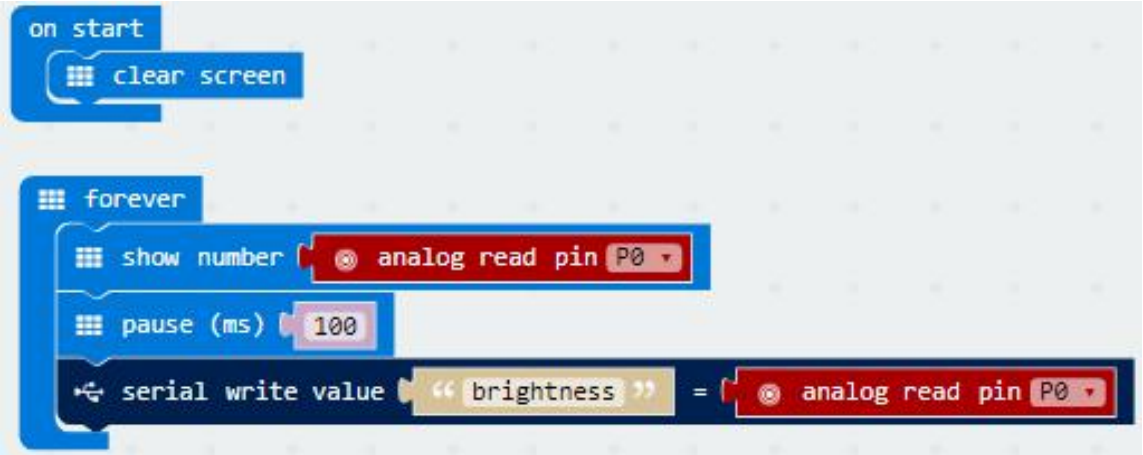
Insert the micro:bit into keyestudio micro:bit sensor V2 shield.Then connect the photocell module to keyestudio micro:bit sensor shield. Shown as below diagram.

Note: need to use the P0 end of micro:bit, that is, Analog INPUT function.



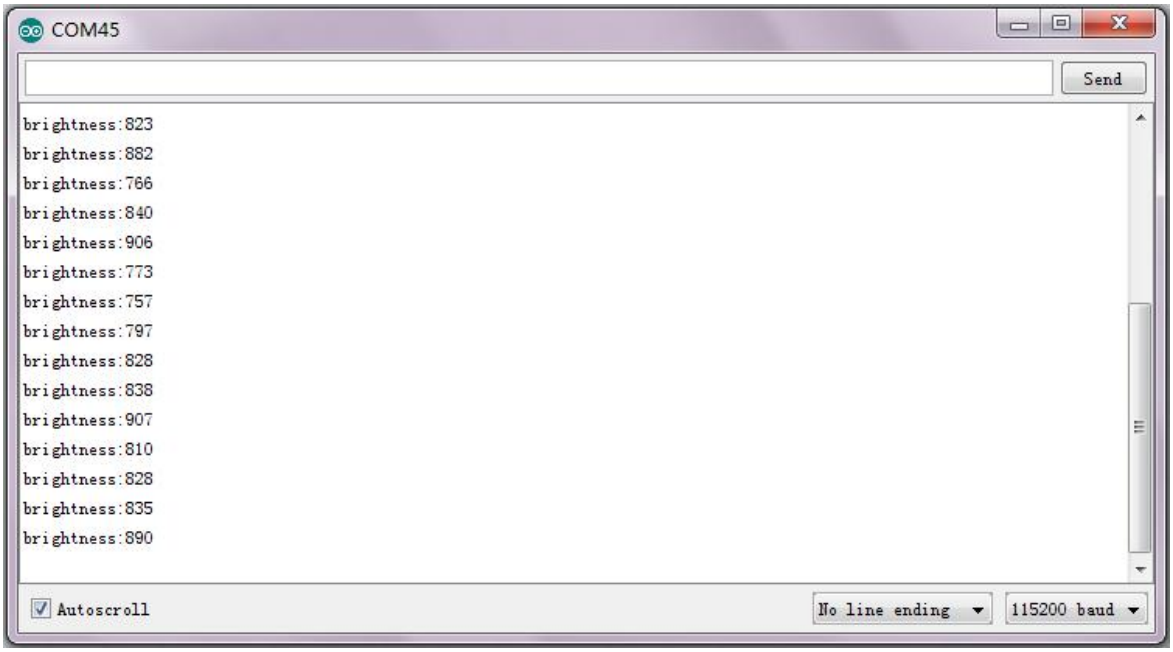
Test Code

If you are not familiar to make code, don't worry. Firstly, you can enter this link:https://makecode.micro:bit.org/reference to know more about micro:bit blocks. Then you can directly enter the https://makecode.micro:bit.org/ to edit your project program. Below is an example code we have done for you.



Example Result

Done wiring and powered up, send the above code to micro:bit. You should see the brightness data on the LED matrix of micro:bit. Or you can open the serial monitor of Arduino IDE to get the data. Shown as below.



Project 23: Analog Temperature

Overview

In this project, we are going to detect another important index in the environment, that is, temperature. You will learn how to use an analog temperature sensor and micro:bit to display the analog value of current temperature on the micro:bit LED matrix or on the Arduino monitor.

Component Required:

- Micro:bit main board*1
- Keyestudio Micro bit Sensor V2 Shield*1
- USB Cable*1
- keyestudio Analog Temperature Sensor*1
- Dupont jumper wire*3

Component Introduction

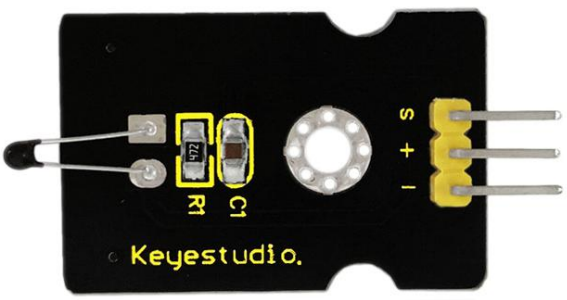
Analog Temperature Sensor:

This analog temperature module is based on a thermistor whose resistance varies with temperature change.

It can detect surrounding temperature changes in real time.

Through the circuit connection, convert the resistance changes into voltage changes, then input the voltage changes into Analog Input of micro:bit via signal end. Actually the analog value of micro:bit can be calculated into temperature value via programming.

This sensor is convenient and effective, widely applied to home alarm system, gardening, and other devices.



Specifications:

Interface type: analog

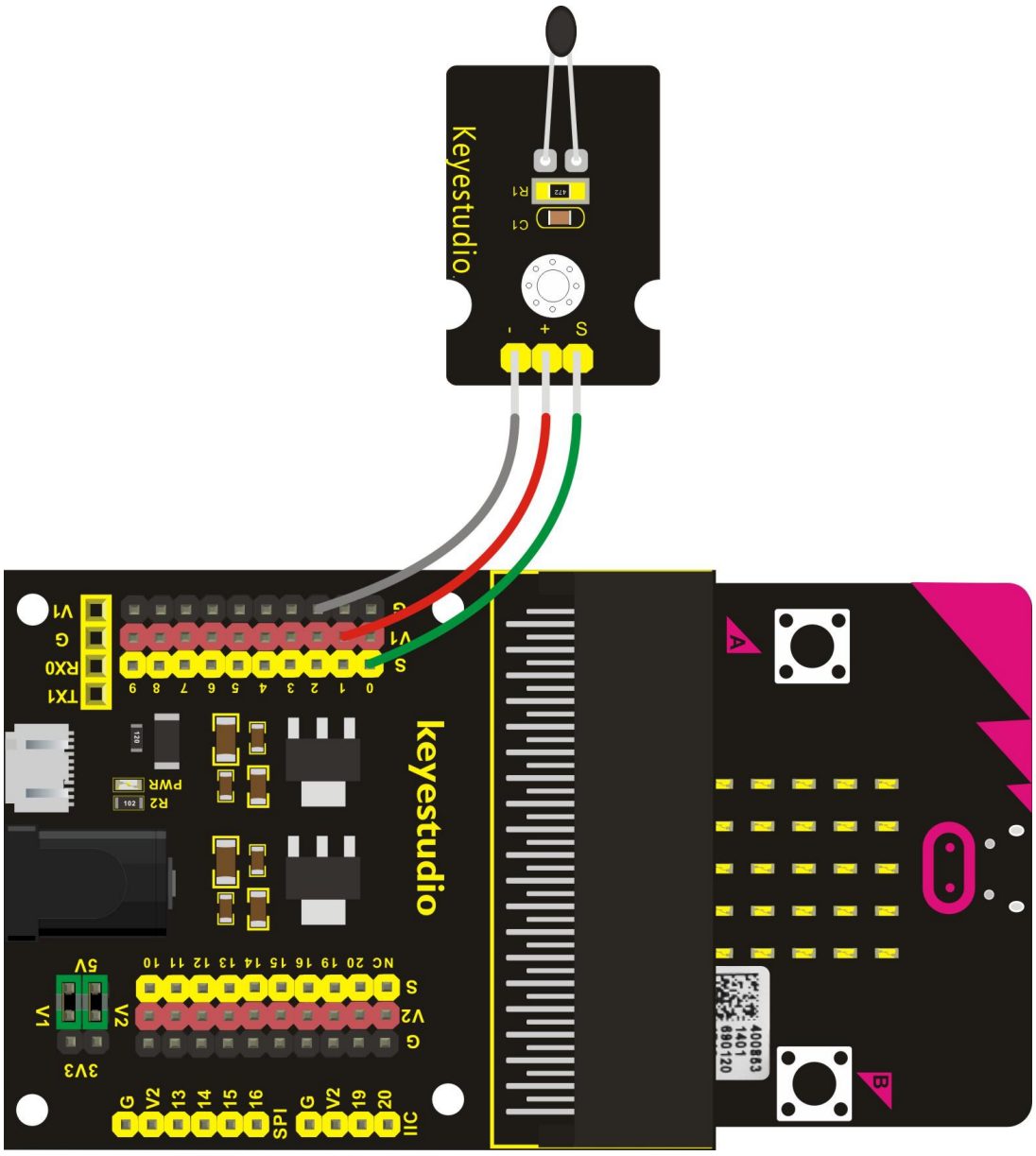
Working voltage: 5V

Temperature range: -55℃～315℃

Size: 30*20mm

Connect It Up

Insert the micro:bit into keyestudio micro:bit sensor V2 shield. Then connect the analog temperature module to keyestudio micro:bit sensor shield. Shown as below diagram.



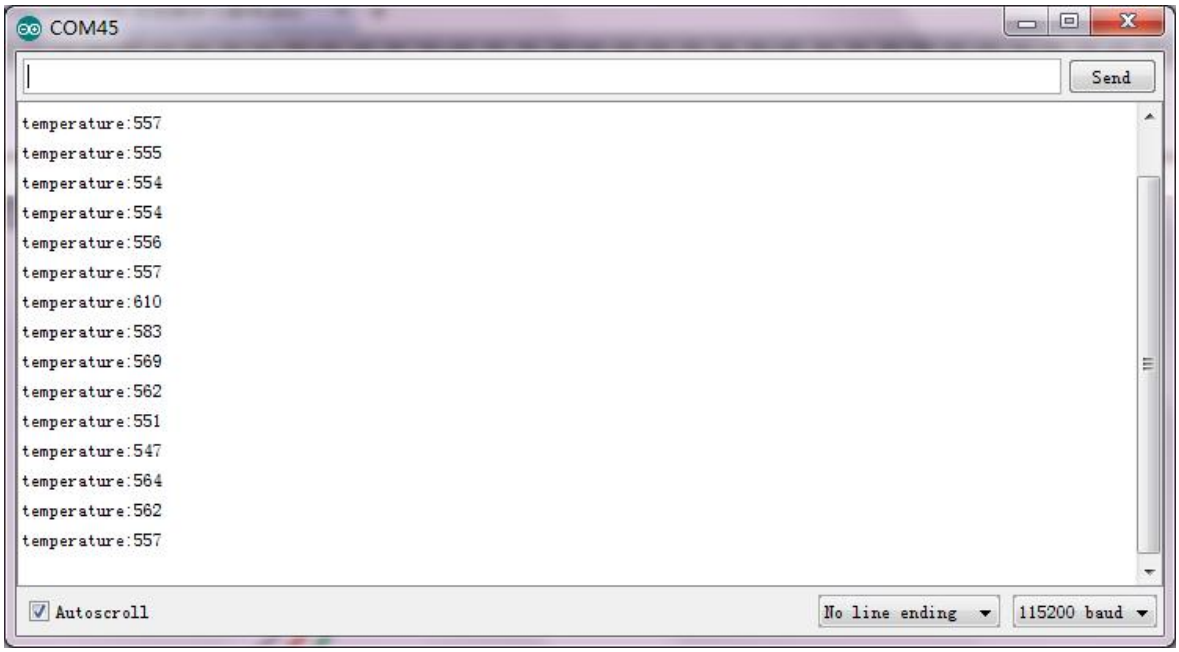
Test Code

If you are not familiar to make code, don't worry. Firstly, you can enter this link:https://makecode.micro:bit.org/reference to know more about micro:bit blocks. Then you can directly enter the https://makecode.micro:bit.org/ to edit your project program. Below is an example code we have done for you.

Example Result

Done wiring and powered up, send the above code to micro:bit.

You should see the analog temperature value is shown on the LED matrix of micro:bit. Or you can open the serial monitor of Arduino IDE to read the value.



Project 24: Hear Footstep

Overview

As for those corridor lights, when we walk through the corridor to make a sound, the corridor light will automatically light up, after that, quiet down, the lights are off. Why? Actually inside the lighting circuit, it has installed a sound sensor. When detects the sound, light is turned on, or else LED off.

In this lesson, we connect an analog sound sensor to P0 of micro:bit, then detect the outside sound via reading the analog value of P0.

The greater the external sound, the greater the analog value.

You can see the analog value is displayed on the micro:bit LED matrix, or check it from serial monitor of arduino software.

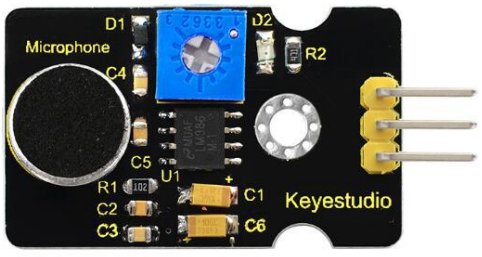
Component Required:

- Micro:bit main board*1
- Keyestudio Micro bit Sensor V2 Shield*1
- USB Cable*1
- keyestudio Analog Sound Sensor*1
- Dupont jumper wire*3

Component Introduction

Analog Sound Sensor Module:

This analog sound sensor module is typically used in detecting the ambient sound. You can use it to make some interactive works, such as a voice switch.



Specifications:

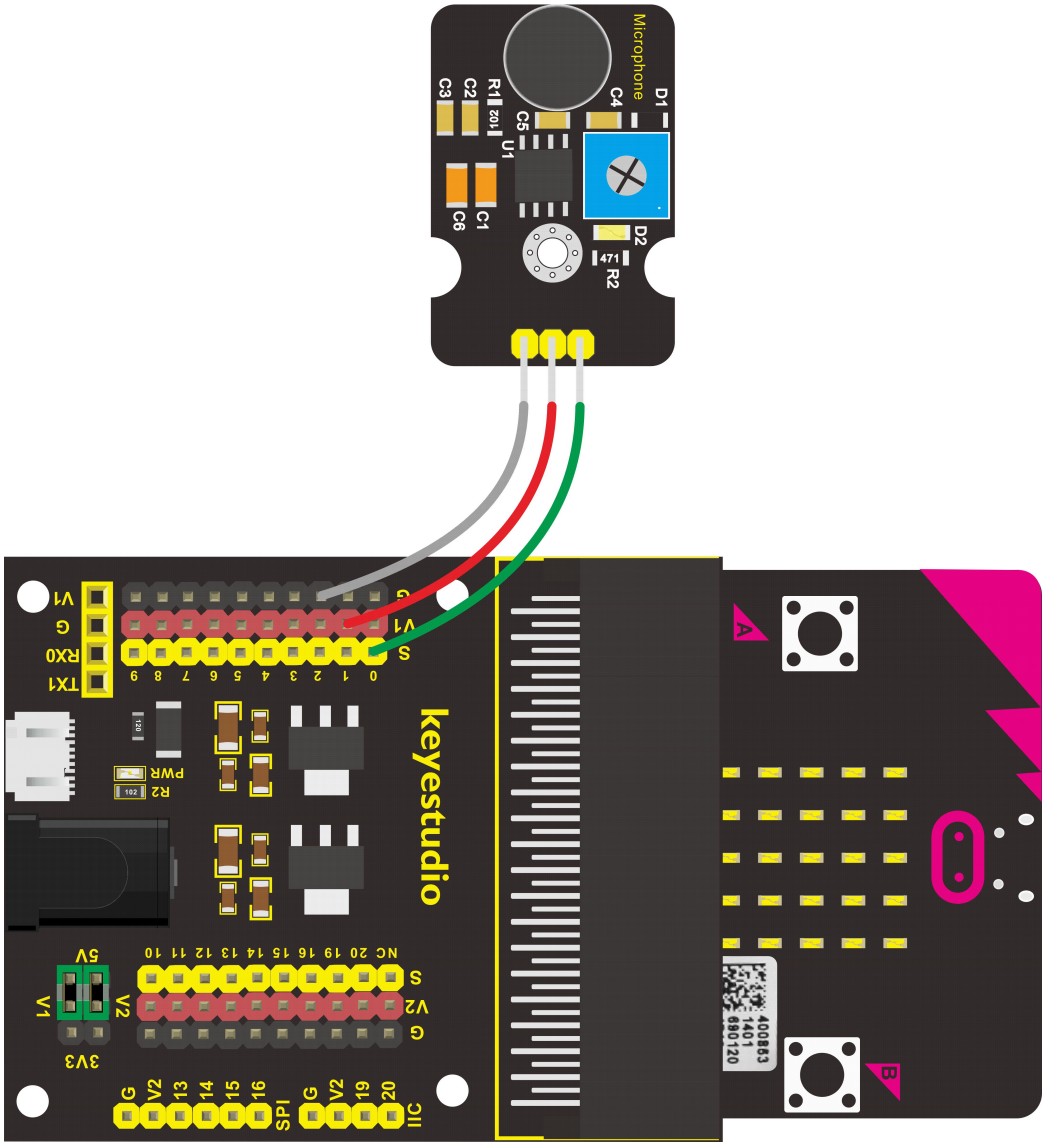
Supply Voltage: 3.3V to 5V

Interface: Analog

Size: 30*20mm

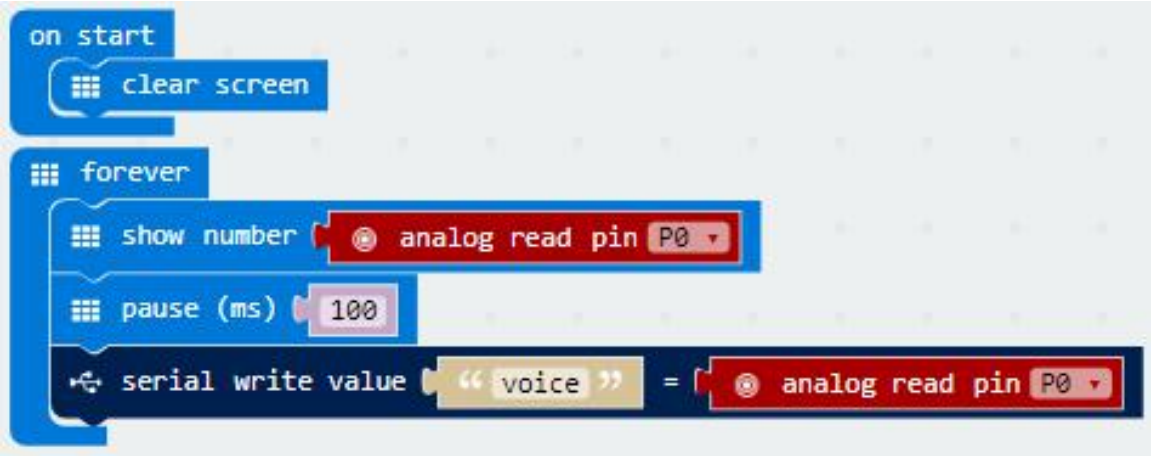
Connect It Up

Insert the micro:bit into keyestudio micro:bit sensor V2 shield. Then connect the analog sound module to keyestudio micro:bit sensor shield. Shown as below diagram.



Test Code

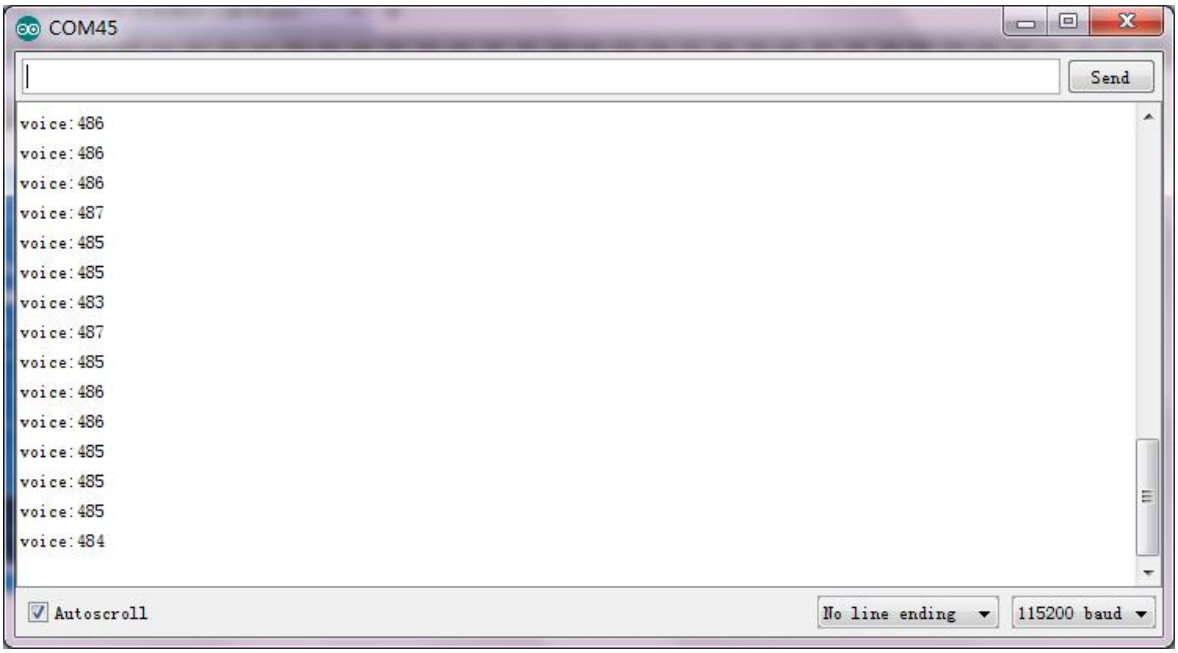
If you are not familiar to make code, don't worry. Firstly, you can enter this link:https://makecode.micro:bit.org/reference to know more about micro:bit blocks. Then you can directly enter the https://makecode.micro:bit.org/ to edit your project program. Below is an example code we have done for you.



Example Result

Done wiring and powered up, send the above code to micro:bit.

You should see the voice value is shown on the LED matrix of micro:bit. Or you can open the serial monitor of Arduino IDE to get the value. Shown below.



Project 25: Rotary Potentiometer

Overview

In this experiment, the signal end of keyestudio Analog Rotation Sensor is connected to micro:bit P0. By reading the analog value of P0, rotate the potentiometer, you should see the analog value is changed on the micro:bit LED matrix.

Component Required:

- Micro:bit main board*1
- Keyestudio Micro bit Sensor V2 Shield*1
- USB Cable*1
- keyestudio Analog Rotation Sensor*1
- Dupont jumper wire*3

Component Introduction

Analog Rotation Sensor:

This analog rotation sensor is based on a potentiometer. It actually uses a variable resistor. When rotate the potentiometer, it actually changes the resistance of variable device.

