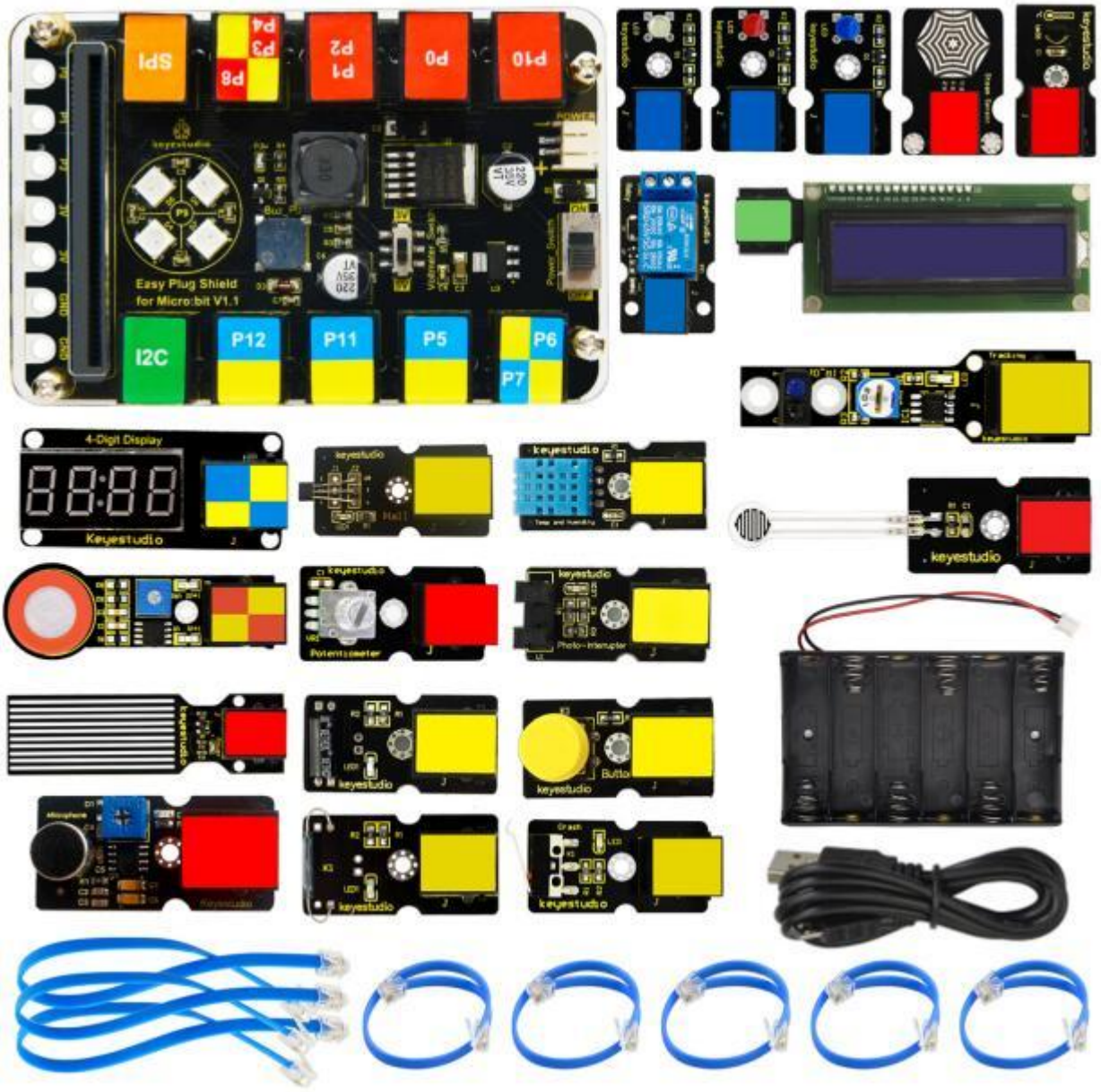
EASY PLUG Super Starter Kit for BBC MICRO:BIT STEM EDU