In the experiment, set well the circuit, convert the resistance changes into voltage changes, then input the voltage changes into Analog Input of micro:bit via signal end, getting the analog value via programming.

Specifications:

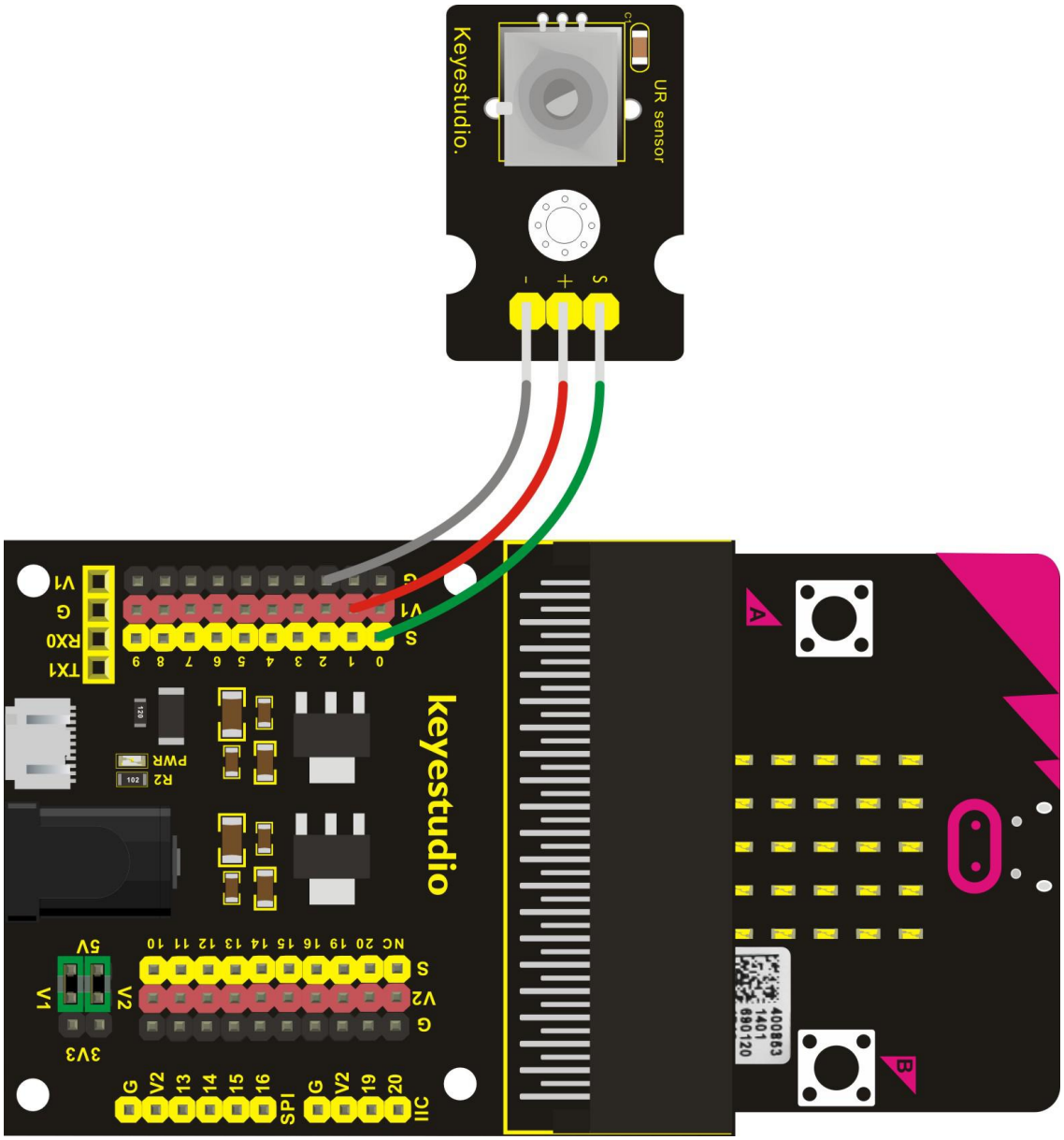
Supply Voltage: 3.3V to 5V

Interface: Analog

Size: 30*20mm

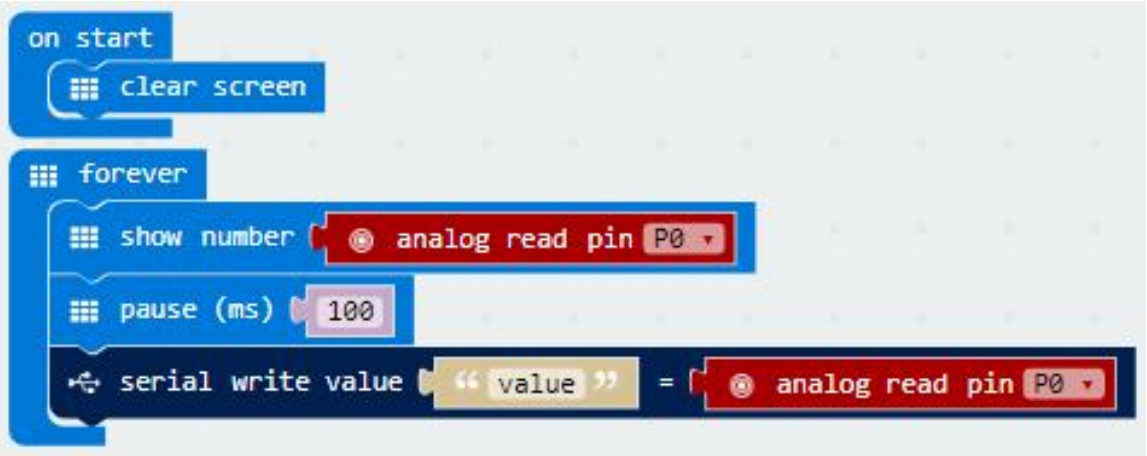
Connect It Up

Insert the micro:bit into keyestudio micro:bit sensor V2 shield. Then connect the analog rotation module to keyestudio micro:bit sensor shield. Connect signal pin to P0, + pin to V1 header, - pin to ground.



Test Code

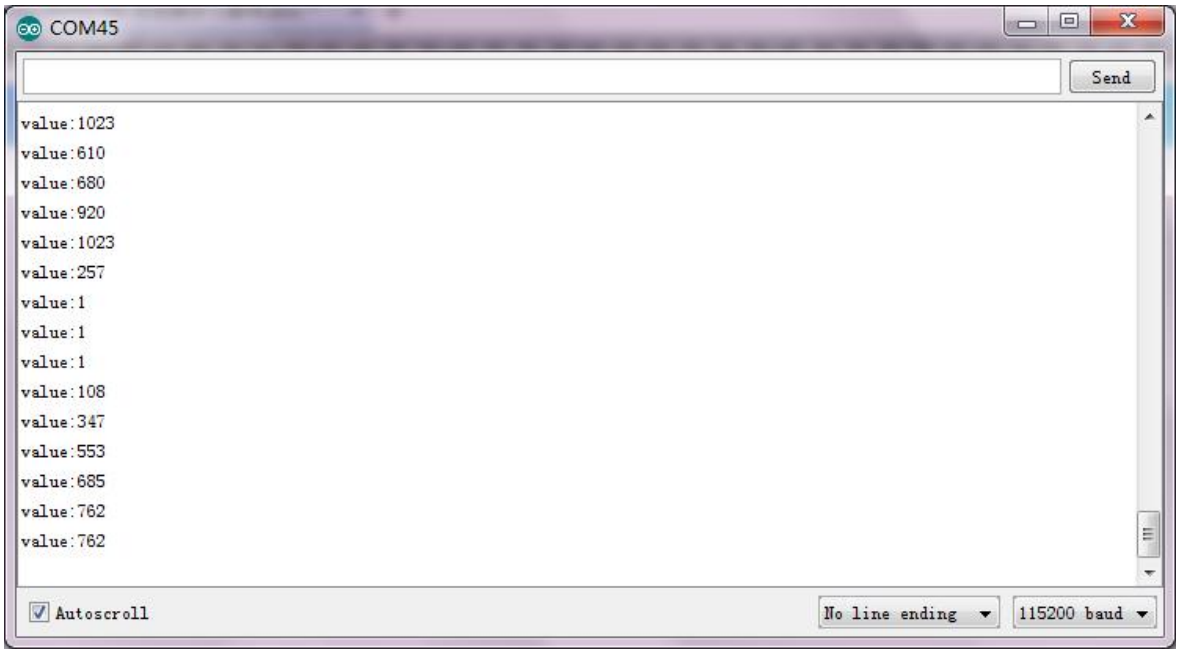
If you are not familiar to make code, don't worry. Firstly, you can enter this link:https://makecode.micro:bit.org/reference to know more about micro:bit blocks. Then you can directly enter the https://makecode.micro:bit.org/ to edit your project program. Below is an example code we have done for you.



Example Result

Done wiring and powered up, send the above code to micro:bit.

Rotate the potentiometer, you should get the value change shown on the LED matrix of micro:bit. Or you can open the serial monitor of Arduino IDE to get the value like this:



Project 26: Alcohol Content in the Air

Overview

In this project, you will learn how to use an analog Alcohol sensor and micro:bit to detect the alcohol content in the air.

Component Required:

- Micro:bit main board*1
- Keyestudio Micro bit Sensor V2 Shield*1
- USB Cable*1
- keyestudio Analog Alcohol Sensor*1
- Dupont jumper wire*3

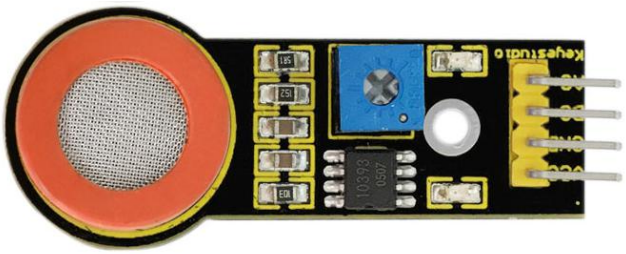
Component Introduction

Analog Alcohol Sensor:

This analog sensor-MQ3 is suitable for detecting the alcohol. It can be used in a breath analyzer. It has a good selectivity because it has higher sensitivity to alcohol and lower sensitivity to Benzine.

The sensitivity can be adjusted by rotating a potentiometer on the sensor. It has two signal pins, Analog A0 and Digital D0. The higher the alcohol concentration, the higher the A0 value.

When both alcohol concentration and A0 value reach a certain value, D0 changes from low level to high level, which can be controlled by potentiometer.



Specifications:

Power supply: 5V

Interface type: Analog

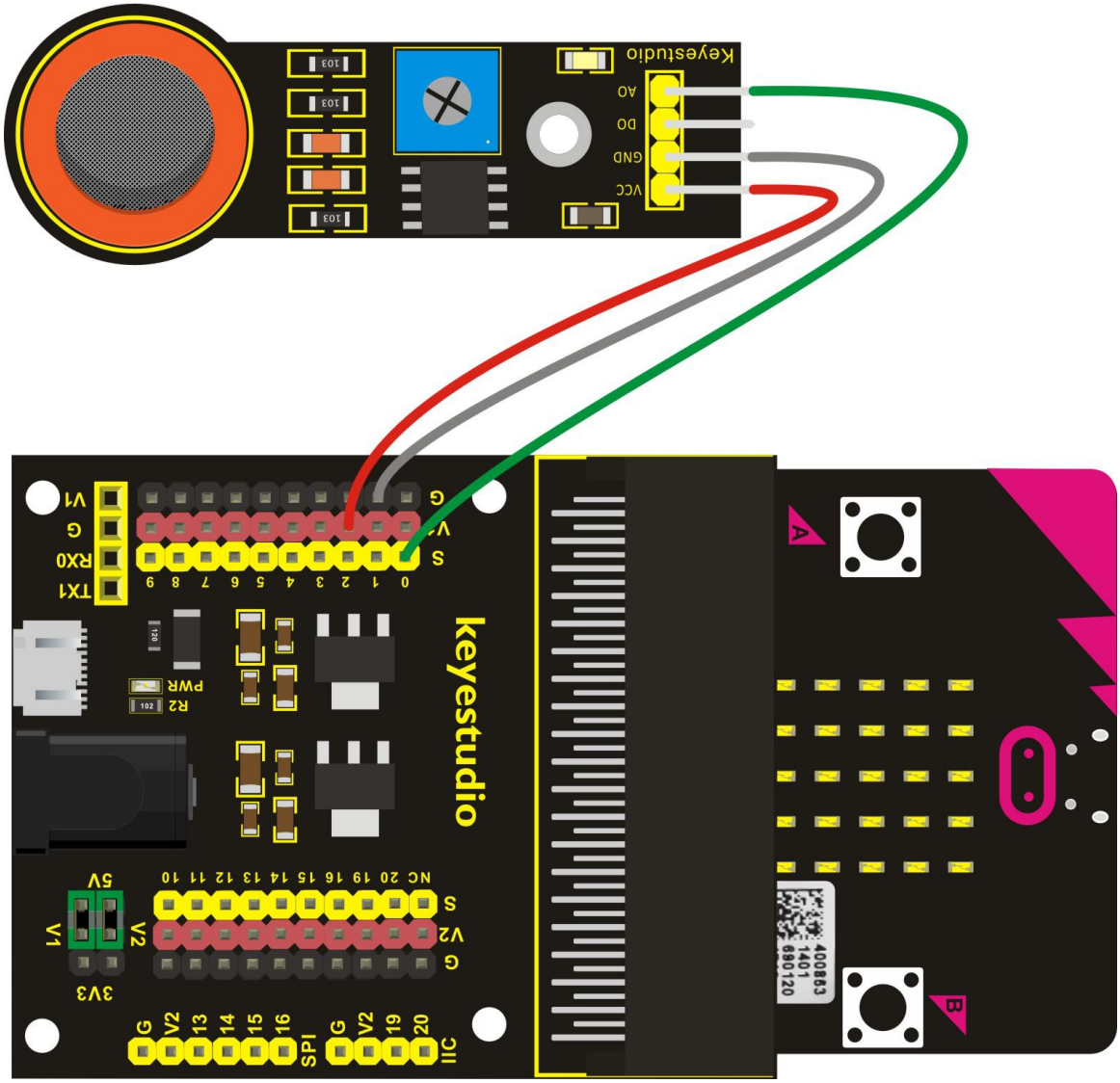
Simple drive circuit

Stable and long service life

Quick response and High sensitivity

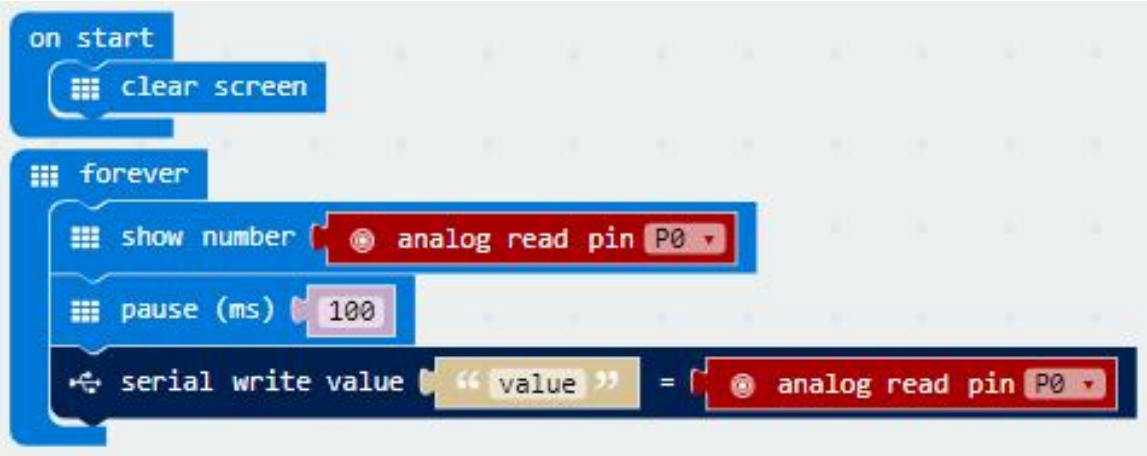
Connect It Up

Insert the micro:bit into keyestudio micro:bit sensor V2 shield. Then connect the analog alcohol module to keyestudio micro:bit sensor shield. Connect VCC to V1 header, ground to ground, A0 pin to P0 header.



Test Code

If you are not familiar to make code, don't worry. Firstly, you can enter this link:https://makecode.micro:bit.org/reference to know more about micro:bit blocks. Then you can directly enter the https://makecode.micro:bit.org/ to edit your project program. Below is an example code we have done for you.

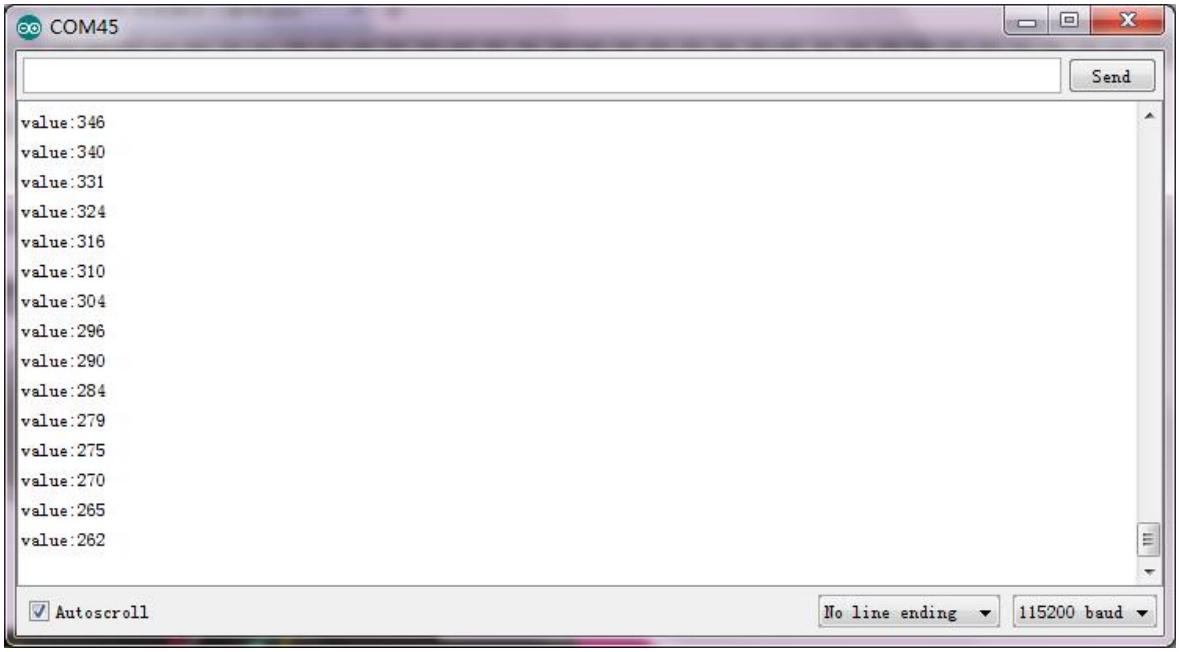


Example Result

Done wiring and powered up, send the above code to micro:bit.

Read the value of A0 signal end. The higher the alcohol concentration, the greater the value.

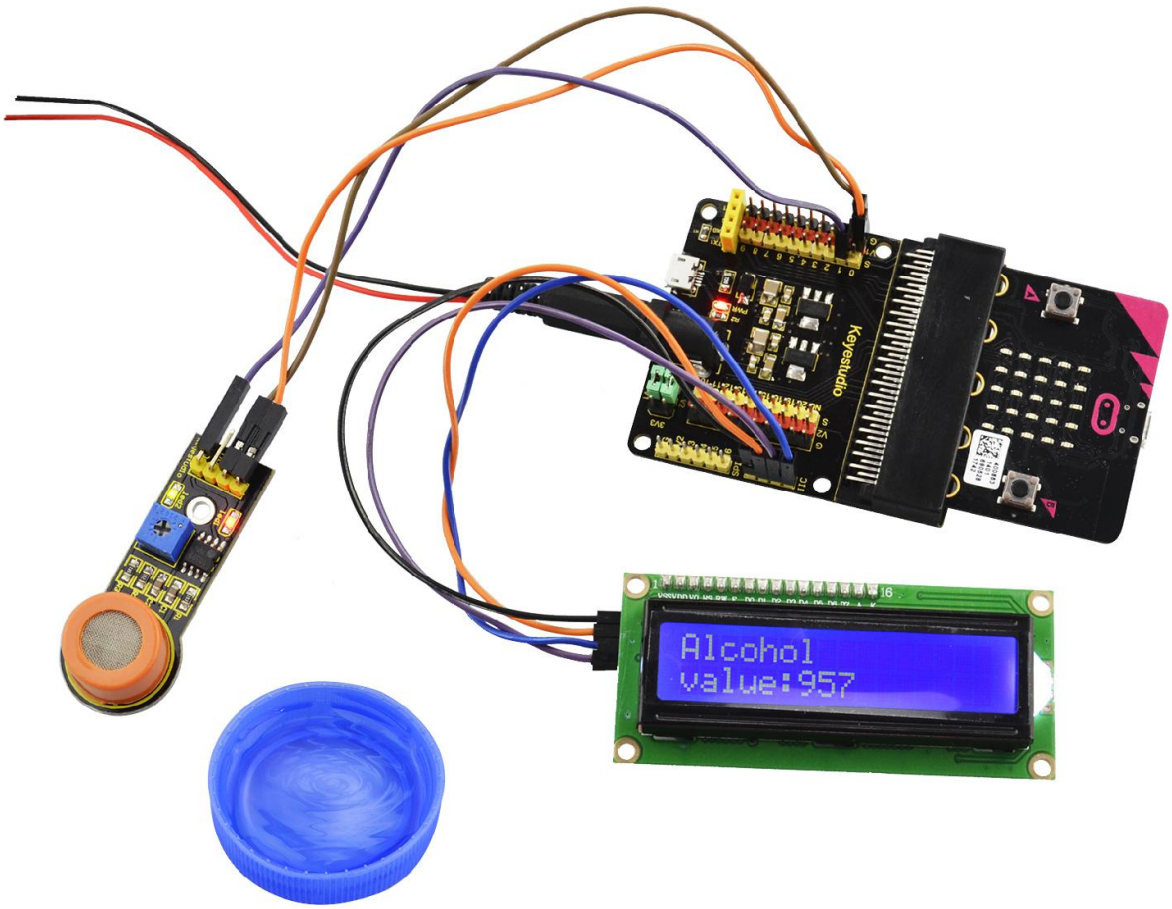
You should see the value is shown on the LED matrix of micro:bit. Or you can open the serial monitor of Arduino IDE to get the value. Shown below.



Extension Experiment

Alcohol Detection

In the experiment, use the sensor to detect the alcohol in the air, outputting analog value. The larger the analog value, the higher the alcohol content. You can see the corresponding analog value is displayed on the 1602LCD.



Project 27: Flammable Gas in the Air

Overview

In real life, gas leakage events often occur. If toxic or flammable and explosive gas are leaked out, there exists a huge potential hazard to people's health. So people have developed different kinds of sensors to detect various gas contents in the air, which can timely alarm to process the leaking gas.

In this project, you will learn how to use an analog gas sensor and micro:bit to detect the flammable gas in the air. Show the analog value of gas on the LED matrix of micro:bit or check it on the serial monitor.

Component Required:

- Micro:bit main board*1
- Keyestudio Micro bit Sensor V2 Shield*1
- USB Cable*1
- keyestudio Analog Gas Sensor*1
- Dupont jumper wire*3

Component Introduction

Analog Gas Sensor:

This analog gas sensor is used to detect combustible gases in the air, such as liquefied Gas, propane, hydrogen Gas, etc.

Keyestudio Analog Gas Sensor has high sensitivity to liquefied Gas, propane and hydrogen, ideal for testing natural Gas and other combustible gases.

It is a low-cost sensor suitable for a variety of applications.

It has high sensitivity and quick response. The sensitivity can be adjusted by rotating a potentiometer on the sensor.

Keyestudio Analog Gas Sensor has two signal terminals, Analog port A0 and digital port D0.