CONTENT

1. Description

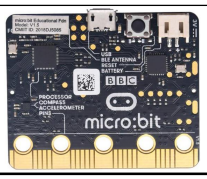
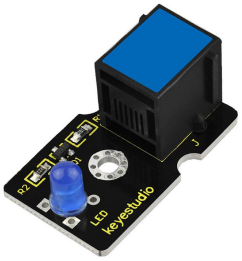
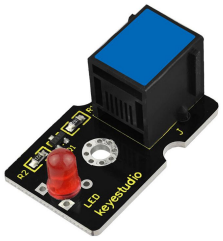
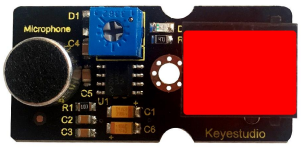
Micro:bit is significantly applied to STEM education for teenagers, as a small microcontroller, which features small in size, easy to carry, and powerful function. At present, innovative technology products, like robots, wearable devices and interactive electronic games can be produced by programming and code.

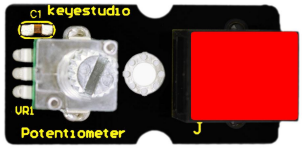
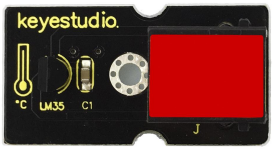
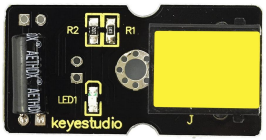
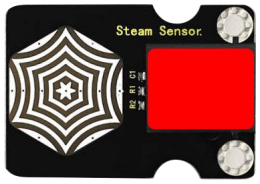
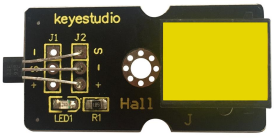
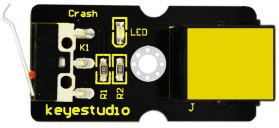
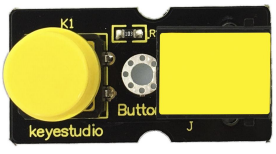
MakeCode is a framework for creating interactive and engaging programming experiences for those new to the world of programming. The platform provides the foundation for a tailored coding experience to create and run user programs on actual hardware or in a simulated target.

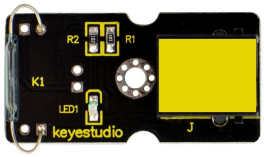
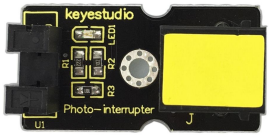
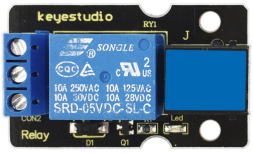
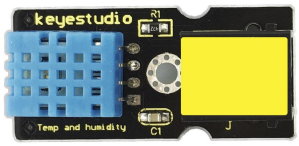
To make you deeply know the micro:bit, we also provide test code and projects.

This super starter kit incorporates different sensors and modules such as passive buzzer, 1602 LCD module, RGB, crash sensor and so on. The detailed projects, from simple to difficult will spur your inspiration and bring in the magical programming world.

2. Kit List

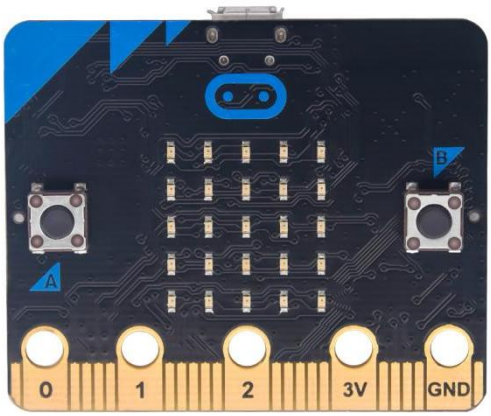
#	Component	Quantity	Picture
0	Micro:bit board is **Not Included** in KS4020 Kit		
0	Micro:bit board is **Included** in KS4021 Kit	1	
1	EASY Plug Shield for Micro bit V1.1	1	
2	EASY Plug While LED Module	1	
3	EASYP Plug Blue LED Module	1	
4	EASY Plug Red LED Module	1	
5	EASY Plug thin-film Pressure Sensor	1	
6	EASY Plug Analog Sound Sensor	1	

7	EASY plug Water Level Sensor	1	
8	EASY plug Potentiometer Sensor	1	
9	EASY Plug Analog Alcohol Sensor	1	
10	EASY Plug LM35 Temperature Sensor Module	1	
11	EASY Plug Digital Tilt Sensor Module	1	
12	EASY plug Steam Sensor	1	
13	EASY Plug Hall Magnetic Sensor	1	
14	EASY Plug Crash Sensor	1	
15	EASY Plug Digital Push Button	1	

16	EASY Plug Reed Switch Module	1	
17	EASY Plug Line Tracking Sensor	1	
18	EASY Plug Photo Interrupter Module	1	
19	EASY Plug Single Relay Module	1	
20	EASY plug DHT11 Temperature and Humidity Sensor	1	
21	EASY Plug 1602 LCD Module	1	
22	EASY Plug 4-digit LED Display	1	
23	200mm Blue RJ11 Cable	5	
24	300mm Blue RJ11 Cable	3	

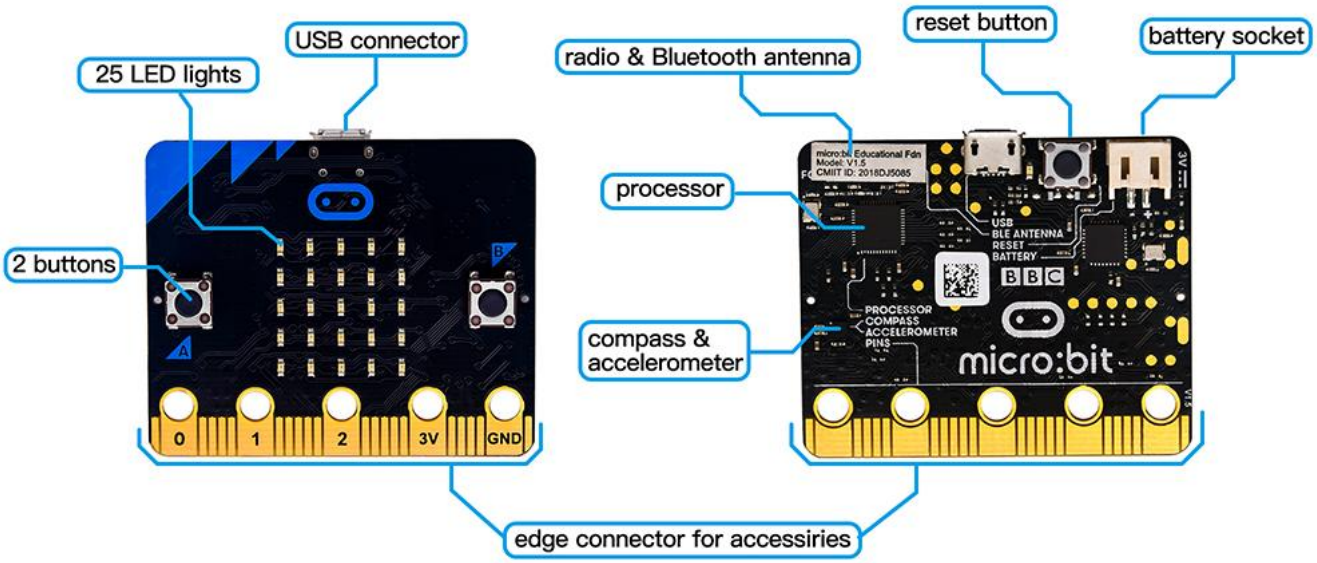
25	Micro USB cable	1	
	6-Slot AA Battery Holder	1	
	1.5V AA Battery	6	