The higher the concentration of combustible gas, the higher the A0 value

is. When both combustible gas concentration and A0 reach a certain value, D0 changes from low level to high level, which can be controlled by potentiometer.

Specifications:

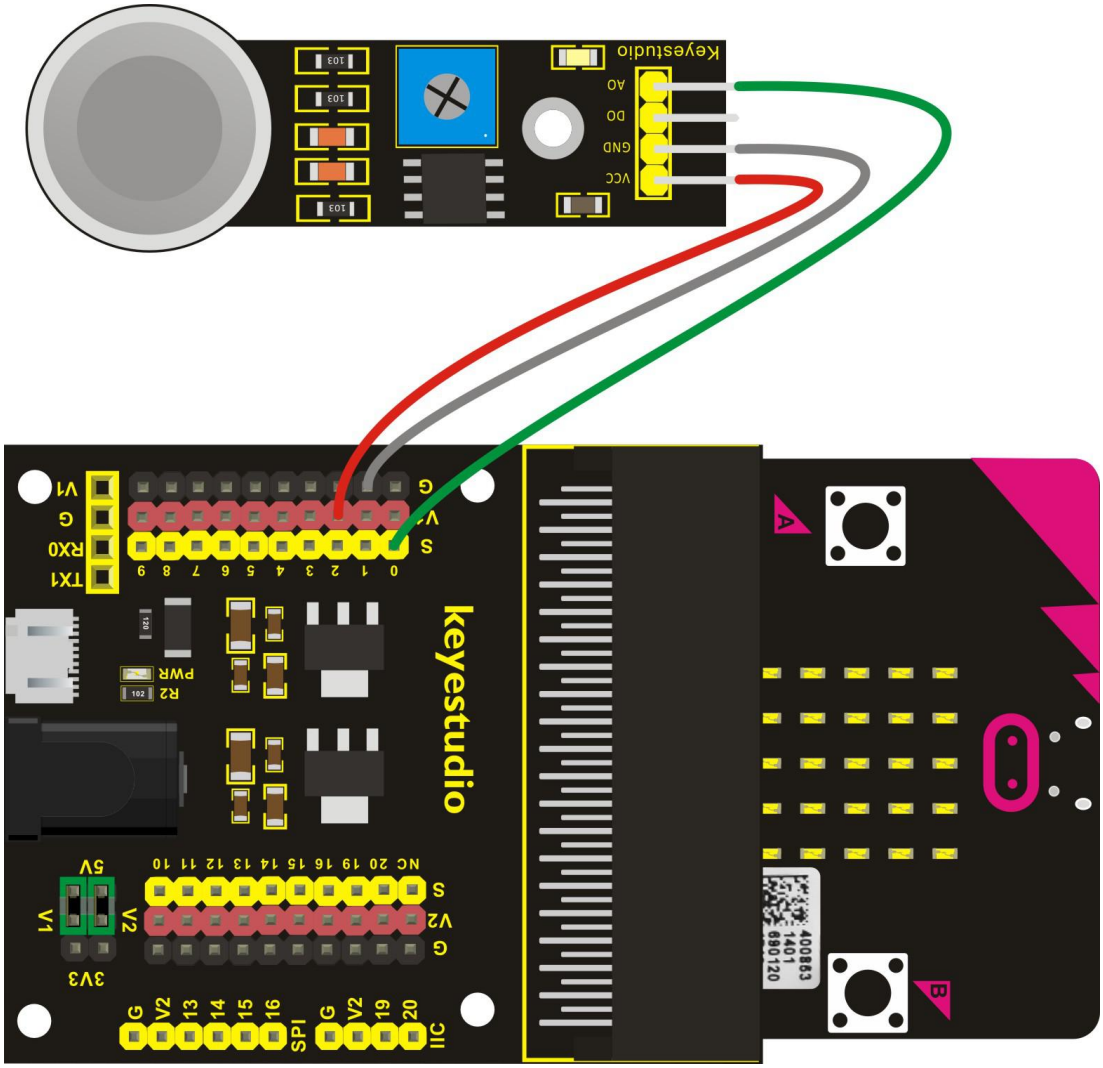
Power supply: 5V

Interface type: Analog

Size: 49.7*20mm

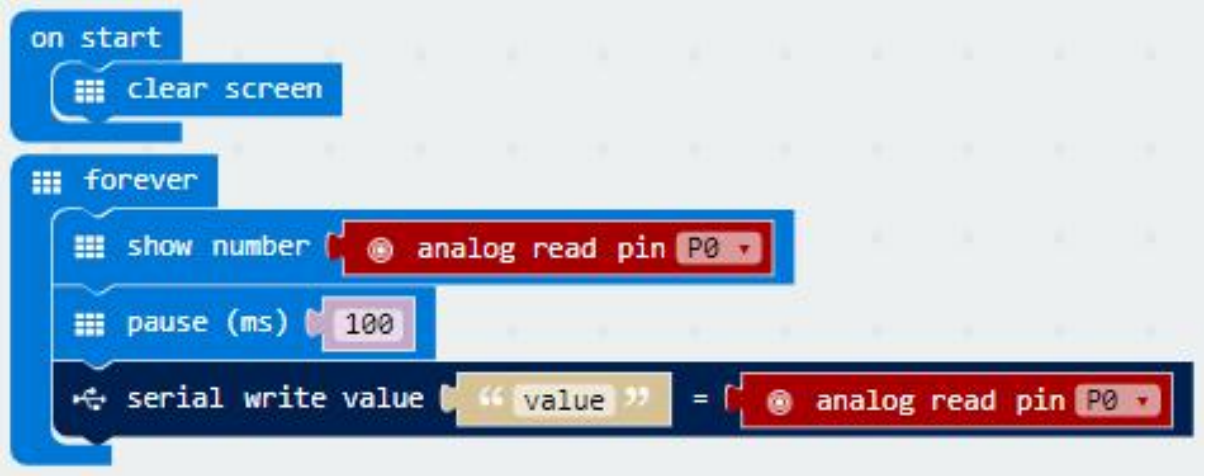
Connect It Up

Insert the micro:bit into keyestudio micro:bit sensor V2 shield. Then connect the analog gas sensor to keyestudio micro:bit sensor shield. Connect VCC to V1 header, ground to ground, A0 pin to P0 header.



Test Code

If you are not familiar to make code, don't worry. Firstly, you can enter this link:https://makecode.micro:bit.org/reference to know more about micro:bit blocks. Then you can directly enter the https://makecode.micro:bit.org/ to edit your project program. Below is an example code we have done for you.

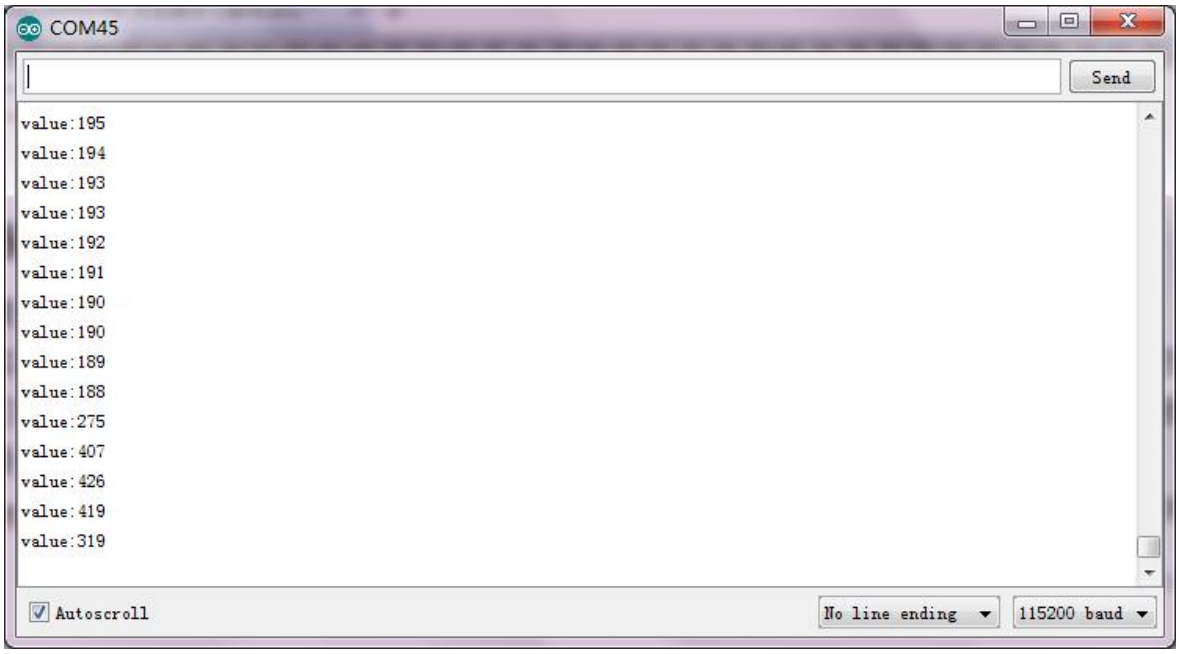


Example Result

Done wiring and powered up, send the above code to micro:bit.

Read the value of A0 signal end. The higher the flammable gas concentration, the greater the value.

You should see the value shown on the LED matrix of micro:bit. Or you can open the serial monitor of Arduino IDE to get the value like this:



Project 28: Ambient Temperature Detection

Overview

In the previous project 23, we only get the analog value of temperature in the current environment. Now, we are going to use a LM35 linear temperature sensor to detect the ambient temperature. Finally get the specific temperature value of current ambient via calculating, and display it on the micro:bit LED matrix or on the Arduino monitor.

Component Required:

- Micro:bit main board*1
- Keyestudio Micro bit Sensor V2 Shield*1
- USB Cable*1
- keyestudio LM35 Linear Temperature Sensor*1
- Dupont jumper wire*3

Component Introduction

LM35 Linear Temperature Sensor:

It is based on a semiconductor LM35 temperature sensor. It can be used to detect ambient temperature. This sensor offers a functional range among 0 degree Celsius to 100 degree Celsius. Sensitivity is 10mV per degree Celsius. The output voltage is proportional to the temperature.

There exists a linear relationship between Signal output voltage and Celsius scale. The formula is as follows: at 0°C, output 0V; every 1°C increase, the output voltage will increase 10mV.

Specification

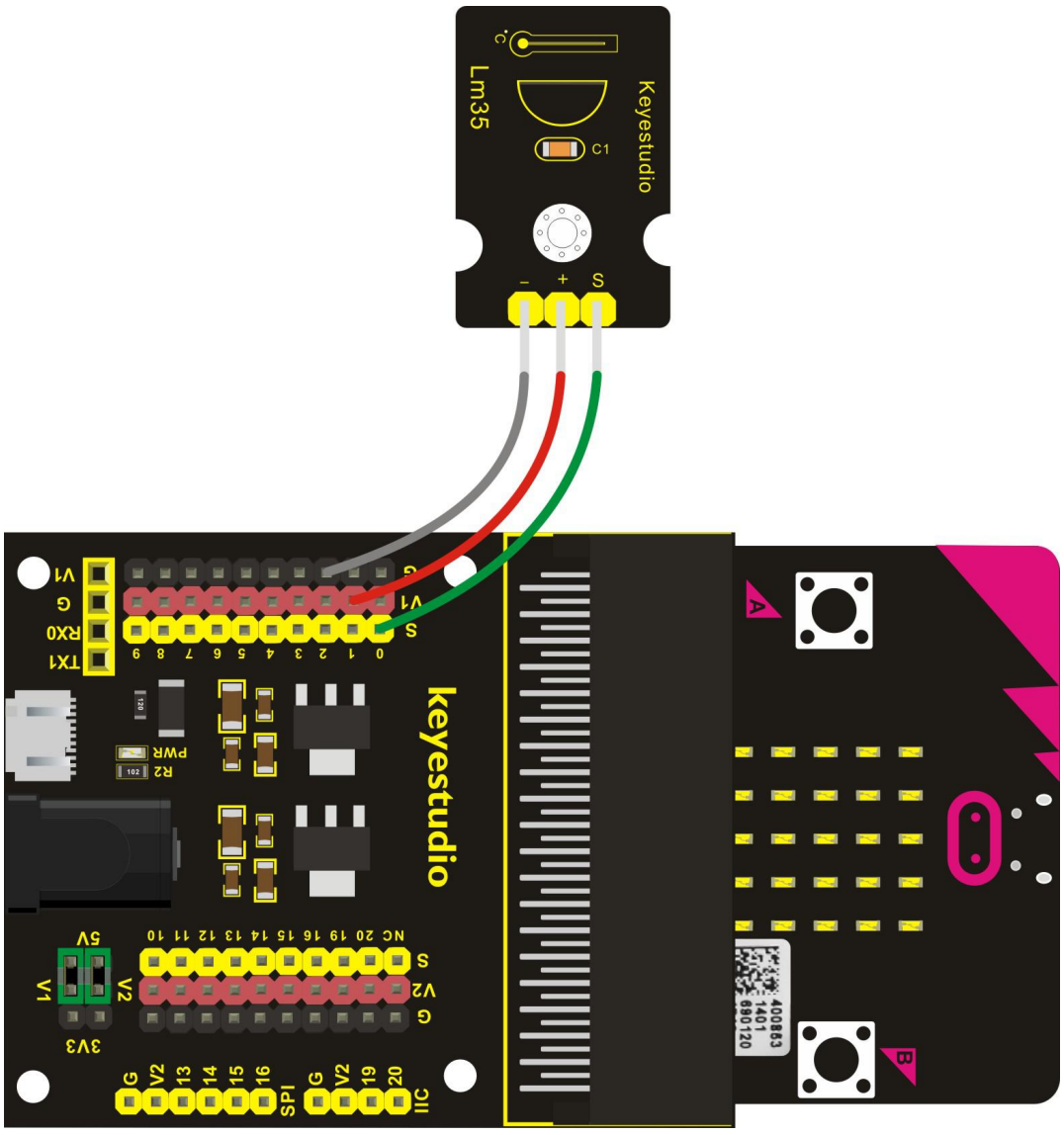
Sensitivity: 10mV per degree Celsius

Functional Range: 0°C to 100°C

Size: 30*20mm

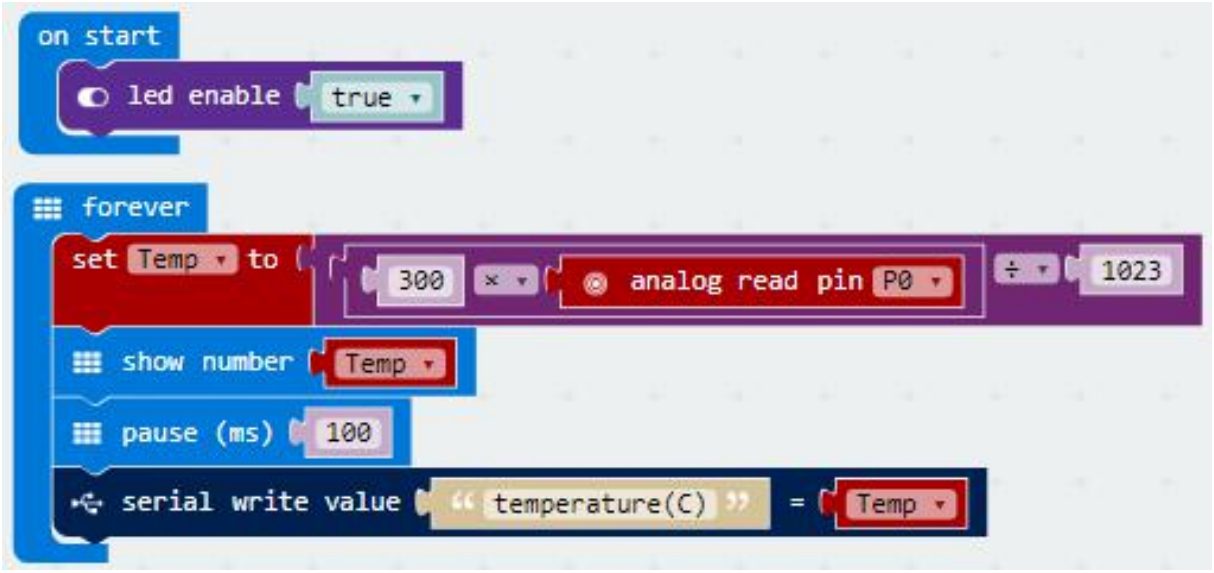
Connect It Up

Insert the micro:bit into keyestudio micro:bit sensor V2 shield. Then connect the LM35 sensor to keyestudio micro:bit sensor shield. Connect signal pin to P0 header, +pin to V1 header, ground to ground.



Test Code

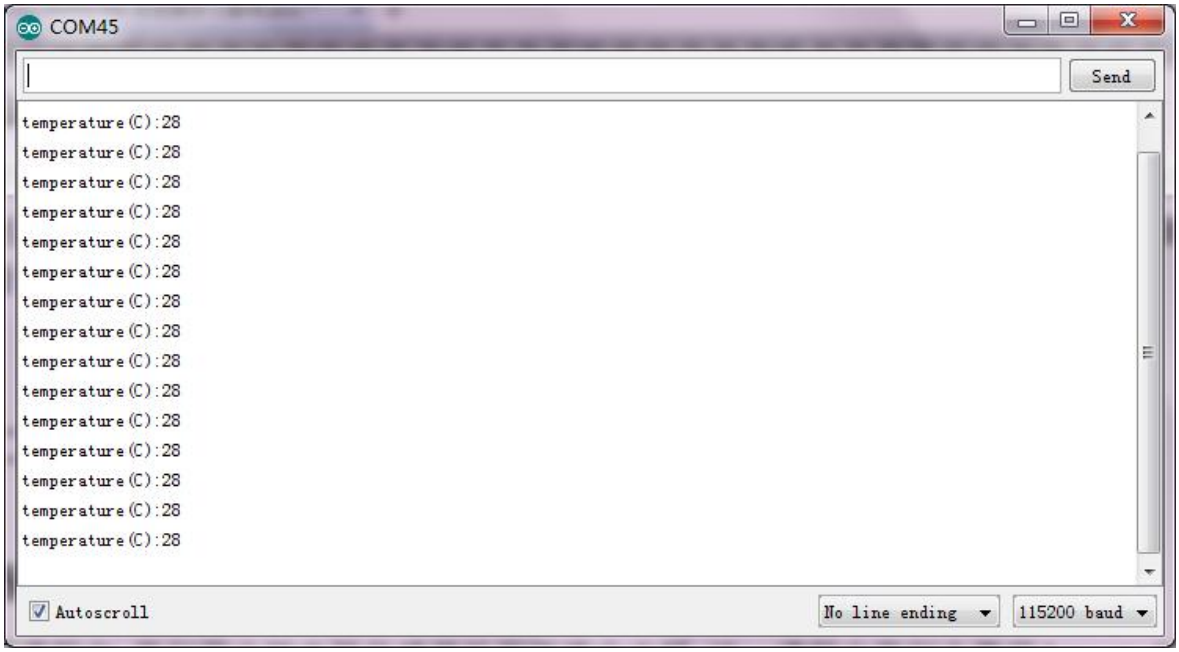
If you are not familiar to make code, don't worry. Firstly, you can enter this link:https://makecode.micro:bit.org/reference to know more about micro:bit blocks. Then you can directly enter the https://makecode.micro:bit.org/ to edit your project program. Below is an example code we have done for you.



Example Result

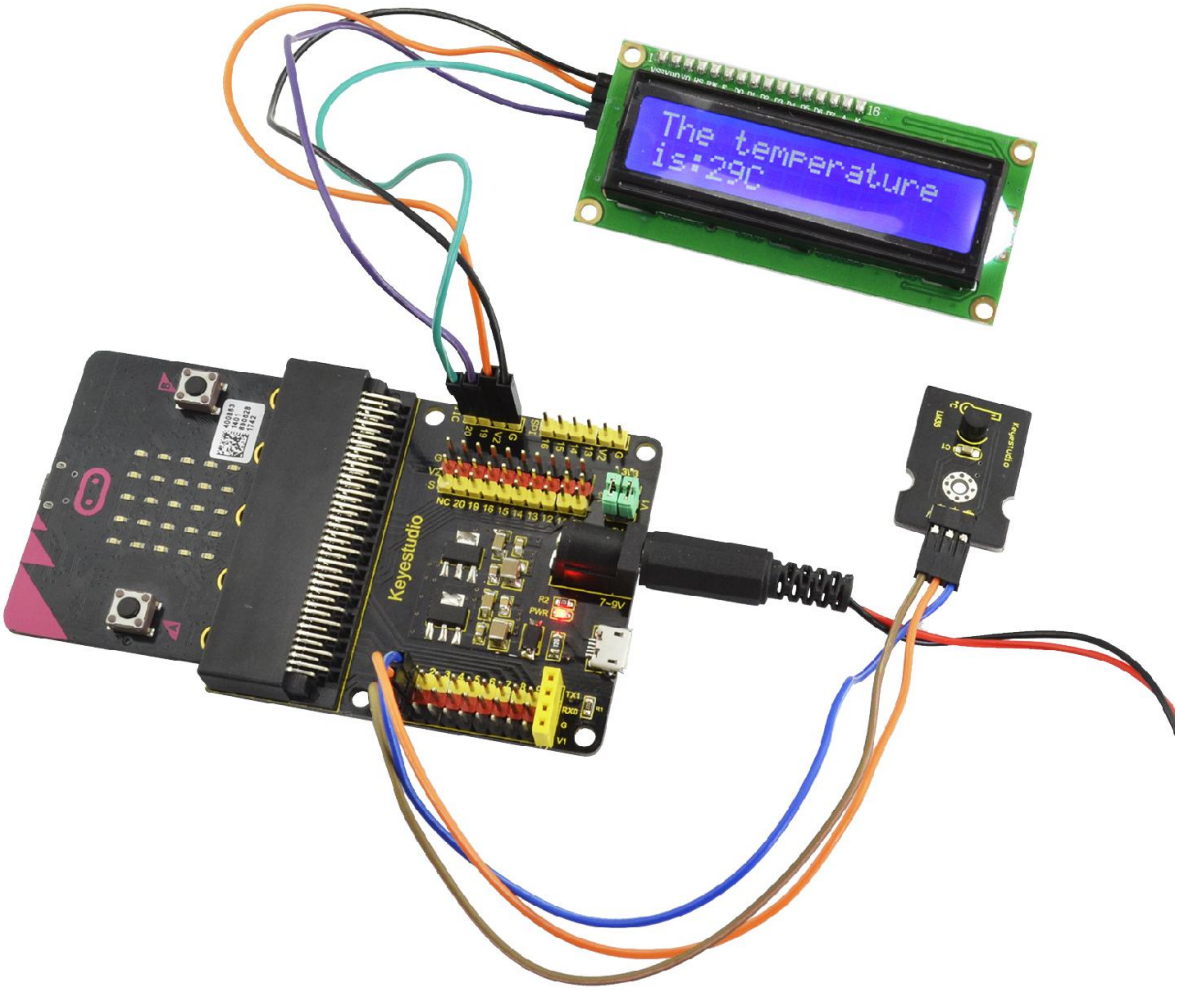
Done wiring and powered up, send the above code to micro:bit.

You should see the temperature value is showed on the LED matrix of micro:bit. Or you can open the serial monitor of Arduino IDE to get the value like below. The value may differs in different ambient.



Extension Experiment:

In the experiment, use the LM35 sensor to detect the temperature in the current environment. You can see the temp. value is displayed on the 1602LCD.



Project 29: Ambient Light

Overview

This lesson is a little bit similar to the previous illumination test by a photocell. But this time we will use keystudio TEMT6000 light sensor whose sensitivity is better than a photocell.

You will learn how to use a TEMT6000 sensor and micro:bit to test the ambient light. Show the analog value on the micro:bit LED matrix or on the Arduino monitor.

Component Required:

- Micro:bit main board*1
- Keyestudio Micro bit Sensor V2 Shield*1
- USB Cable*1
- TEMT6000 Ambient Light Sensor*1
- Dupont jumper wire*3

Component Introduction

TEMT6000 Ambient Light Sensor:

This TEMT6000 light sensor is mainly composed of a high visible photosensitive light (NPN type) triode. It can capture the tiny light changes and magnify it about 100 times, which is easily recognized by the microcontroller for AD conversion.

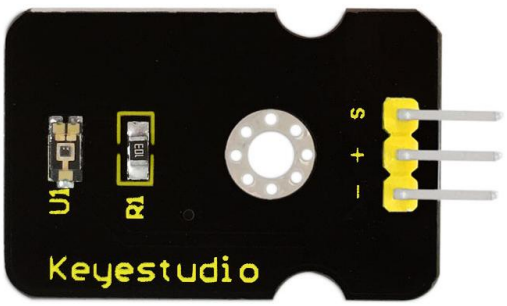
Its response to visible light illumination is similar to that of the human eye, so it can judge the intensity of ambient light. But note that it does not react well to IR or UV light.

This sensor is available for friendly interaction applications.

Specifications:

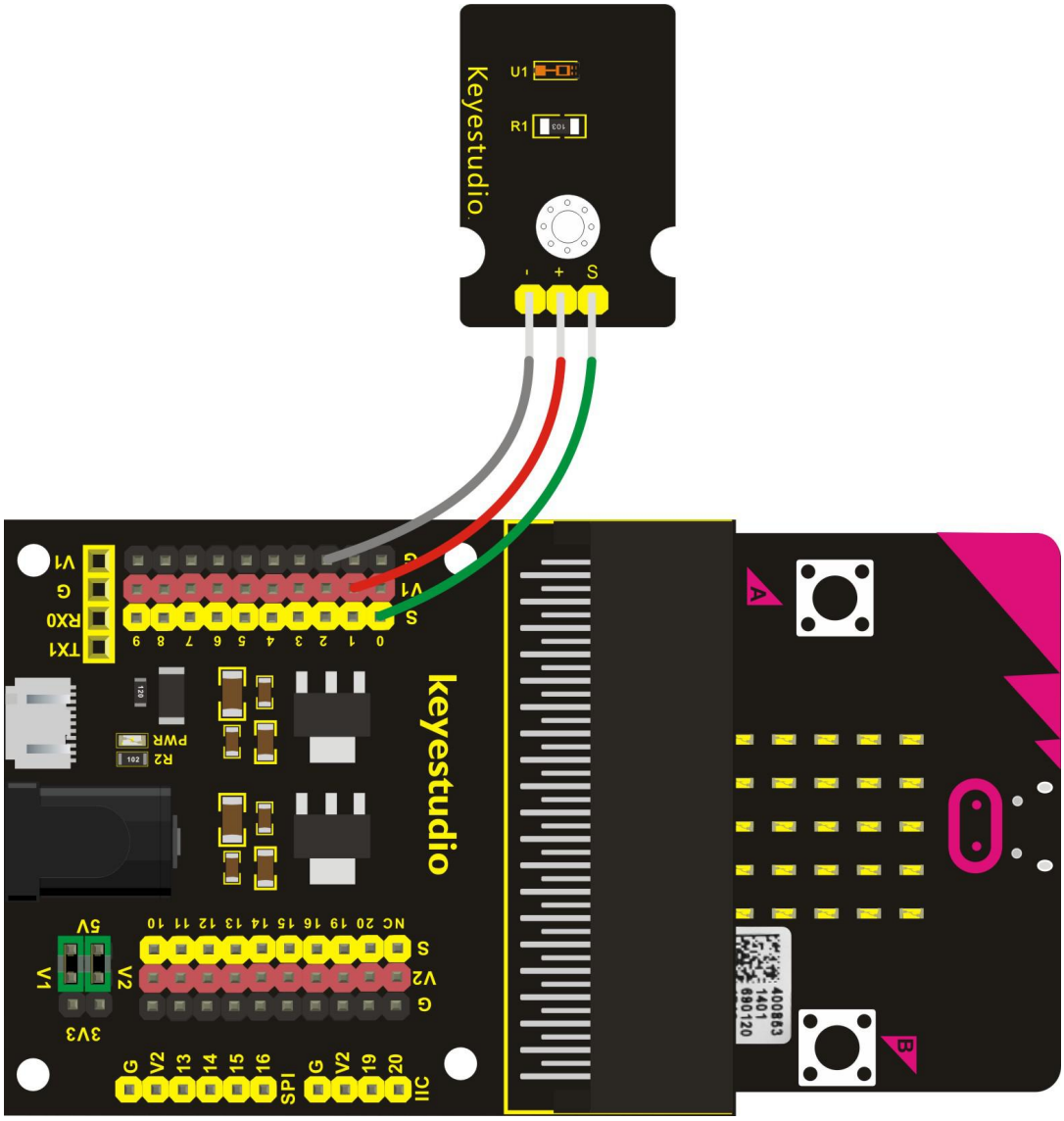
Supply Voltage: +5VDC 50mA

Size: 36.5*16mm



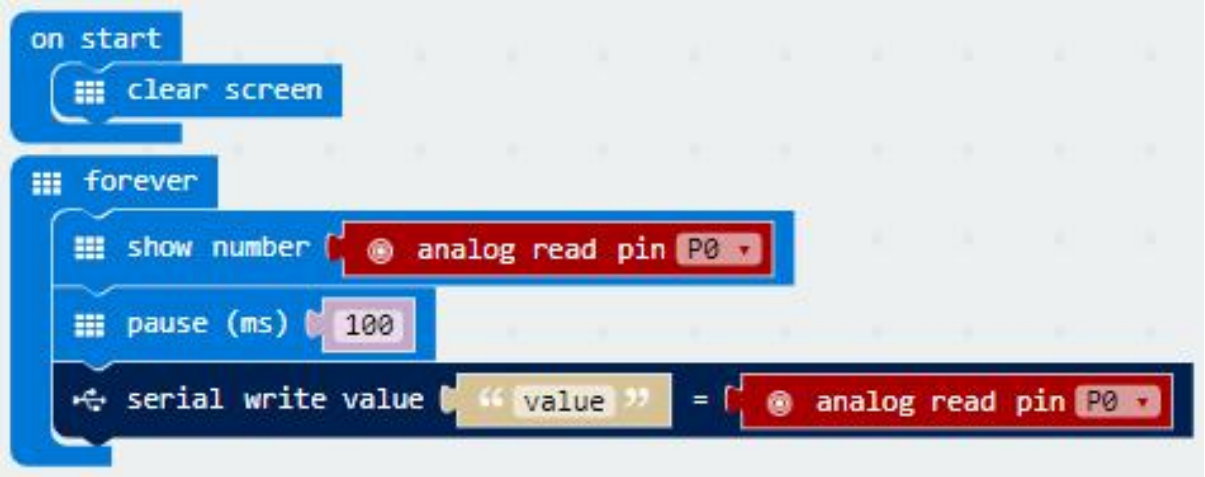
Connect It Up

Insert the micro:bit into keyestudio micro:bit sensor V2 shield. Then connect the TEMT6000 light sensor to keyestudio micro:bit sensor shield. Connect the signal pin to P0 header, +pin to V1 header, ground to ground.



Test Code

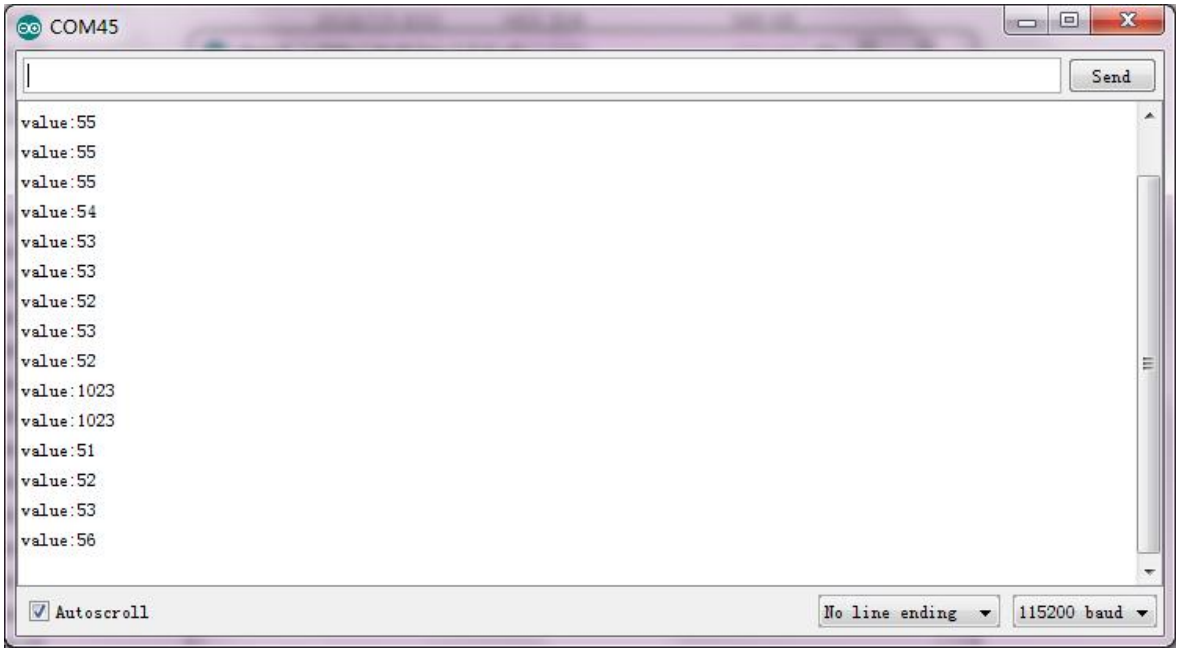
If you are not familiar to make code, don't worry. Firstly, you can enter this link:https://makecode.micro:bit.org/reference to know more about micro:bit blocks. Then you can directly enter the https://makecode.micro:bit.org/ to edit your project program. Below is an example code we have done for you.



Example Result

Done wiring and powered up, send the above code to micro:bit.

Read the value of signal end. The stronger the ambient light, the greater the value. You should see the value is showed on the LED matrix of micro:bit. Or you can open the serial monitor of Arduino IDE to get the value below.



Project 30: Automatic Water Your Plant

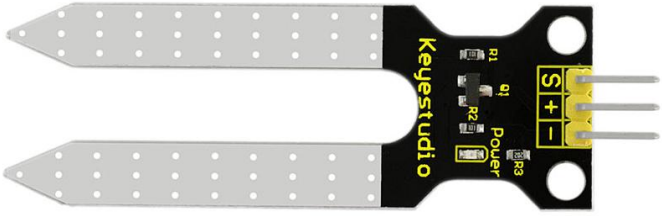
Overview

In life, you may often water some flowers and plants from time to time to prevent them from withering, but not need to pour more. It may requires experience. So can we make a system that allows the machine to automatically water the plants' soil when it is dry? Of course yes.

In this project, you will learn how to use a soil sensor and micro:bit to detect the humidity of your plants' soil. Display the analog value on the micro:bit LED matrix or on the serial monitor. The greater the humidity, the greater the analog value.

Component Required:

- Micro:bit main board*1
- Keyestudio Micro bit Sensor V2 Shield*1
- USB Cable*1
- keyestudio Soil Humidity Sensor*1
- Dupont jumper wire*3



Component Introduction

Soil Humidity Sensor:

This simple soil sensor is ideal for detecting the humidity of your plants' soil. If the soil lacks the water, the analog value output by the sensor will decrease, otherwise, it will increase.

Specifications:

- Power Supply Voltage: 3.3V or 5V
- Working Current: ≤ 20mA
- Output Voltage: 0-2.3V (The greater the humidity, the higher the output voltage.)
- Sensor type: Analog output
- Interface: Pin1- signal, Pin2- GND, Pin3 - VCC
- Dimensions: 20*60mm

The automatic water system is as follows:

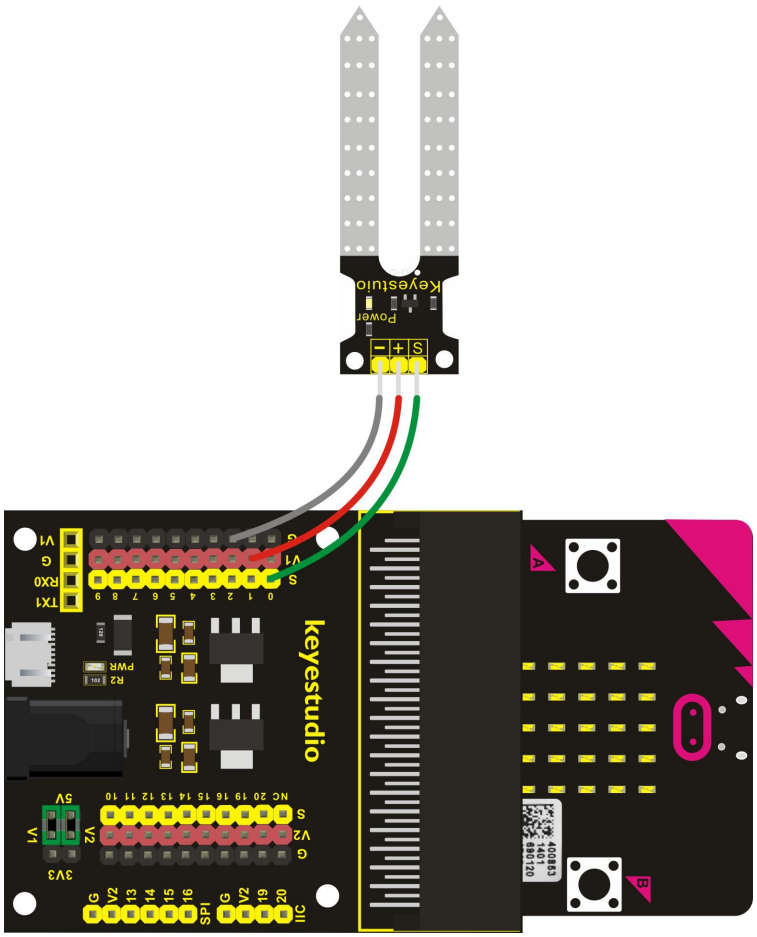
Firstly, we connect a soil sensor to the microcontroller for the purpose of detecting the humidity of soil. Then connect a relay module to the MCU as well. On the normally open (NO) terminals of relay, separately connect a pump and a power supply.

When the soil is detected too dry, the microcontroller will control the relay on, NO terminal connected, supply the power to the pump, and the pump will start to work, watering your flowers and plants.

If the soil is detected enough humid, the microcontroller will control the relay off, NO terminal disconnected, power off, so the pump will stop watering.

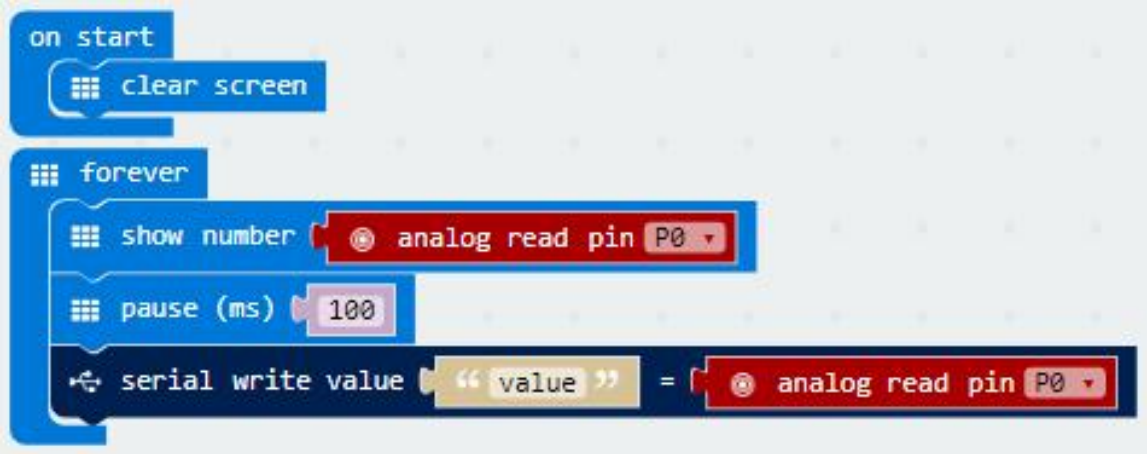
Connect It Up

Insert the micro:bit into keyestudio micro:bit sensor V2 shield. Then connect the soil humidity sensor to keyestudio micro:bit sensor shield. Connect the signal pin to P0 header, +pin to V1 header, ground to ground.



Test Code

If you are not familiar to make code, don't worry. Firstly, you can enter this link:https://makecode.micro:bit.org/reference to know more about micro:bit blocks. Then you can directly enter the https://makecode.micro:bit.org/ to edit your project program. Below is an example code we done for you.

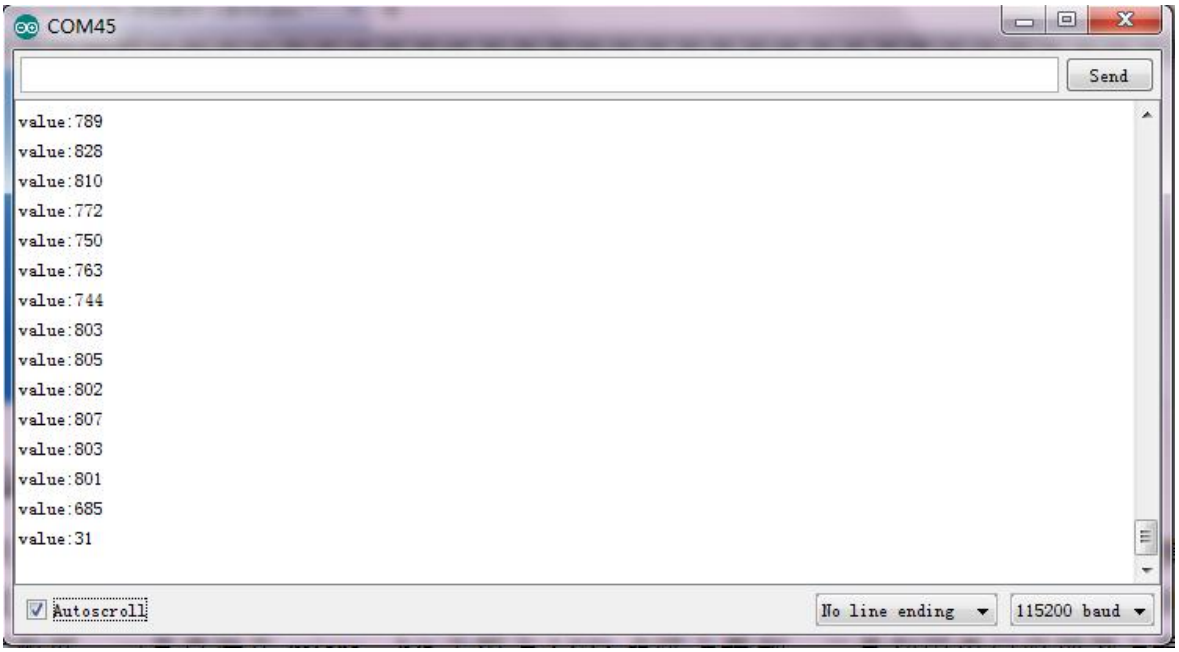


Example Result

Done wiring and powered up, send the above code to micro:bit.

Insert the sensor into the soil of your plants. Read the analog value on signal end. The greater the soil humidity, the greater the analog value.

You should see the value is showed on the LED matrix of micro:bit. Or you can open the serial monitor of Arduino IDE to get the value.



Project 31: Water Level Alarm

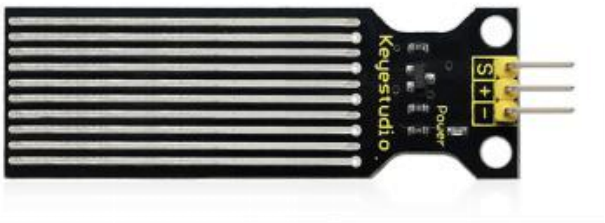
Overview

In real life, when heavy rain occurs, the water level in a river or a reservoir will rise sharply. When reaching a certain water level, it is necessary to open a floodgate to solve the safety hazard. However, how to detect the water level in a river or a reservoir? Very simple, use a water level sensor.

So in this experiment, we are about to use a water sensor and a buzzer module to detect the water level in the glass, if beyond level, buzzer should make an alarm.

Component Required:

- Micro:bit main board*1
- Keyestudio Micro bit Sensor V2 Shield*1
- USB Cable*1
- keyestudio Water Sensor*1
- keyestudio Digital Buzzer Module*1
- Dupont jumper wire*6



Component Introduction

keyestudio Water Level Sensor:

The water sensor is easy- to-use, portable and cost-effective, designed to identify and detect water level and water drop. This smaller sensor can measure the volume of water drop or water quantity through an array of traces of exposed parallel lines.