3. Micro:bit



For more details, enter the website please: https://microbit.org/guide/

Function:



Features:

- NRF51822 processor（16 MHz 32bit, ARM Cortex-M0, Bluetooth 4.0 low consumption/2.4GHz RF wireless, 16kB RAM and 256kB Flash)
- KL26Z micro controller（48 MHz ARM Cortex-M0+ core,128 KB Flash)
- 25 pcs programmable LEDs
- 2 programmable buttons
- Physical pins
- Light and temperature sensors
- Accelerometer(MMA8652 and I2C get the data from accelerator sensor)
- Geomagnetic sensor/compass (MAG3110, I2C obtain three-axis geomagnetic data)
- Wireless communication，by radio and Bluetooth.

Micro USB port

More details, please enter website:

https://microbit.org/guide/features/

Hardware:

The details of micro:bit board: https://tech.microbit.org/hardware/

Micro:bit Pins:

Before getting started with the following projects, firstly need to figure out each pin of micro:bit main board.

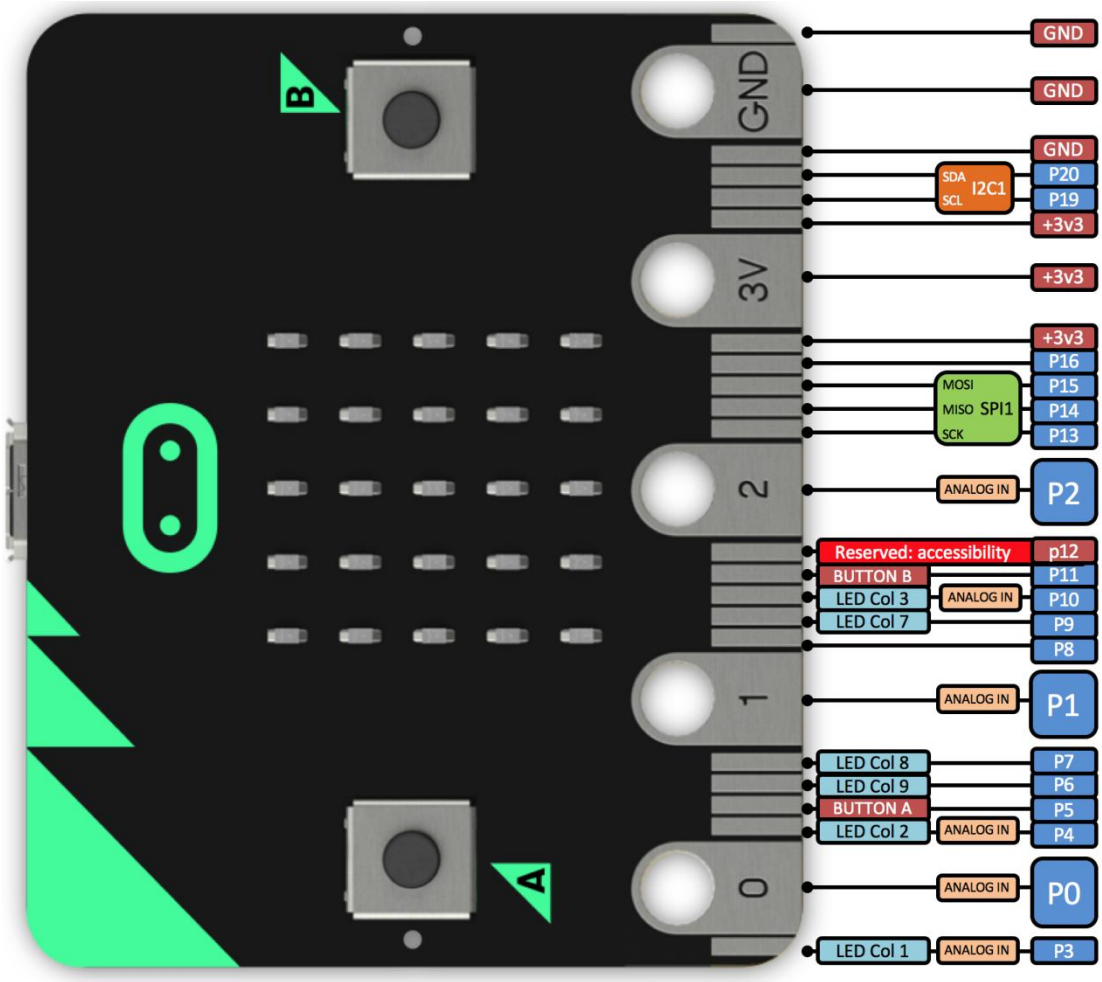
The BBC micro:bit has 25 external connections on the edge connector of the board, which we refer to as "pins".