Features:

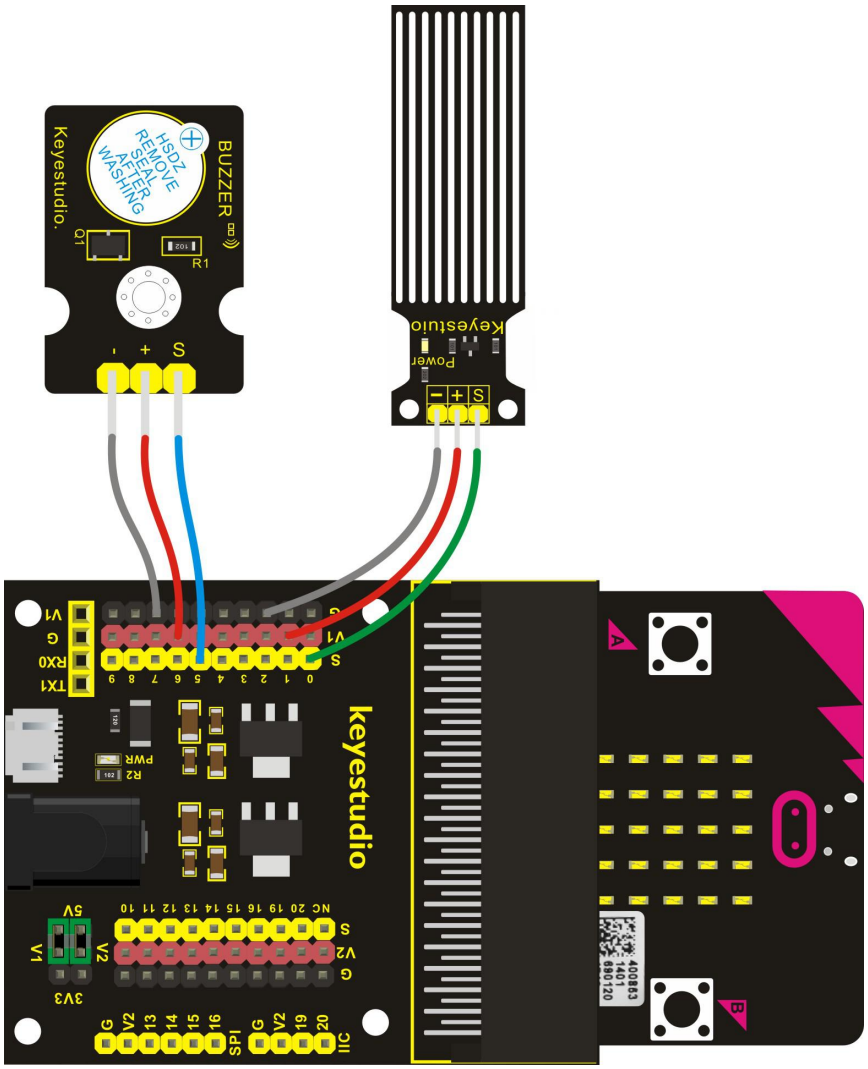
- smooth conversion between water quantity and analog quantity;
- strong flexibility, outputting basic analog value;
- low power consumption and high sensitivity;
- Production process: FR4 double-side tinned
- Shape design: Anti-skid semi-lunar recess

Specifications:

- Operating voltage: DC5V
- Operating current: ＜20mA
- Sensor type: Analog output
- Detection area: 40mm x16mm
- Working Temperature: 10℃-30℃
- Working Humidity: 10%-90% without condensation
- Dimensions: 65mm x 20mm x 8mm

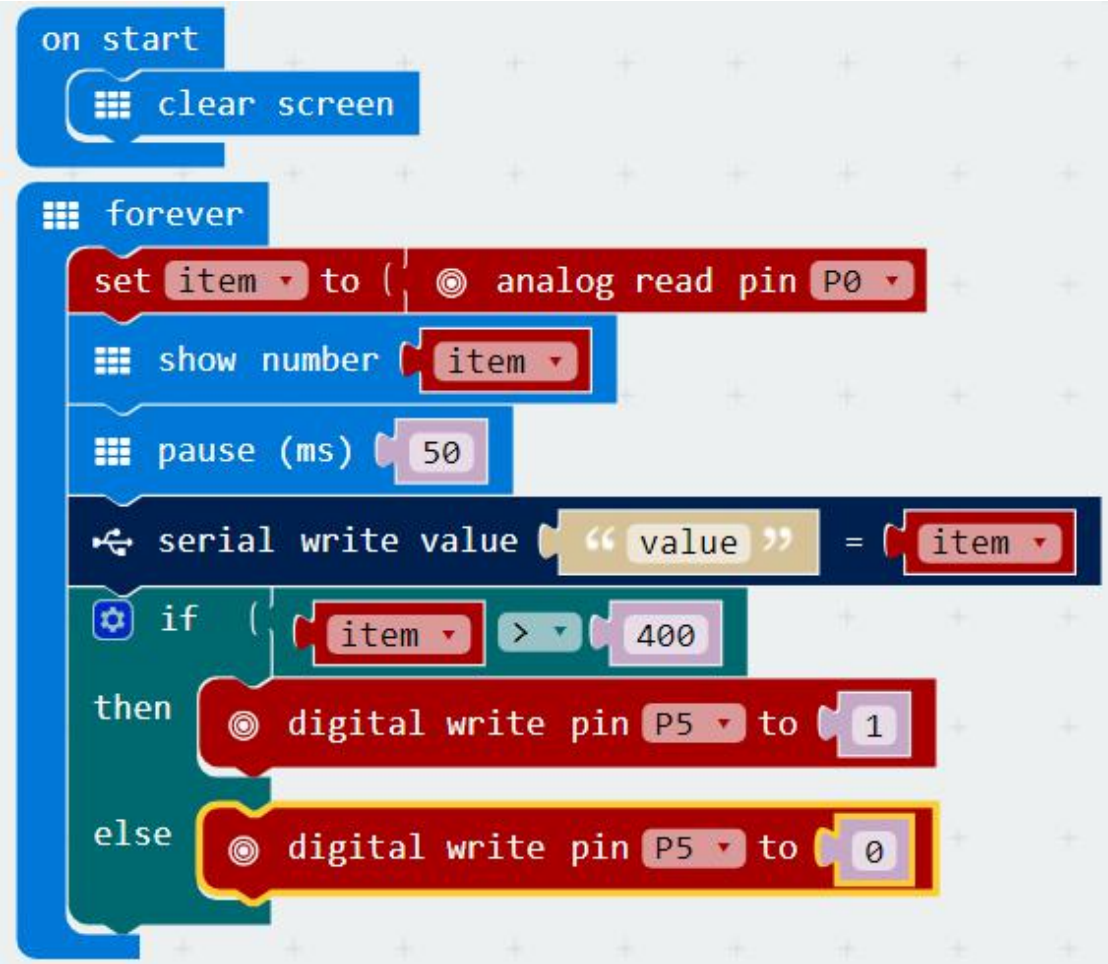
Connect It Up

Insert the micro:bit into keyestudio micro:bit sensor V2 shield. Then separately connect the buzzer and water sensor to keyestudio micro:bit sensor shield. shown below.



Test Code

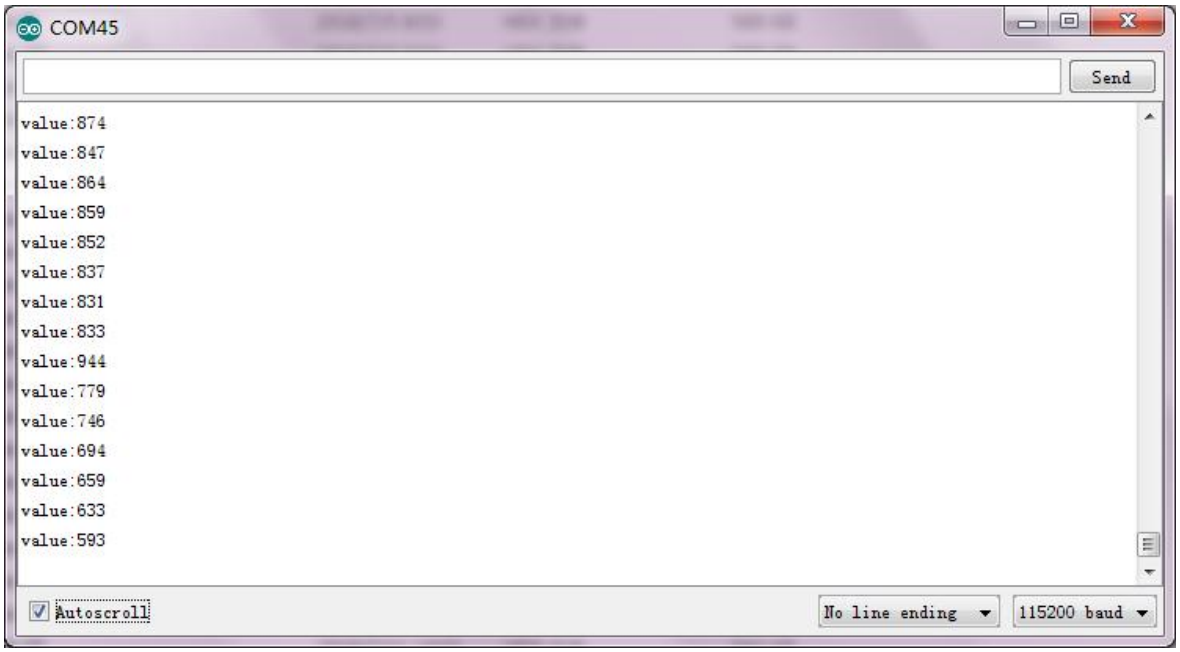
If you are not familiar to make code, don't worry. Firstly, you can enter this link:https://makecode.micro:bit.org/reference to know more about micro:bit blocks. Then you can directly enter the https://makecode.micro:bit.org/ to edit your project program. Below is an example code we have done for you.



Example Result

Done wiring and powered up, send the above code to micro:bit.

Read the value of signal end. The higher the water level, the greater the value. When the analog value is greater than 400, buzzer on the module will alarm. You should see the value is showed on the LED matrix of micro:bit. Or you can open the serial monitor of Arduino IDE to get the value. Like below figure shown.


COM45
Send
value:874
value:847
value:864
value:859
value:852
value:837
value:831
value:833
value:944
value:779
value:746
value:694
value:659
value:633
value:593
Autoscroll
No line ending
115200 baud

Project 32: Ultraviolet Detection

Overview

In this project, you will learn how to use Ultraviolet sensor and micro:bit to detect the ultraviolet light. Show the analog value on the micro:bit LED matrix or on the Arduino monitor.

Component Required:

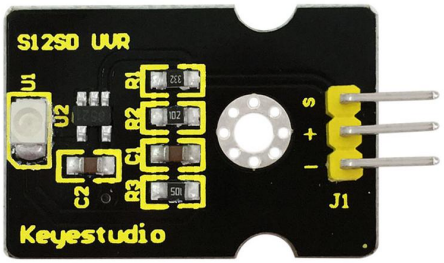
- Micro:bit main board*1
- Keyestudio Micro bit Sensor V2 Shield*1
- USB Cable*1
- keyestudio GUVA-S12SD 3528 Ultraviolet Sensor*1
- Dupont jumper wire*3

Component Introduction

Keyestudio GUVA-S12SD Ultraviolet Sensor:

This sensor mainly includes GUVA-S12SD, applied to measure ultraviolet index of intelligent wearable device, such as watches, smart phone and outdoor device with UV index.

In the aspect of disinfection by ultraviolet rays, it can be used to monitor the intensity of ultraviolet light or used as a UV flame detector.

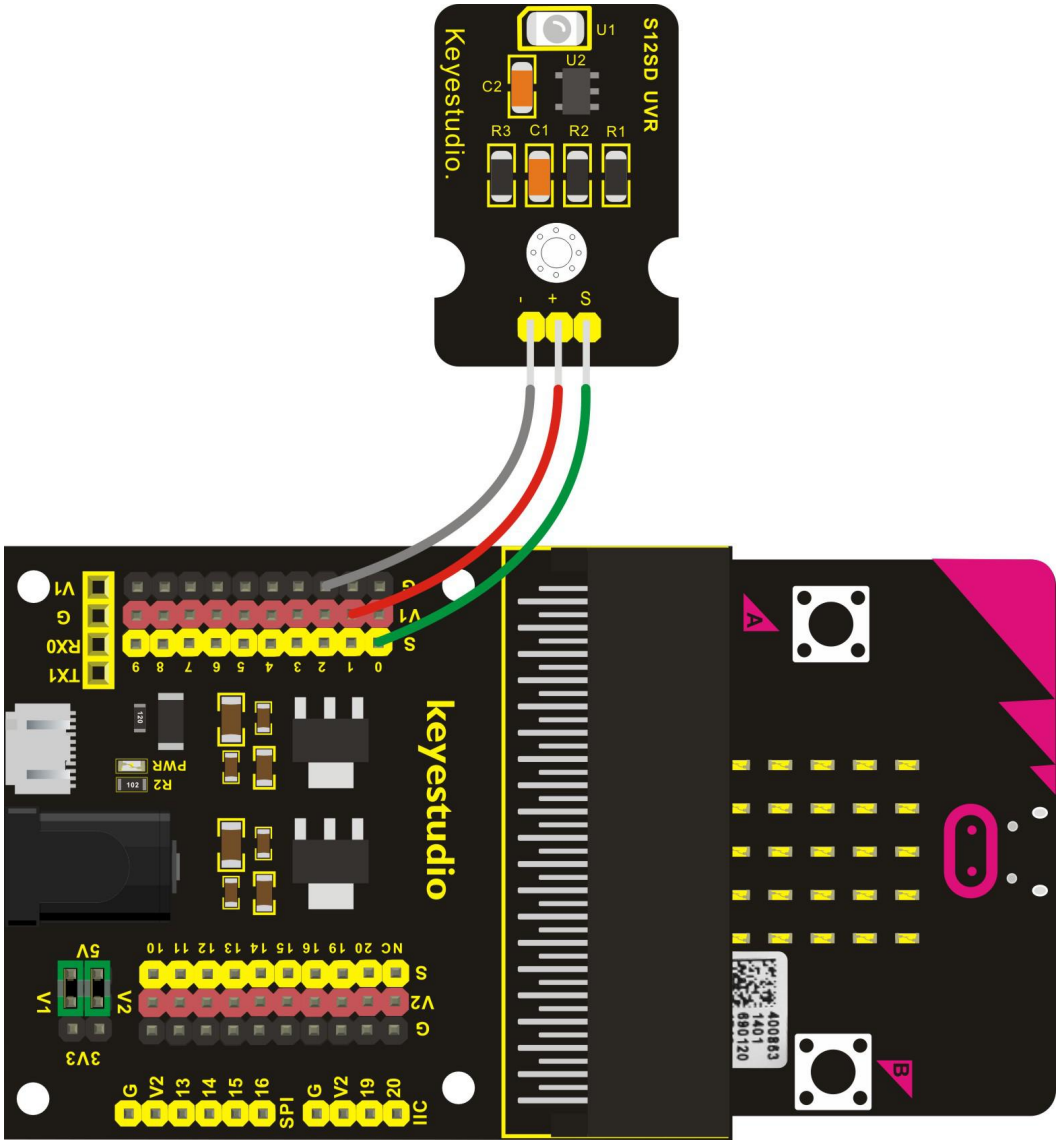


Parameters:

- Supply Voltage: 2.5V ~ 5V
- Output Signal: Analog Signal
- Responsivity: 0.14A/W
- Dark Current: 1nA
- Detecting Range of Spectrum: 240-370nm
- Light Current: 101~125nA UVA Light, 1mW/cm2
- Dimensions: 15mm×30mm×0.7mm

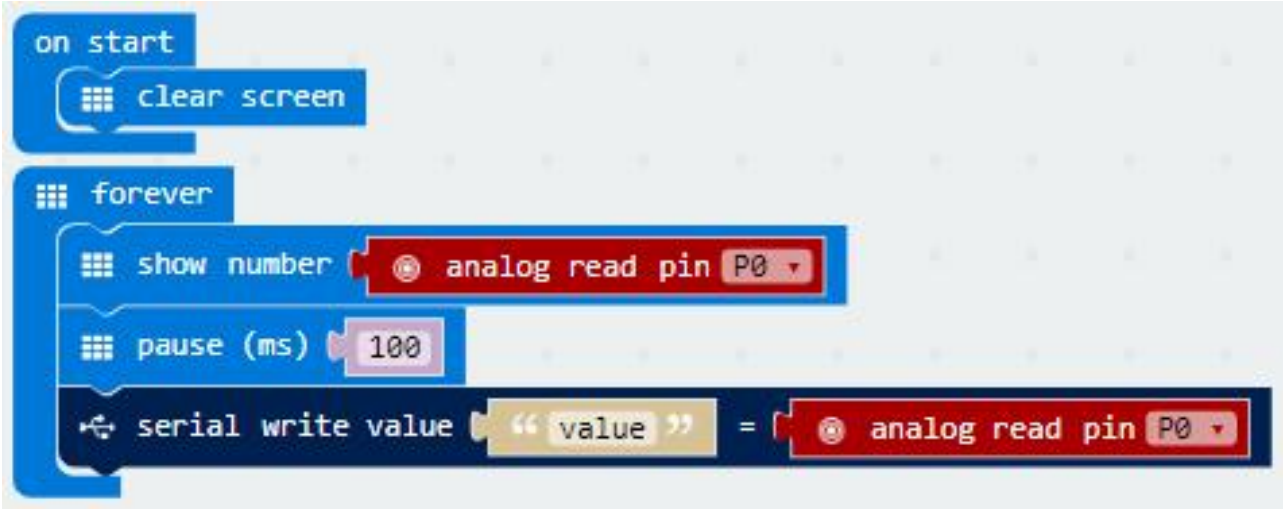
Connect It Up

Insert the micro:bit into keyestudio micro:bit sensor V2 shield. Then connect the Ultraviolet sensor to the shield. Connect the signal pin to Analog P0.



Test Code

If you are not familiar to make code, don't worry. Firstly, you can enter this link:https://makecode.micro:bit.org/reference to know more about micro:bit blocks. Then you can directly enter the https://makecode.micro:bit.org/ to edit your project program. Below is an example code we have done for you.

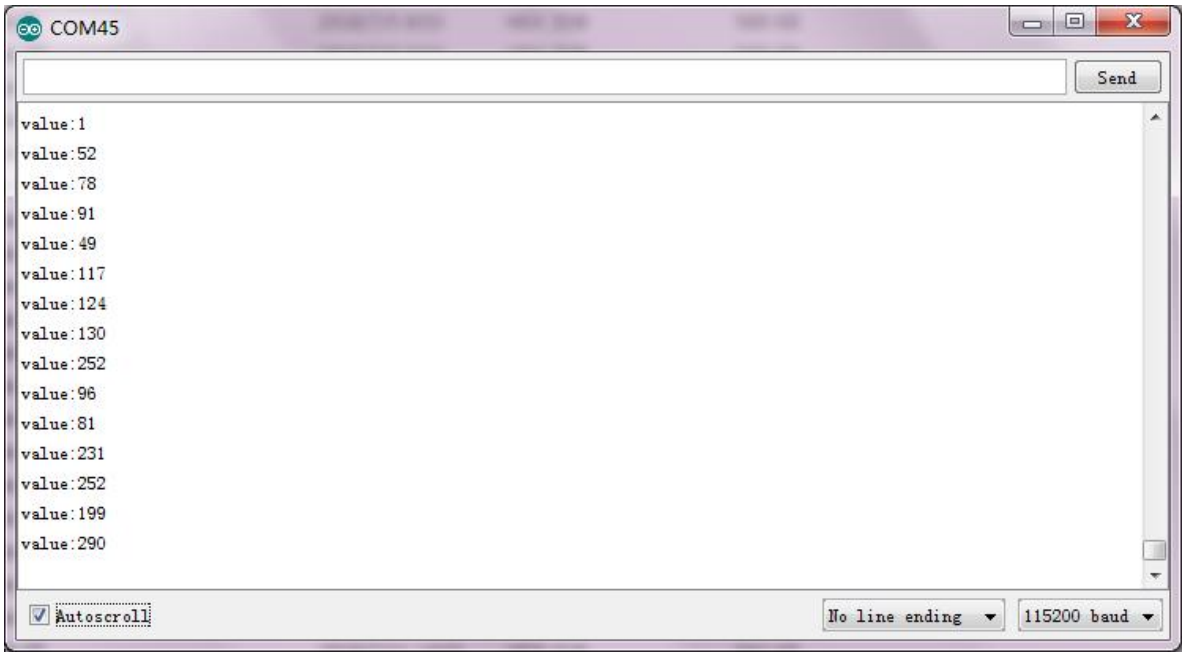


Example Result

Done wiring and powered up, send the above code to micro:bit.

Read the analog value of P0 signal end. The greater the Ultraviolet light, the greater the value.

You should see the value is showed on the LED matrix of micro:bit. Or you can open the serial monitor of Arduino IDE to get the value like this:



Project 33: Vapor in the Air

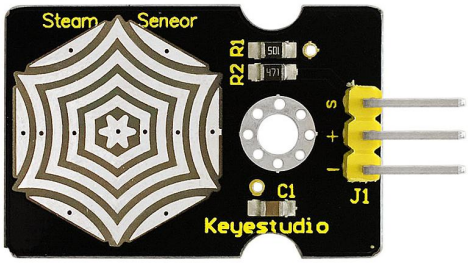
Overview

Our lives are surrounded by air everywhere. The air contains many ingredients, some of which are useful, some are harmful, some of which have a significant impact on the human body, and some of which have a slight effect on the human body.

So in this lesson, you will learn how to use a steam sensor and micro:bit to detect the vapor content in the air. Show the analog value on the micro:bit LED matrix or on the serial monitor.

Component Required:

- Micro:bit main board*1
- Keyestudio Micro bit Sensor V2 Shield*1
- USB Cable*1
- keyestudio Steam Sensor*1
- Dupont jumper wire*3



Component Introduction

Keyestudio Steam Sensor:

Steam sensor is an analog sensor, which can be used as a simple rainwater detector or liquid level switch.

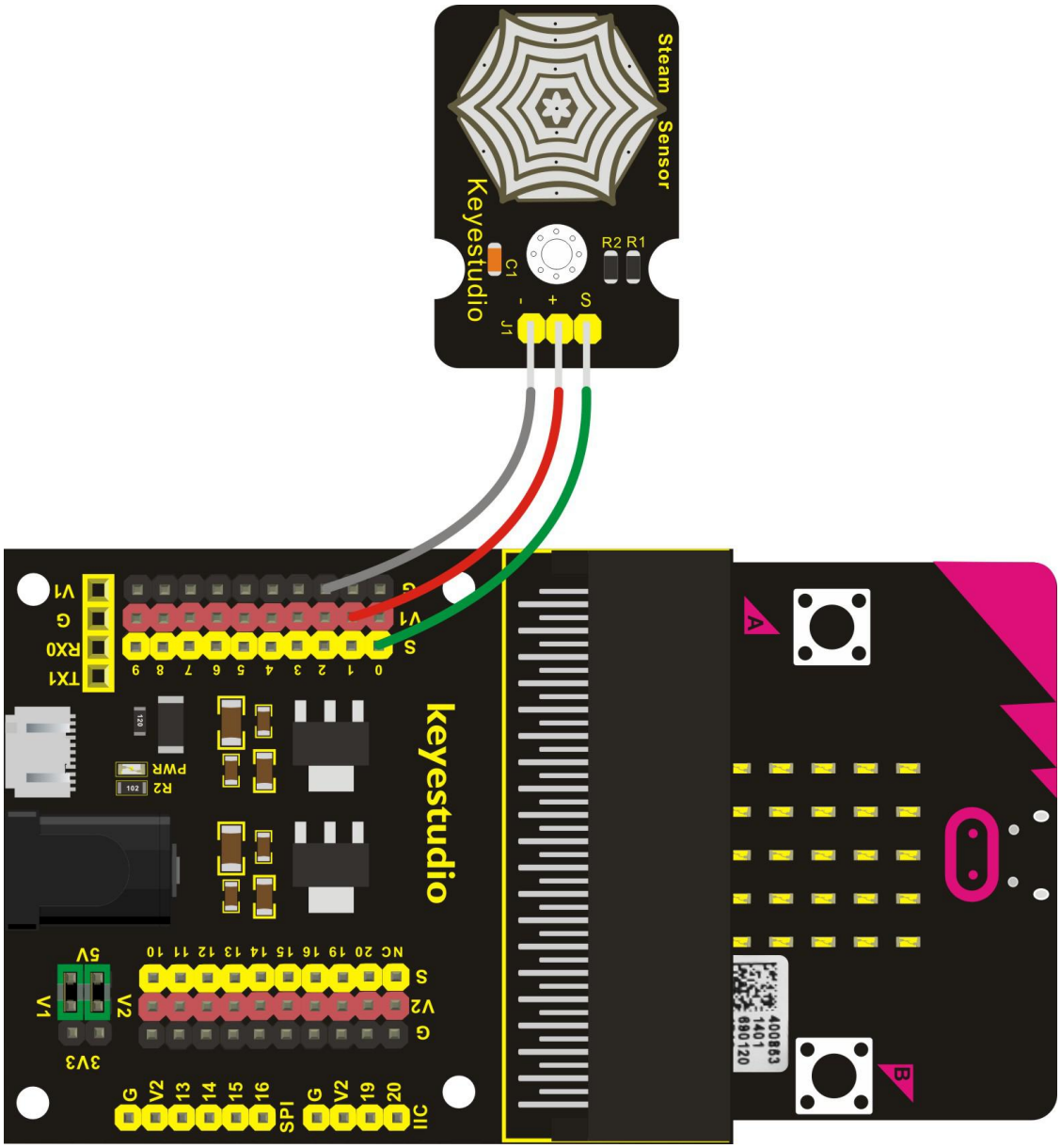
When moisture on the sensing area of this sensor rises, output voltage of its signal end will increase.

Parameters:

- Working Voltage: 3.3V-5V
- Working Current: <20mA
- Working Temperature: －10℃～＋70℃
- Interface Type: Analog Signal Output
- Size: 36mm x 20mm

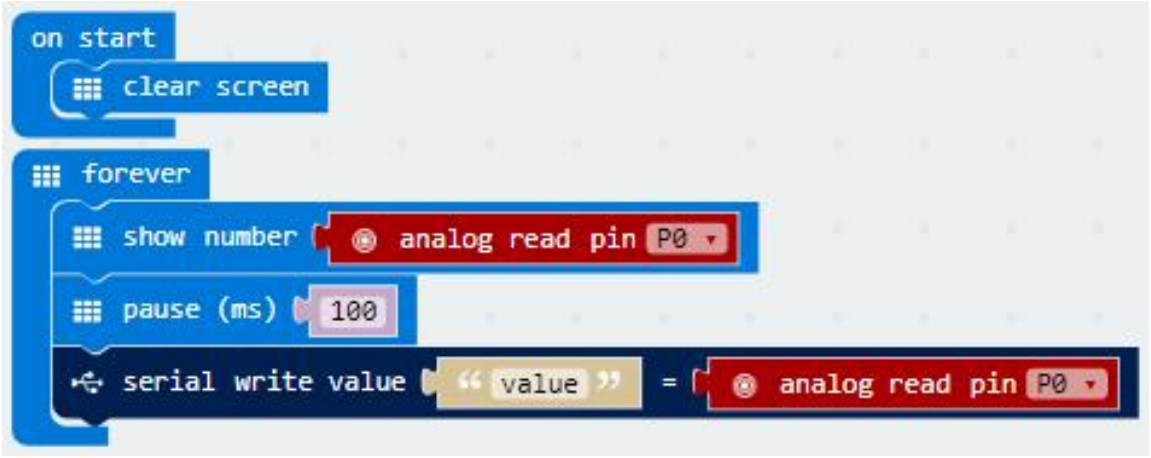
Connect It Up

Insert the micro:bit into keyestudio micro:bit sensor V2 shield. Then connect the steam sensor to the shield. Connect the signal pin to Analog P0.



Test Code

If you are not familiar to make code, don't worry. Firstly, you can enter this link:https://makecode.micro:bit.org/reference to know more about micro:bit blocks. Then you can directly enter the https://makecode.micro:bit.org/ to edit your project program. Below is an example code we have done for you.

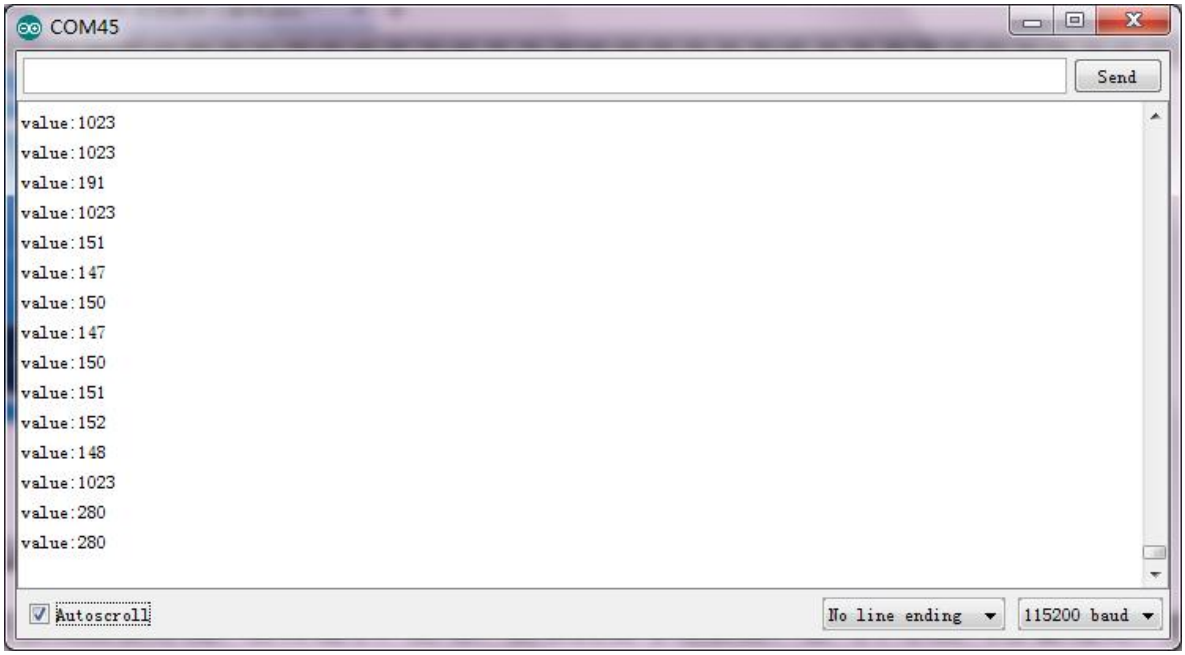


Example Result

Done wiring and powered up, send the above code to micro:bit.

Read the analog value of P0 signal pin. The higher the vapor content in the air, the greater the value.

You should see the value is showed on the LED matrix of micro:bit. Or you can open the serial monitor of Arduino IDE to get the value as the figure shown below.



Project 34: Pressure Detection

Overview

In the previous projects, you have learned various external information detected by different sensors, such as temperature, light, sound, gas, and so on. Now, let's use the keyestudio thin-film pressure sensor and micro:bit to detect external stress. Show the analog value of pressure on the micro:bit LED matrix or on the serial monitor.

Component Required:

- Micro:bit main board*1
- Keyestudio Micro bit Sensor V2 Shield*1
- USB Cable*1
- keyestudio Thin-film Pressure Sensor*1
- Dupont jumper wire*3

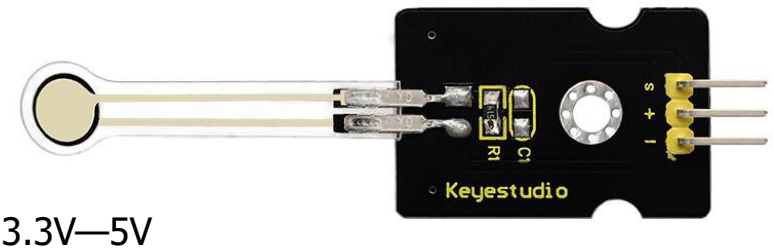
Component Introduction

Thin-film Pressure Sensor:

This sensor adopts the flexible nano pressure-sensitive material with an ultra-thin film pad. It is water-proof and pressure-sensitive.

When the sensor detects the outside pressure, the resistance of sensor will change. Then through the circuit can convert the resistance changes into the voltage changes, output it on the signal end.

In this way, we can get the conditions of pressure changes by detecting the signal changes.



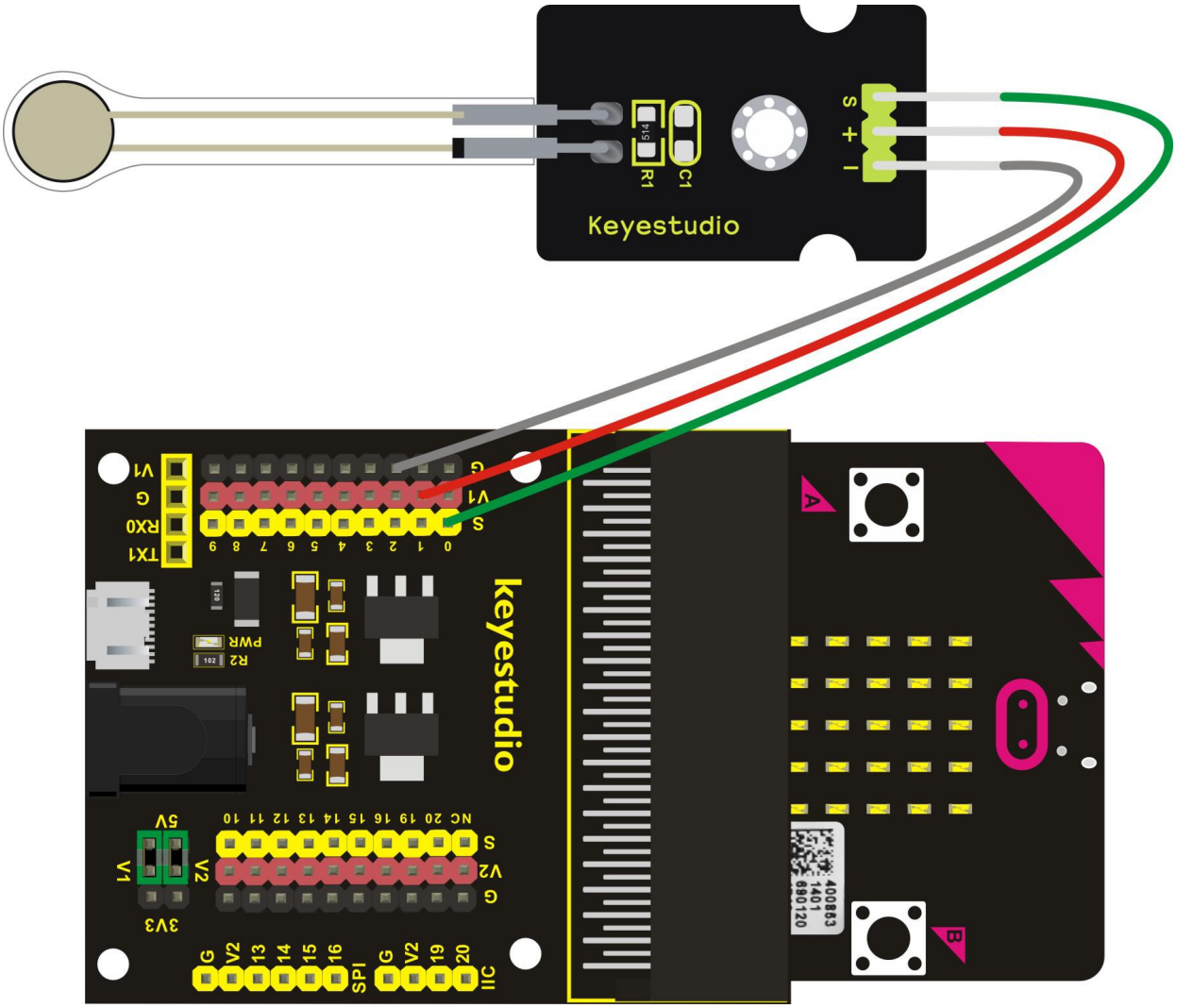
Parameters:

- Range: 0-10KG
- Working Voltage: DC 3.3V—5V
- Thickness: ＜0.25mm
- Response Point: ＜20g
- Repeatability: ＜±5.8%（50% load）

- Accuracy: ±2.5%（85% range interval）
- Durability: ＞100 thousand times
- Initial Resistance: ＞100MΩ(no load)
- Response Time: ＜1ms
- Recovery Time: ＜15ms
- Working Temperature: - 20℃—60℃

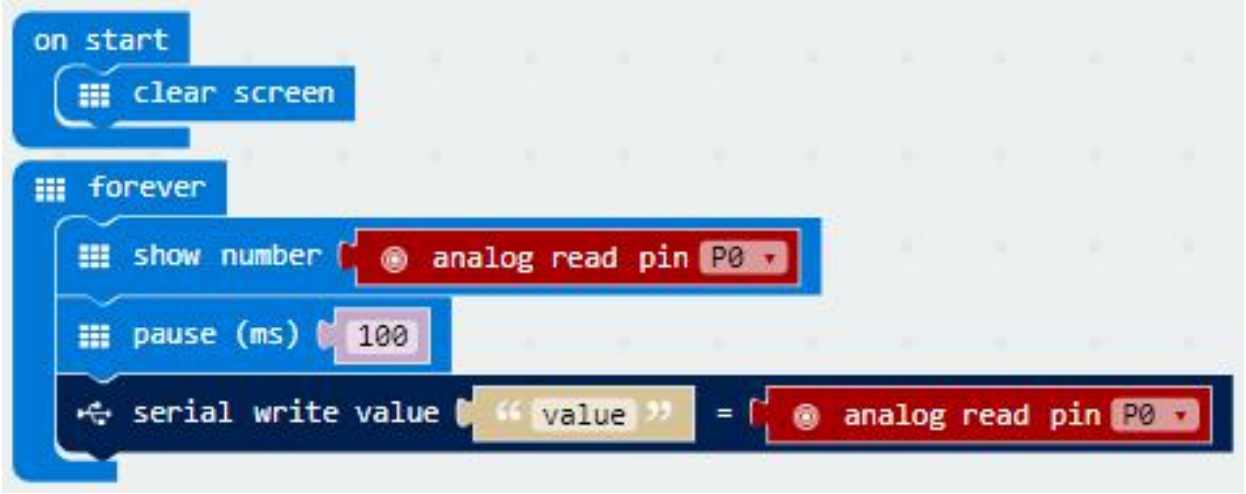
Connect It Up

Insert the micro:bit into keyestudio micro:bit sensor V2 shield. Then connect the pressure sensor to the shield. Connect the signal pin to Analog P0.



Test Code

If you are not familiar to make code, don't worry. Firstly, you can enter this link:https://makecode.micro:bit.org/reference to know more about micro:bit blocks. Then you can directly enter the https://makecode.micro:bit.org/ to edit your project program. Below is an example code we have done for you.

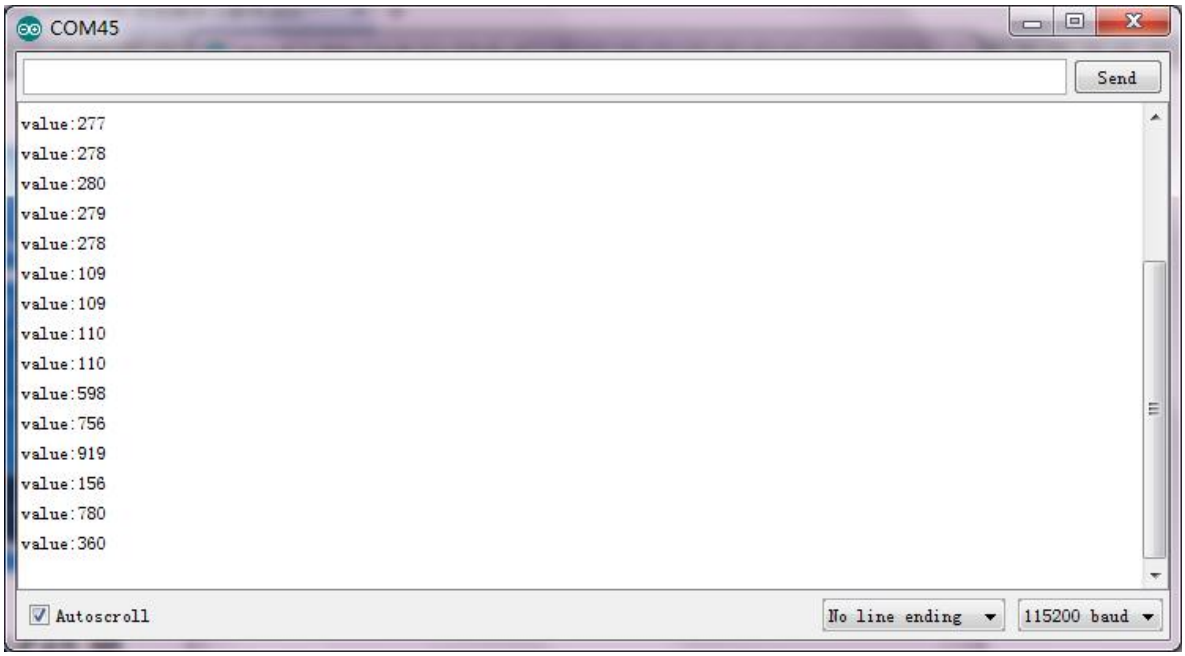


Example Result

Done wiring and powered up, send the above code to micro:bit.

Hardly press the thin pad of sensor, then read the analog value of P0 signal pin. The greater the pressure, the greater the value.

You should see the value is showed on the LED matrix of micro:bit. Or you can open the serial monitor of Arduino IDE to get the value below.



Project 35: Light Controlled By Vibration

Overview

In this project, you will learn how to use a vibration sensor and micro:bit to control an LED on and off.

Component Required:

- Micro:bit main board*1
- Keyestudio Micro bit Sensor V2 Shield*1
- USB Cable*1
- Keyestudio Vibration Sensor*1
- keyestudio Piranha LED Module*1
- Dupont jumper wire*6

Component Introduction

Keyestudio Vibration Sensor:

This sensor is mainly based on a 801S sensor element. The interior structure is a metal ball fixed on a special spring as a pole, and the other surrounded by it as another pole. Once the vibration reaches a certain amplitude, the two poles are connected.

Parameters:

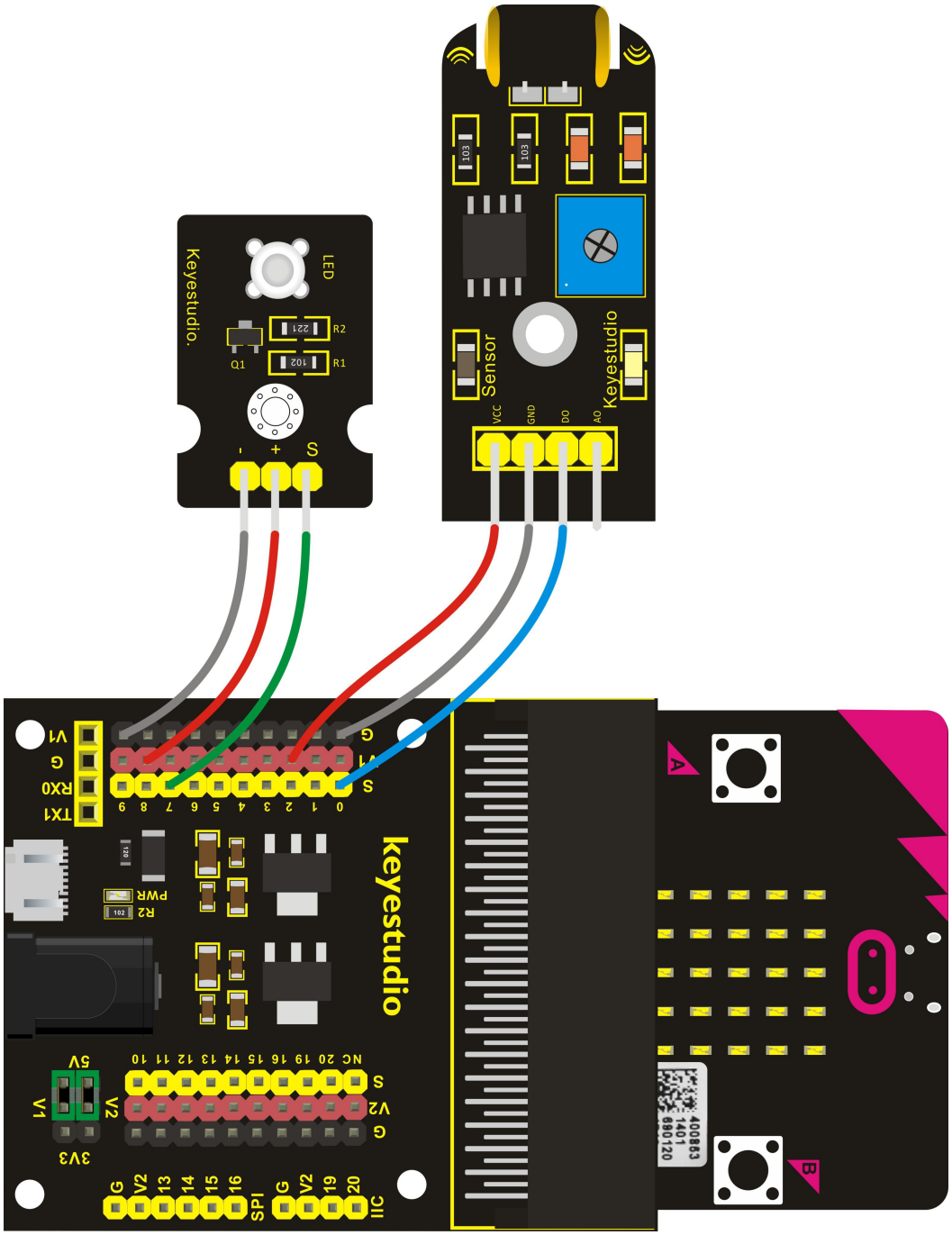
IO Type: Digital

Supply Voltage: 3.3V-5V

Note: you can adjust the sensitivity by a trim-pot on the sensor. The sensitivity is the best when adjust an LED on the sensor between on and off state.

Connect It Up

Insert the micro:bit into keyestudio micro:bit sensor V2 shield. Then connect the vibration sensor and LED module to the shield. Connect the signal pin of vibration sensor to Analog P0.

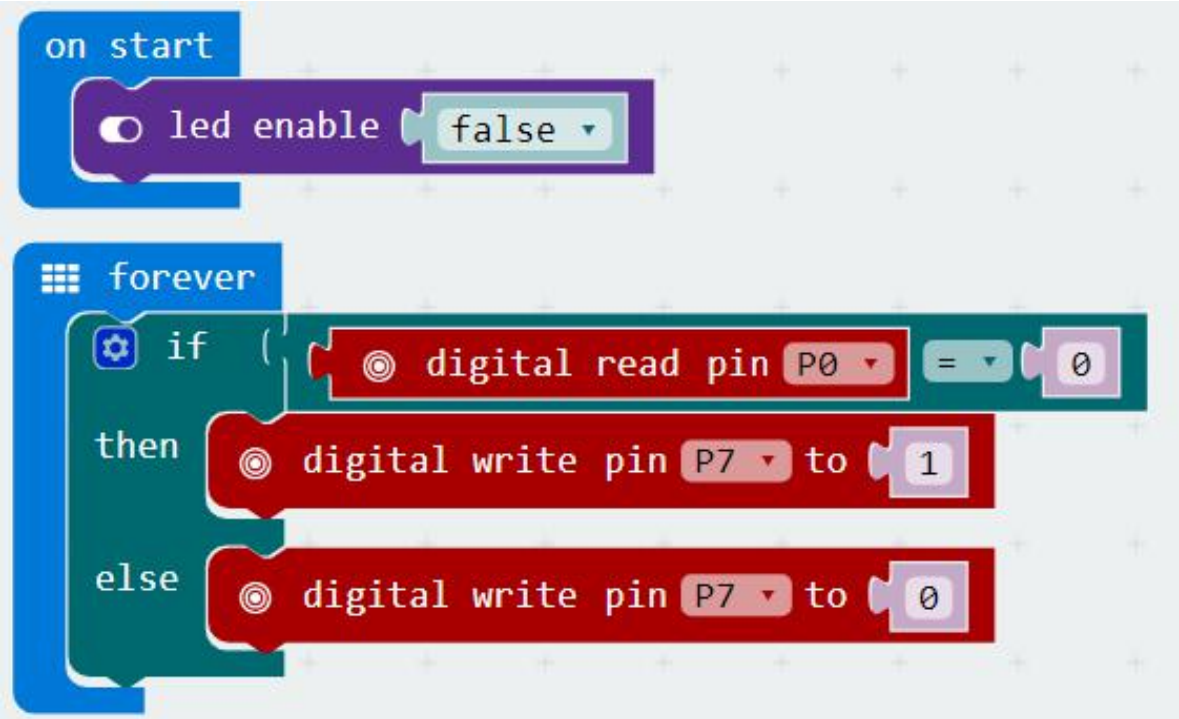


Test Code

If you are not familiar to make code, don't worry.

Firstly, you can enter this link:https://makecode.micro:bit.org/reference to know more about micro:bit blocks.

Then you can directly enter the https://makecode.micro:bit.org/ to edit your project program. Below is an example code we have done for you.



Example Result

Done wiring and powered up, send the above code to micro:bit.

By reading the High/Low level changes of P0 pin to control an LED state. If you slap the table where the sensor locates, when the vibration sensor detects the vibration signal, an LED on the Piranha LED module will lights up, otherwise, LED off.

Project 36: Joystick

Overview

For some DIY projects, you perhaps use a component, that is, joystick module, such as game joysticks. How could they operate?

In this lesson, you will learn how to control a joystick module and micro:bit shield to display the data on serial monitor.

Component Required:

- Micro:bit main board*1
- Keyestudio Micro bit Sensor V2 Shield*1
- USB Cable*1
- keyestudio Joystick Module*1
- Dupont jumper wire*5

Component Introduction

keyestudio Joystick Module:

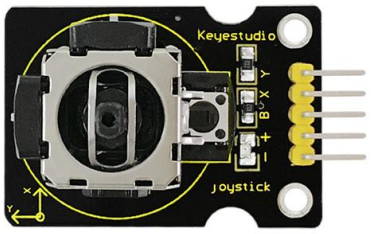
Lots of interactive projects may need joystick. This module provides an affordable solution, easy to use.

On the joystick module, it has 3 signal interfaces, which can simulate the three-dimensional space. The signal pins X and Y will simulate the X-and Y-axis of space. Connect them to Analog Input of microcontroller. By controlling 2 analog input values to control the coordinate of an object in X- or Y-axis.

Another signal pin Z(labeled B on the module) will simulate the Z-axis of space. Generally connected to Digital port, and used as a button.