The edge connector is the gray area on the right side of the figure below.

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.

Please refer to the following diagram shown below.



More details you could refer to the official website:

https://microbit.org/guide/hardware/pins/

3.1. Install Drive of Micro:bit Board

First of all, connect the micro:bit to your computer using a USB cable. And enter website https://fs.keyestudio.com/KS4020-4021 to download the driver file of micro:bit, double-click 

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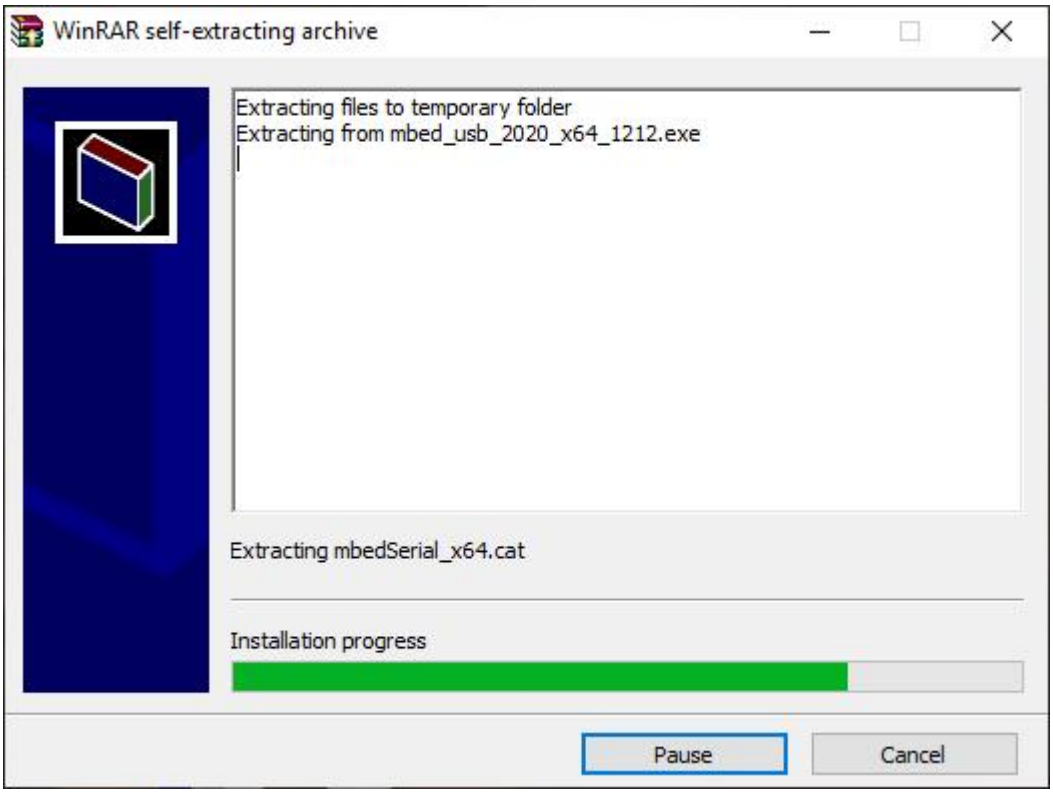
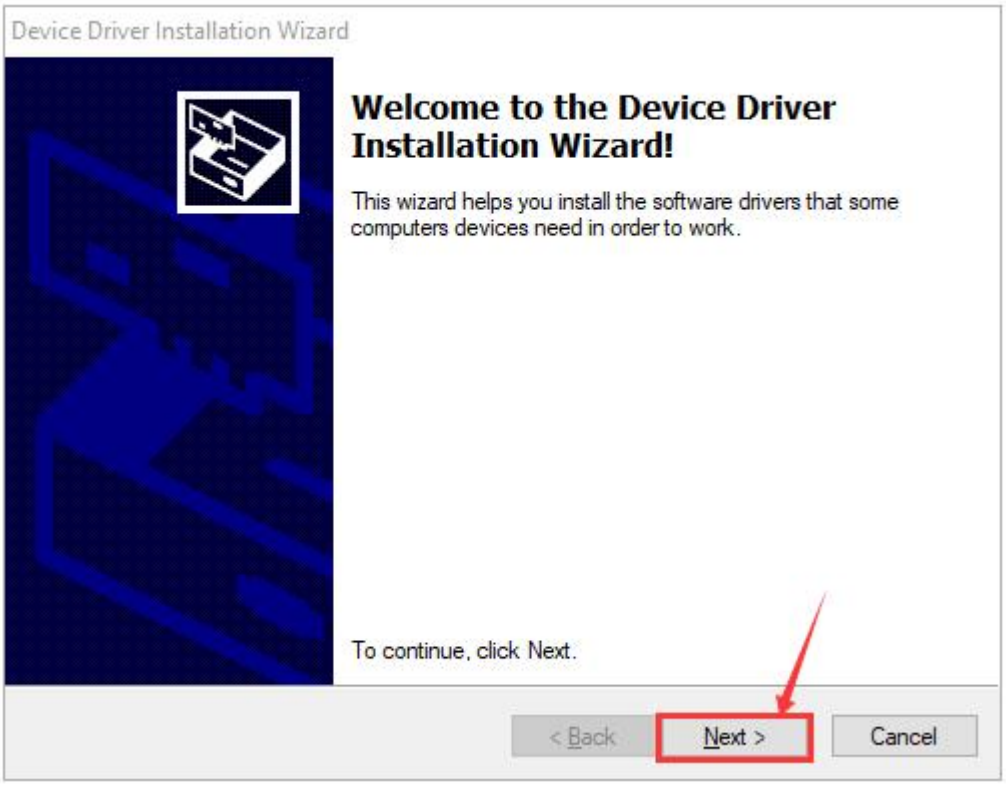
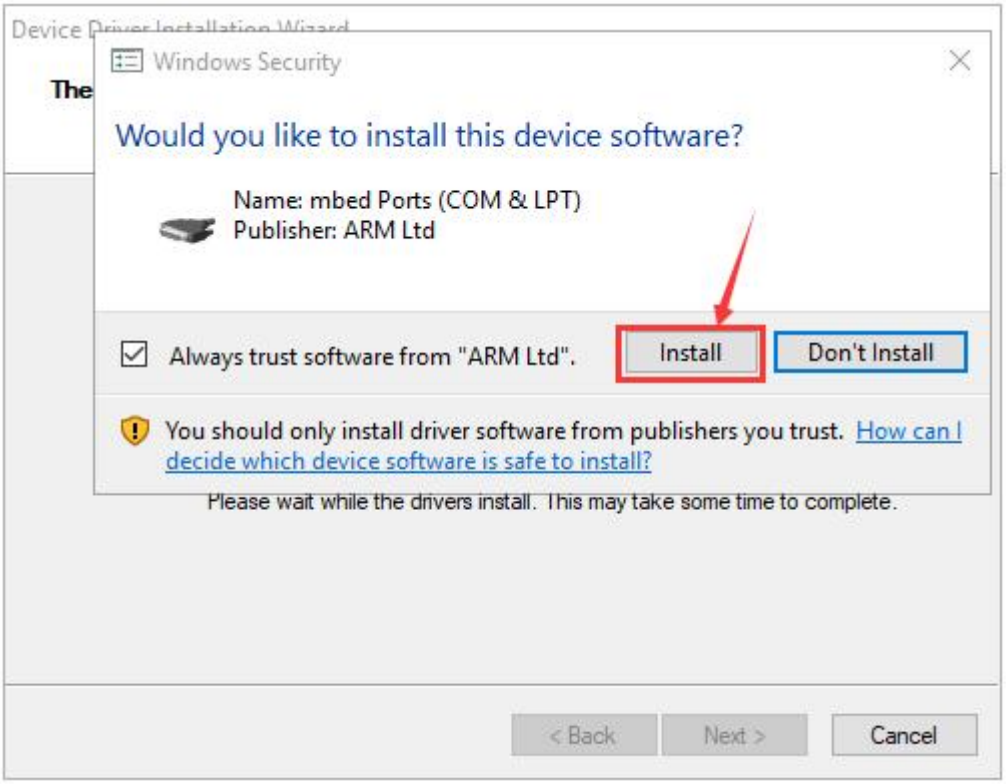
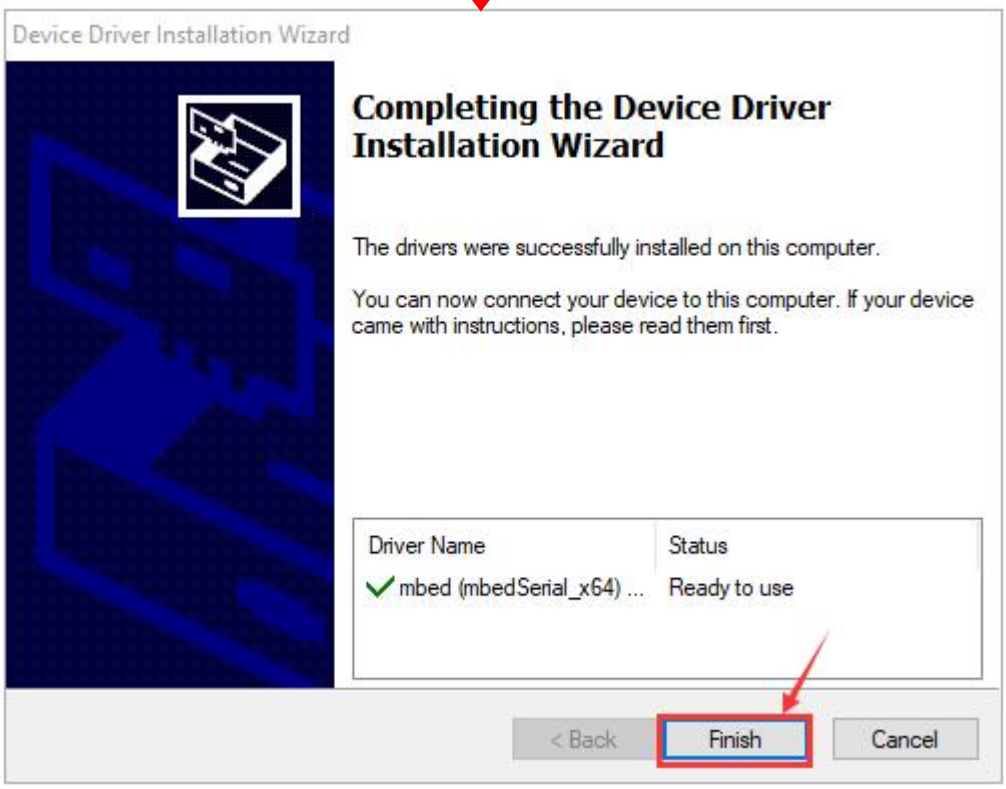