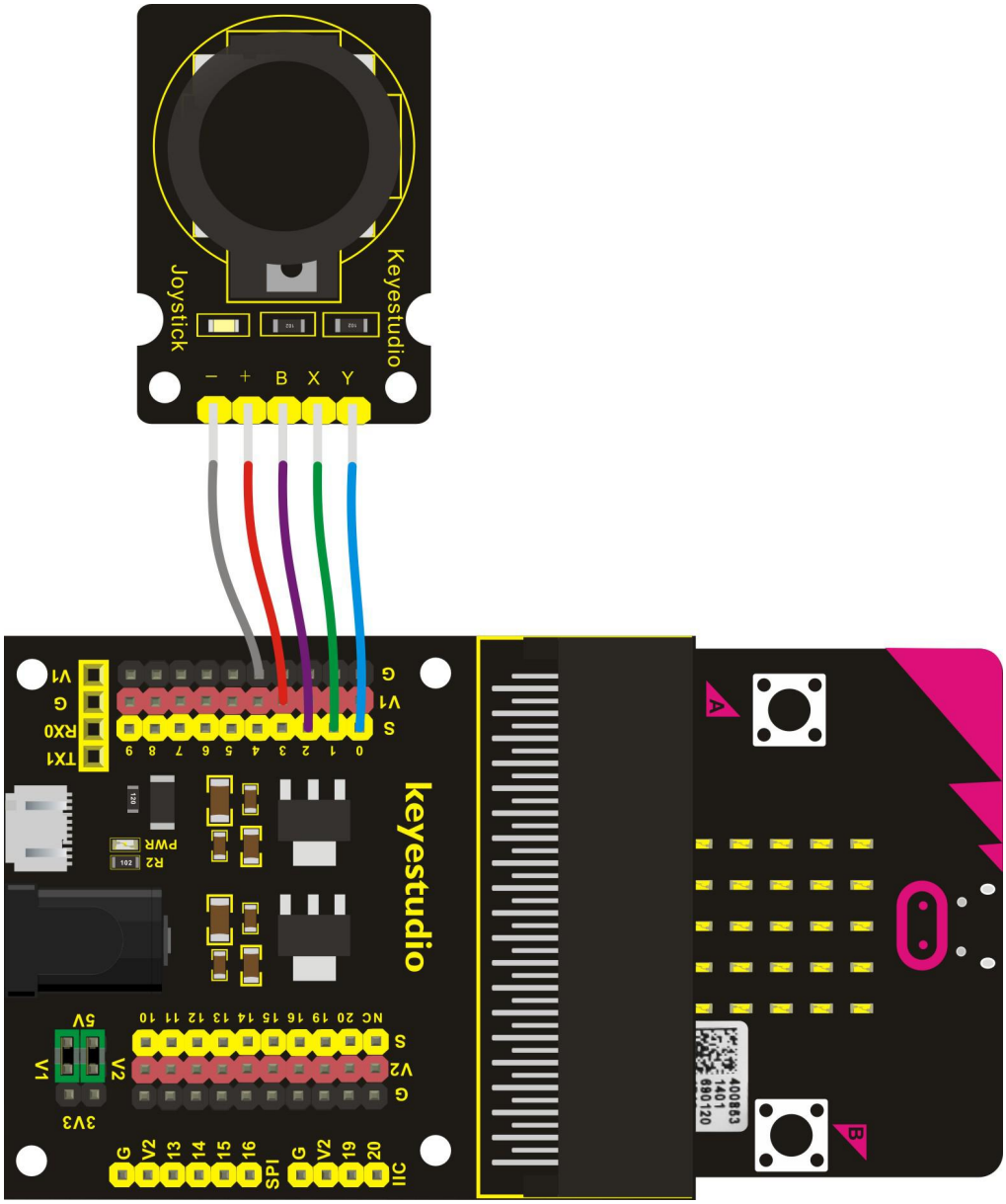
Specifications:

- Supply Voltage: 3.3V to 5V
- Interface: Analog x2, Digital x1
- Size: 40*28mm



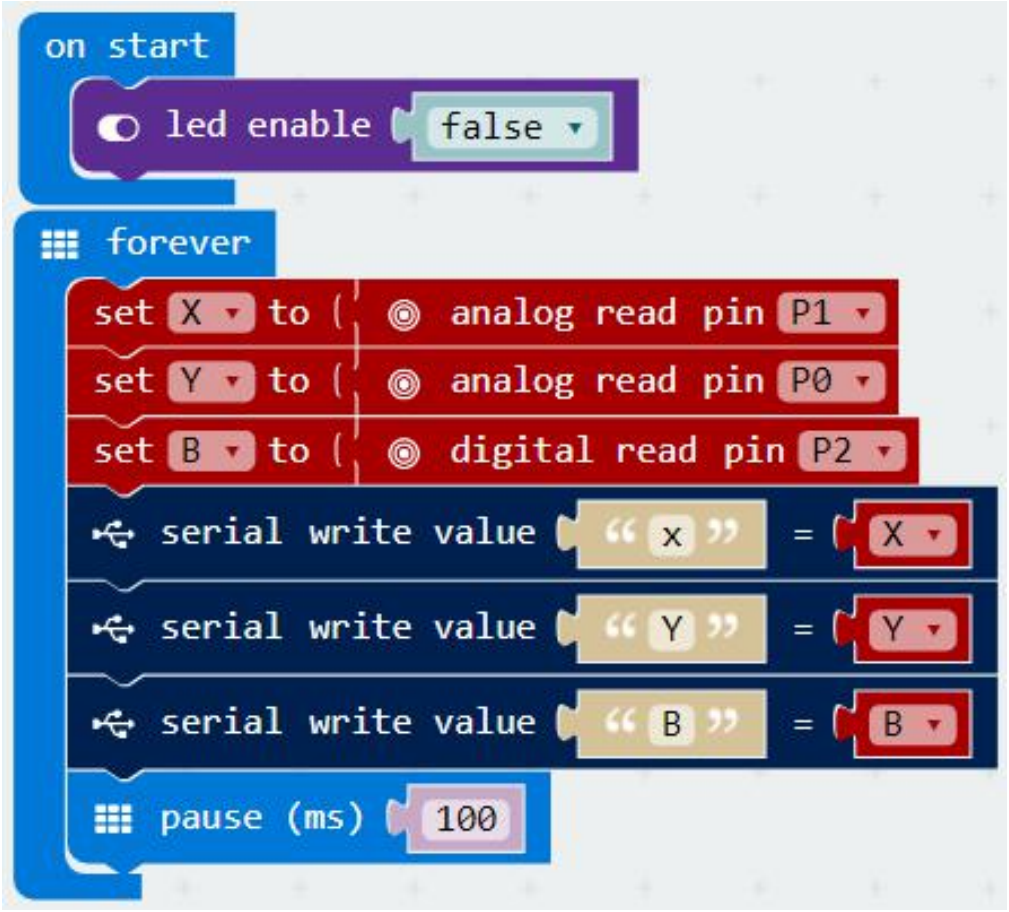
Connect It Up

Insert the micro:bit into keyestudio micro:bit sensor V2 shield. Then connect the joystick module to the shield. Separately connect the signal pins X,Y to P1, P0 of micro:bit, connect the pin B to P2. Shown below.



Test Code

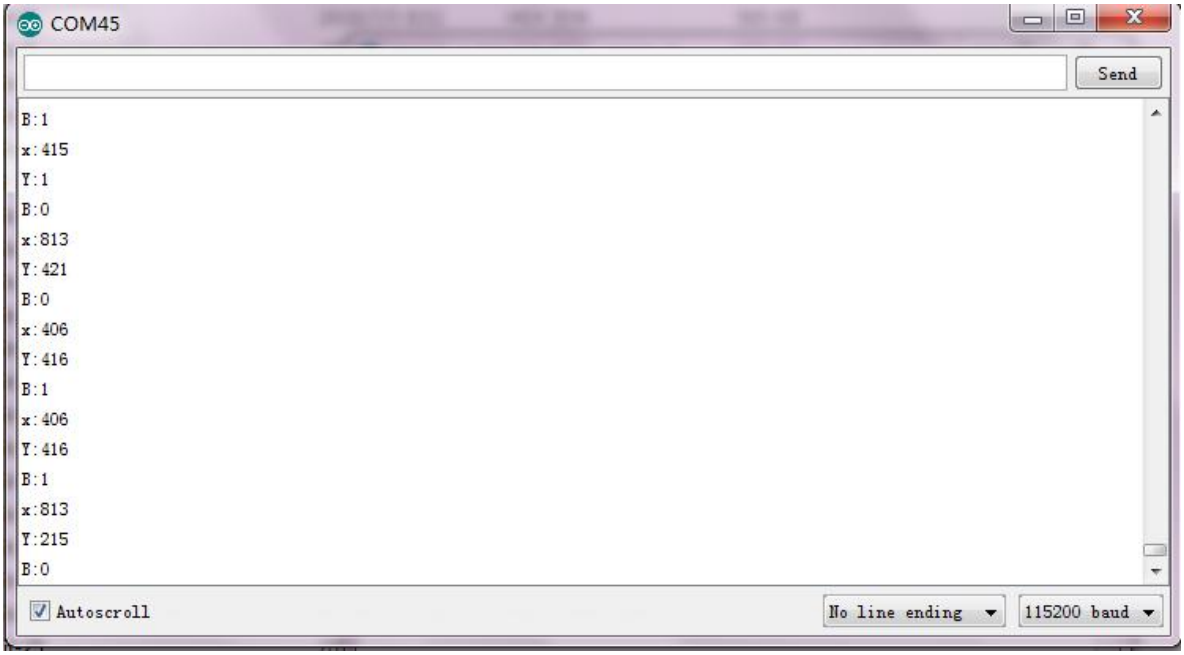
If you are not familiar to make code, don't worry. Firstly, you can enter this link:https://makecode.micro:bit.org/reference to know more about micro:bit blocks. Then you can enter the https://makecode.micro:bit.org/ to edit your project program. Below is an example code we done for you.



Example Result

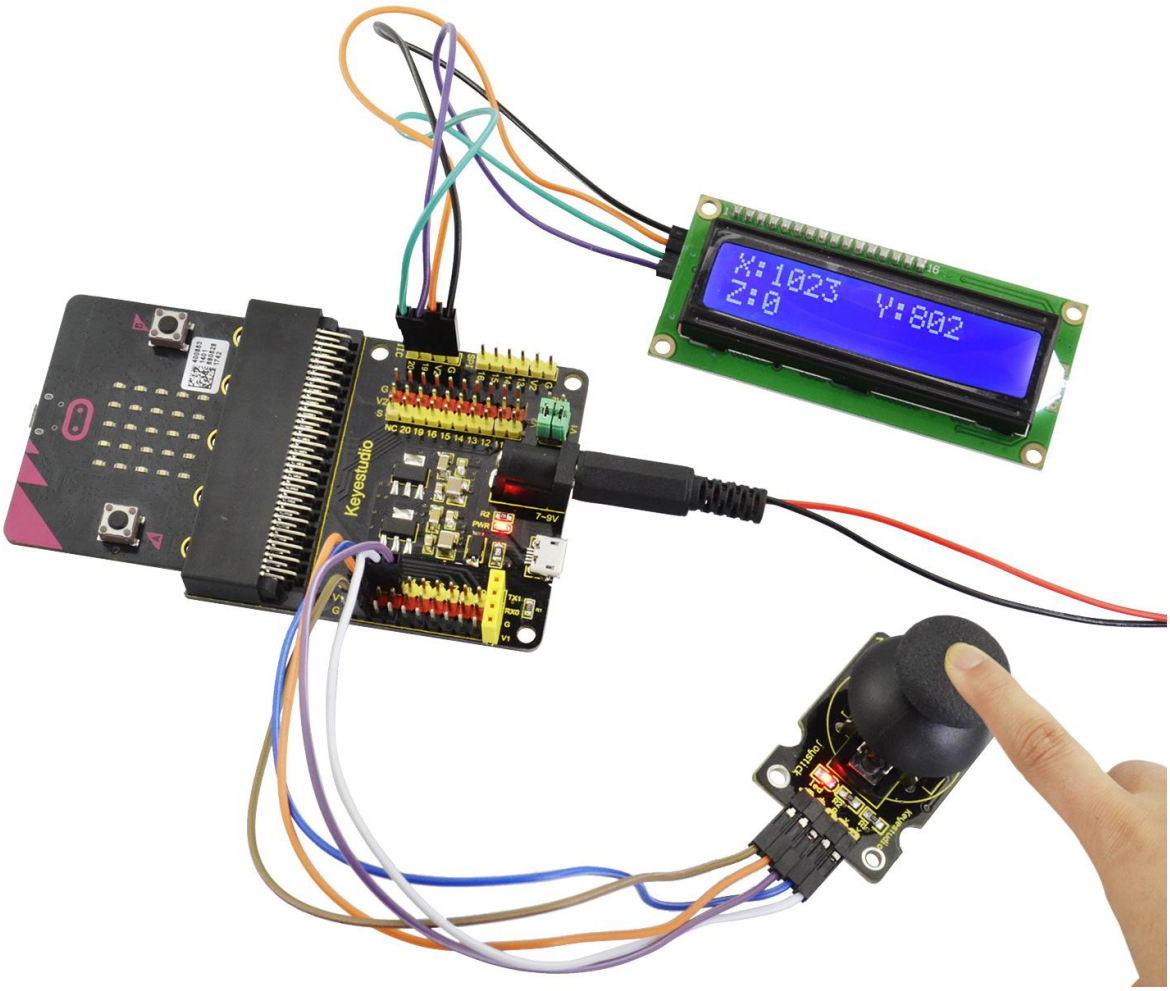
Done wiring and powered up, send the above code to micro:bit.

Then open the serial monitor of arduino software, you should see the value of X,Y and B pins. If push the joystick, the value will change.



Extension Experiment

In the experiment, you can push the joystick to get the analog value of X and Y-axis, digital value of Z-axis, displaying them on 1602LCD.



Project 37: Micro Servo

Overview

For those DIY smart cars, they often have a function of automatic obstacle avoidance. In the DIY process, we need a servo to control the ultrasonic module to rotate left and right, and then to detect the distance between car and obstacles, so as to control the car to avoid obstacles.

If use other microcontrollers to control the rotation of servo, we need to set a pulse of a certain frequency and a certain width in order to control the servo angle.

But if use the micro bit main board to control the servo angle, we only need to set the control angle in the development environment. The corresponding pulse will be automatically set in the development environment to control the servo rotation.

In this project, you will learn how to control the micro servo rotate back and forth between 0°and 90°.

Component Required:

- Micro:bit main board*1
- Keyestudio Micro bit Sensor V2 Shield*1
- USB Cable*1
- keyestudio Micro Servo*1
- Dupont jumper wire*3

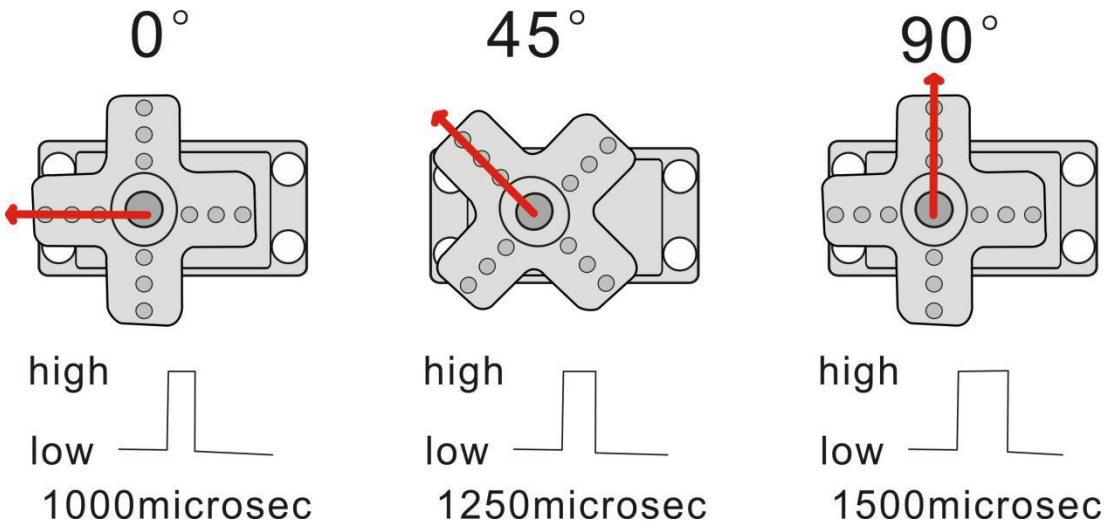
Component Introduction

keyestudio Micro Servo:

The servo has three interfaces,distinguished by brown, red and orange line (different brand may have different color). Brown line is for GND, red one for power 5V, orange one for signal terminal (PWM signal).

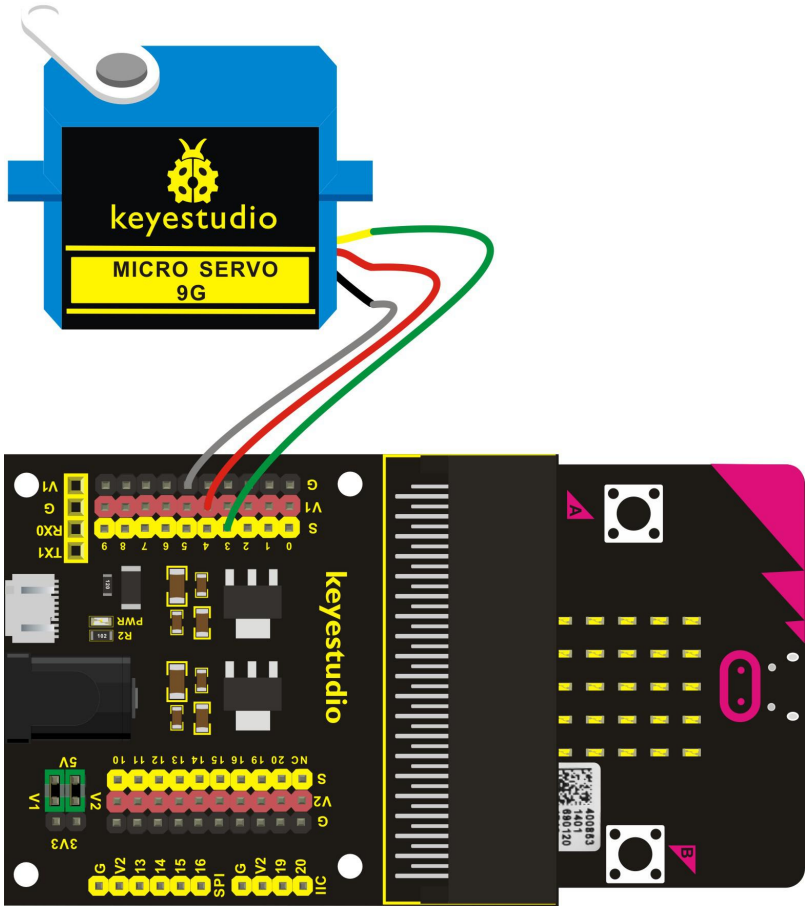
The rotation angle of servo is controlled by regulating the duty cycle of the PWM(Pulse-Width Modulation) signal. The standard cycle of the PWM

signal is fixed at 20ms (50 Hz), and the pulse width is distributed between 1ms-1.5ms. The pulse width corresponds to the rotation angle (0°～90°).



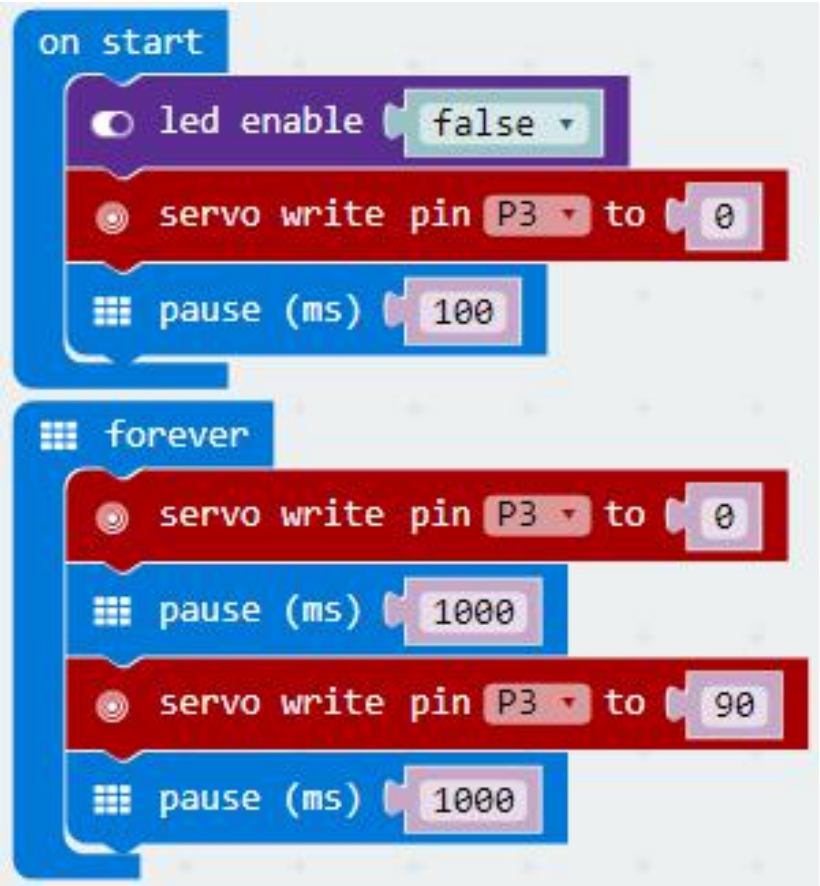
Connect It Up

Insert the micro:bit into keyestudio micro:bit sensor V2 shield. Then connect the micro servo to the shield. Connect the signal line to P3 of micro:bit, power line to V1 header, ground line to ground header.



Test Code

If you are not familiar to make code, don't worry. Firstly, you can enter this link:https://makecode.micro:bit.org/reference to know more about micro:bit blocks. Then you can enter the https://makecode.micro:bit.org/ to edit your project program. Below is an example code we done for you.



Example Result

Done wiring and powered up, send the above code to micro:bit. You should see the servo turn back and forth between 0°and 90°.

Project 38: Add LCD

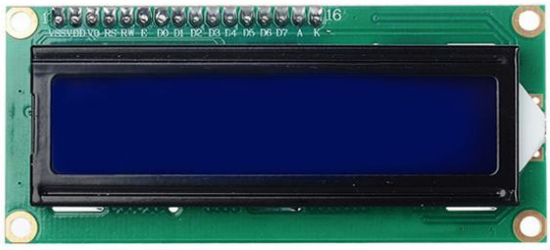
Overview

In life, we can use the display and other sensors to do a variety of experiments. You can DIY a variety of small items. For example, use a temperature module and display to make a temperature tester, or use an ultrasound module and display to make a distance tester.

In the following, we will use keyestudio 1602 I2C module as the display, connect it to I2C pin headers of micro:bit shield. You will learn how to control the 1602 LCD show the character"keyestudio"and number.

Component Required:

- Micro:bit main board*1
- Keyestudio Micro bit Sensor V2 Shield*1
- USB Cable*1
- keyestudio 1602 I2C Module*1
- Dupont jumper wire*3



Component Introduction

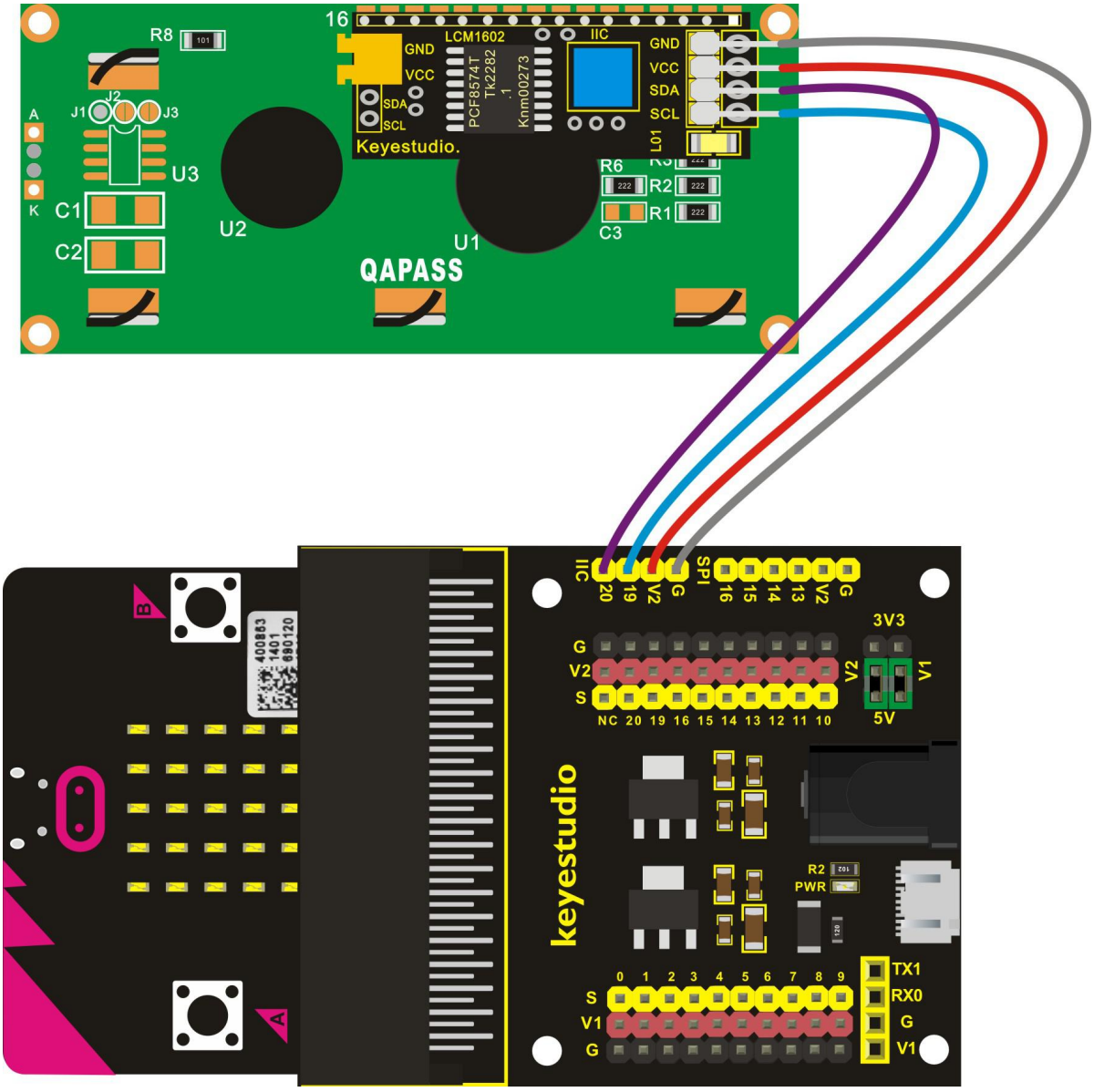
keyestudio 1602 I2C Module:

This module is a LCD 16x2 display, useful for creating standalone projects.

- 16 characters wide, 2 rows;
- White text on blue background;
- Chip Operating Voltage: 4.5-5.5V
- Working Current: 2.0mA (5.0V)
- Optimum working voltage of the module is 5.0V
- Single LED backlight included can be dimmed easily with a resistor.
- Built in character set supports English text
- Comes with necessary contrast potentiometer

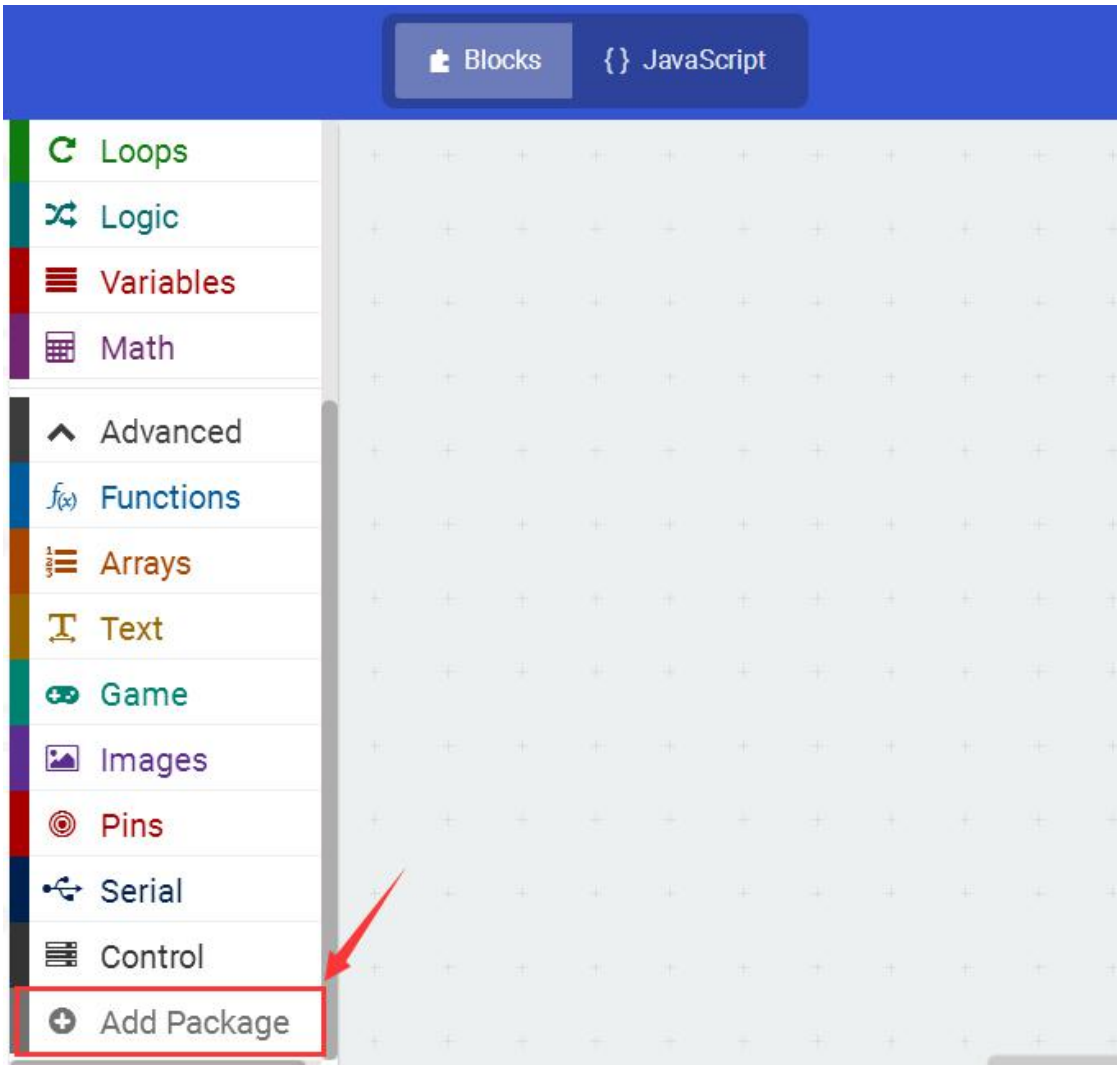
Connect It Up

Insert the micro:bit into keyestudio micro:bit sensor V2 shield.Then connect the 1602 LCD to IIC pin headers on the shield. Connect the SCL pin to P19, SDA pin to P20, VCC pin to V2 , GND to ground. Shown below.

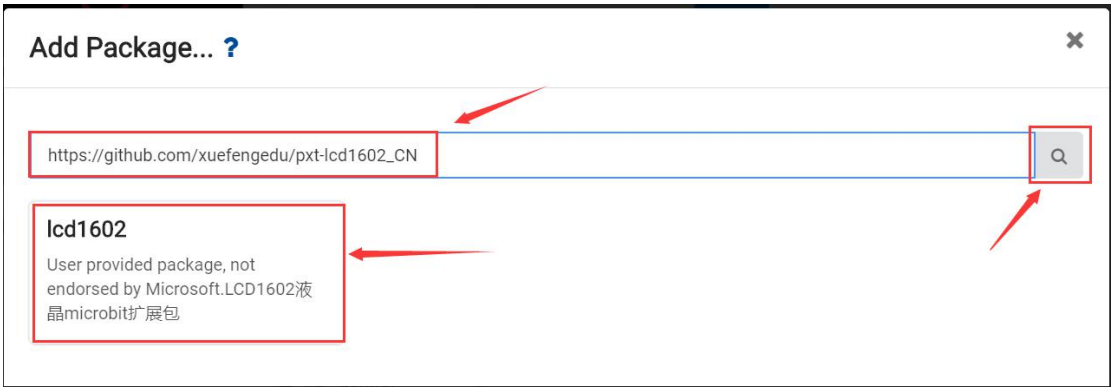


Test Code

Enter the https://makecode.micro:bit.org/ to edit your project program. Here you should add the package to set the code. Shown as follows:



Then on the bar search the link, you should see as below.



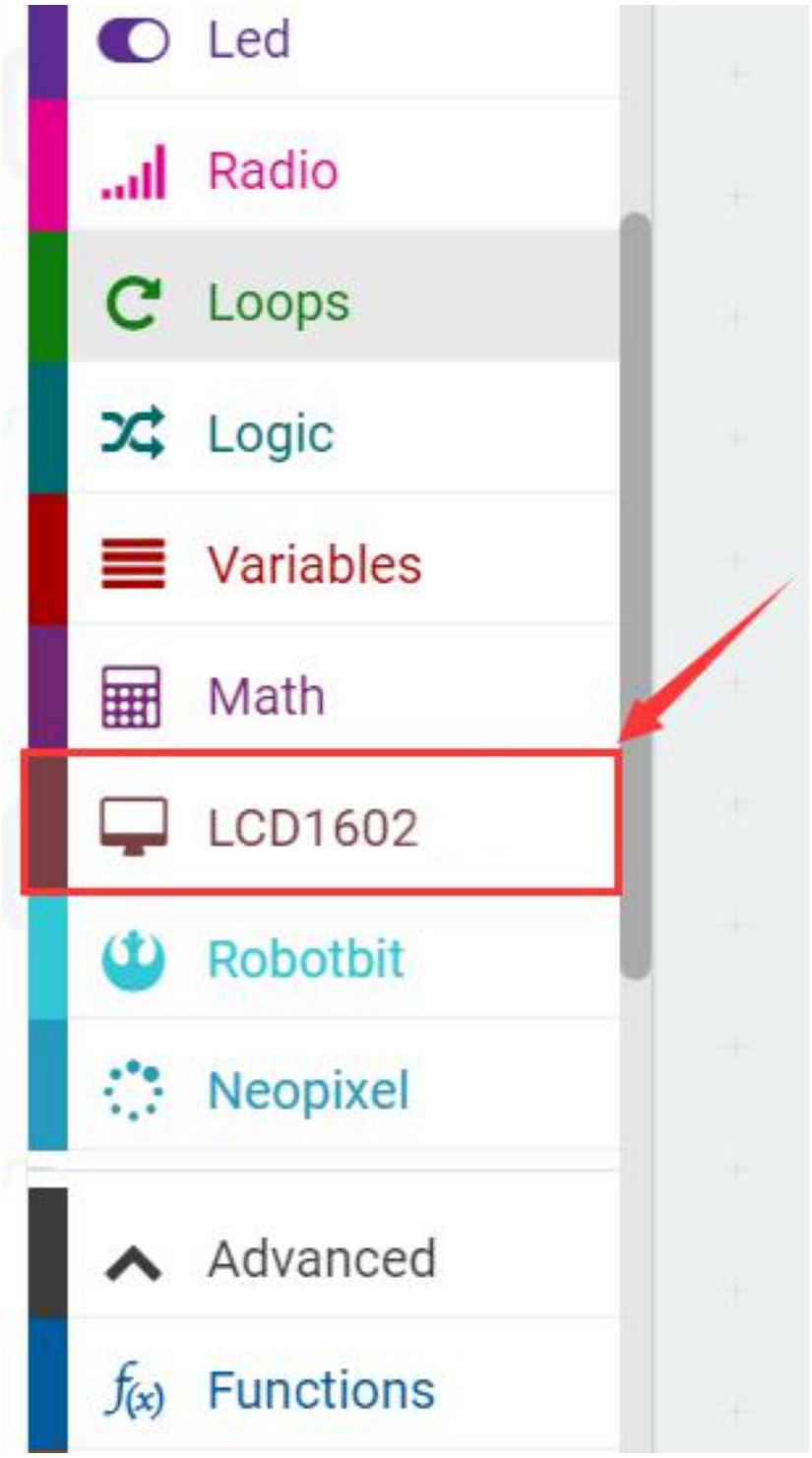
Libraries download from this link below:

https://github.com/xuefengedu/pxt-lcd1602_CN

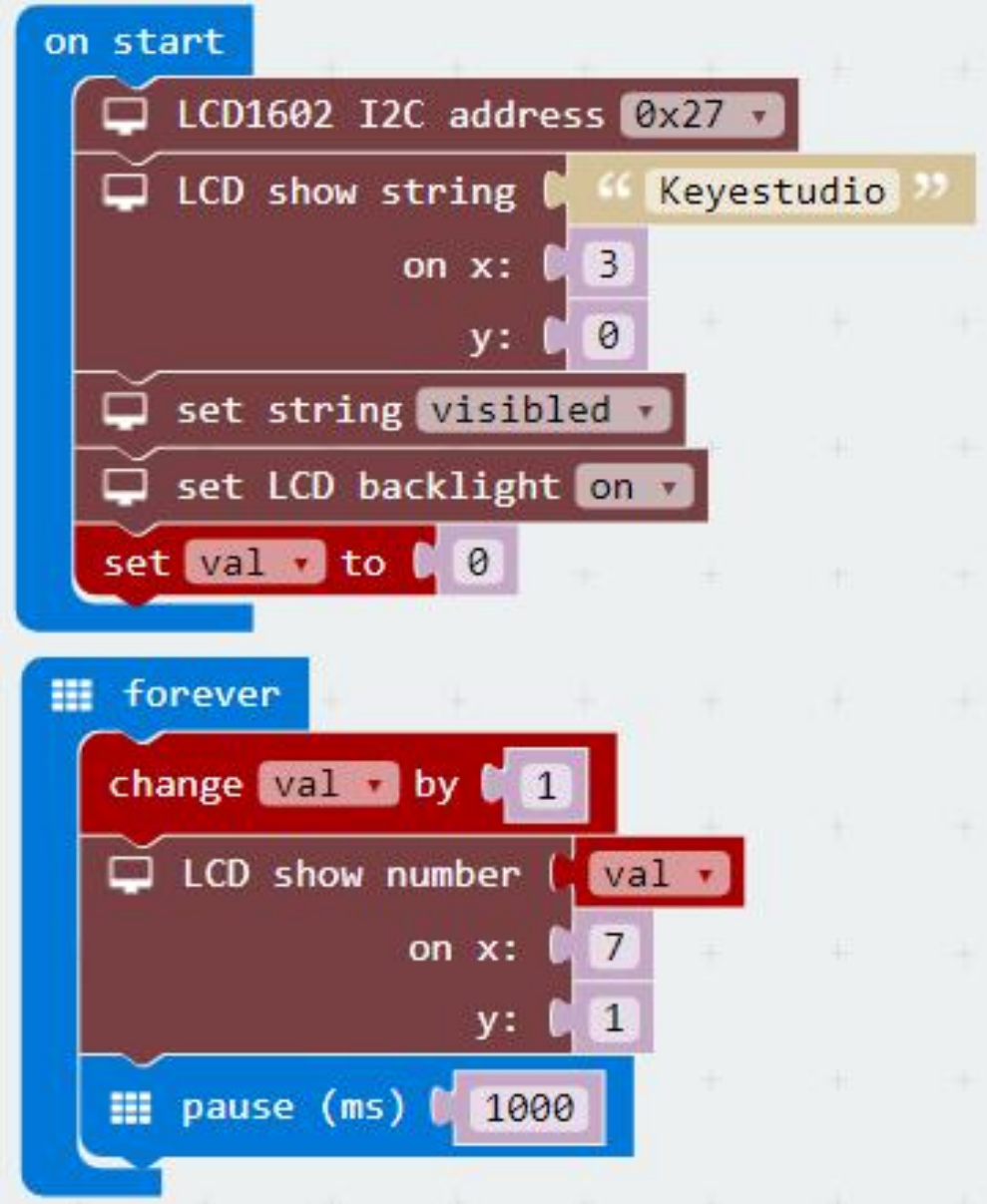
Click the **lcd1602** to download the package.

After that, you should see the LCD 1602 module successfully added on the

Editor Block. Shown below.



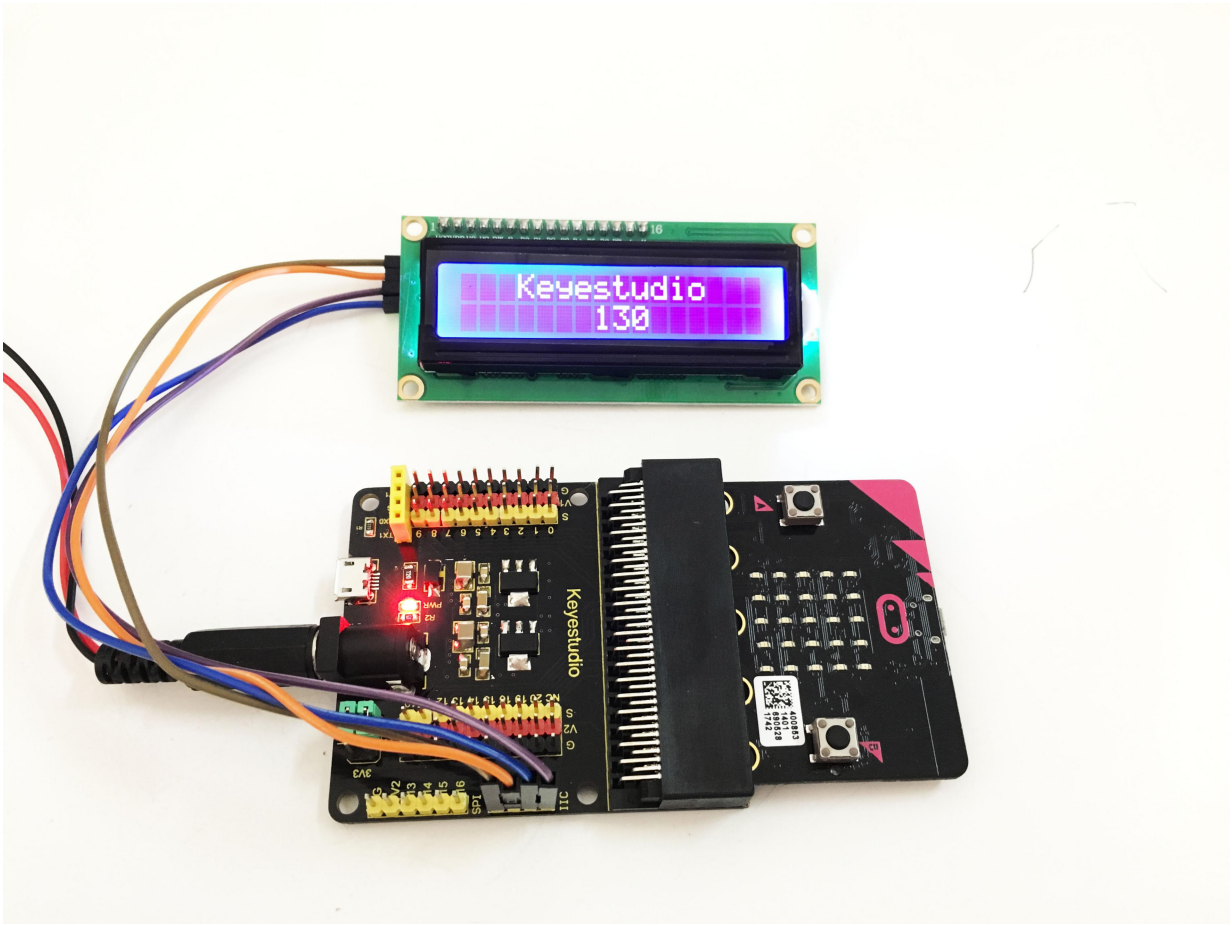
Finally, you should see the code shown below.



Example Result

Done wiring and powered up, send the above code to micro:bit.

You should see the character "Keyestudio" is showed on the first line of LCD screen, on the second line show the number. And the number will plus 1 per second.


Keyestudio
130
Keyestudio

8. Resources Link

1) Keyestudio Official Website: http://www.keyestudio.com/
2) Keyestudio WIKI Website: http://wiki.keyestudio.com/
3) User Guide Download:

   https://drive.google.com/open?id=1d5ZKPxedhzJ8Gw6eJmbHmBIzbmNtmR1z
4) Source Code for All projects:

   https://drive.google.com/open?id=1Bsr5cAwEr2RhPYiU81weKX57dVHVeNih
5) Code Libraries Download:

   https://github.com/xuefengedu/pxt-lcd1602_CN
6) Micro:bit Driver Software:

   https://drive.google.com/open?id=1DMwiSb91XnIRtTaYvIEIil6zrAHVuHmt
7) Arduino Software Link：

   https://drive.google.com/open?id=1ivTOKCKgkmEuBtZpLI75XKryGI-xx-xF
8) Arduino Official Website: https://www.arduino.cc
9) BBC micro bit Pins: http://micro:bit.org/guide/hardware/pins/
10) BBC micro:bit website: http://micro:bit.org/
11) Micro:bit MakeCode Block Editor: https://makecode.micro:bit.org/
12) Code Block Reference: https://makecode.micro:bit.org/reference
13) Meet micro:bit starter programming: http://micro:bit.org/guide/
14) BBC micro:bit Features Guide: http://micro:bit.org/guide/features/
15) BBC micro:bit Safety Warnings: http://micro:bit.org/guide/features/
16) BBC micro:bit Quick Start Guide: http://micro:bit.org/guide/quick/

Our Tutorial

This tutorial is designed for everyone to play the MICRO:BIT. You will learn all the basic information about how to control the micro:bit, controller board, sensor modules and more to make interactive projects. Easy play and enjoy your time!
Is it great? Well, it's just the beginning of MICRO:BIT's journey. There are more and more awesome projects for you to explore. Furthermore, our KEYESTUDIO research and development team will continue to explore on this path, walking you through the basics up to complex projects. Hope that you can enjoy our works!

About keyestudio

Located in Shenzhen, the Silicon Valley of China, KEYES DIY ROBOT CO.,LTD is a thriving technology company dedicated to open-source hardware research & development, production and marketing. Keyestudio is a best-selling brand owned by KEYES Corporation, our product lines rang from Arduino boards, shields, sensor modules, Raspberry Pi, micro:bit extension boards and smart car to complete starter kits designed for customers of any level to learn Arduino knowledge.
All of our products comply with international quality standards and are greatly appreciated in a variety of different markets throughout the world. For more details of our products, you can check it from the links below.

Official website: http://www.keyestudio.com/
US Amazon storefront: http://www.amazon.com/shops/A26TCVWBQE4D9T
CA Amazon storefront: http://www.amazon.ca/shops/A26TCVWBQE4D9T
UK Amazon storefront: http://www.amazon.co.uk/shops/A39F7KX4U3W9JH
DE Amazon storefront: http://www.amazon.de/shops/A39F7KX4U3W9JH
FR Amazon storefront: http://www.amazon.de/shops/A39F7KX4U3W9JH
ES Amazon storefront: http://www.amazon.de/shops/A39F7KX4U3W9JH
IT Amazon storefront: http://www.amazon.de/shops/A39F7KX4U3W9JH
US Amazon storefront: http://www.amazon.com/shops/APU90DTITU5DG
CA Amazon storefront: http://www.amazon.ca/shops/APU90DTITU5DG
JP Amazon storefront: http://www.amazon.jp/shops/AE9VWCCXQIC6J

Customer Service

As a continuous and fast growing technology company, we keep striving our best to offer you excellent products and quality service as to meet your expectation. We look forward to hearing from you and any of your critical comment or suggestion would be much valuable to us.
You can reach out to us by simply drop a line at Fennie@keyestudio.com

Thank you in advance.