After downloading the driver, then click “Next”

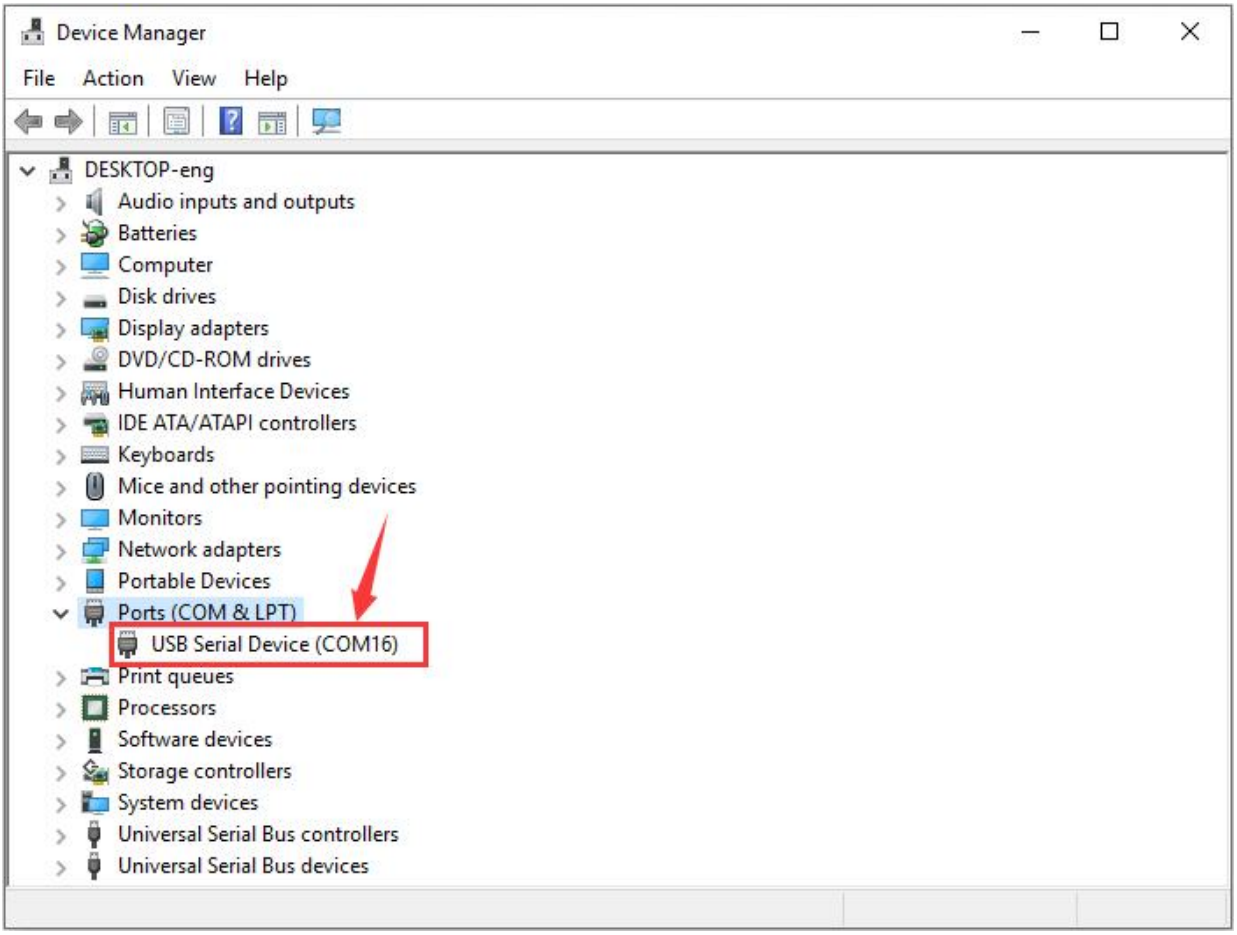


The following page pops up and click “install”





Tap "Finish". Then click "Computer" —> "Properties" —> "Device manager", as shown below.



4. Code and Programming

We take Windows system as example to show you.

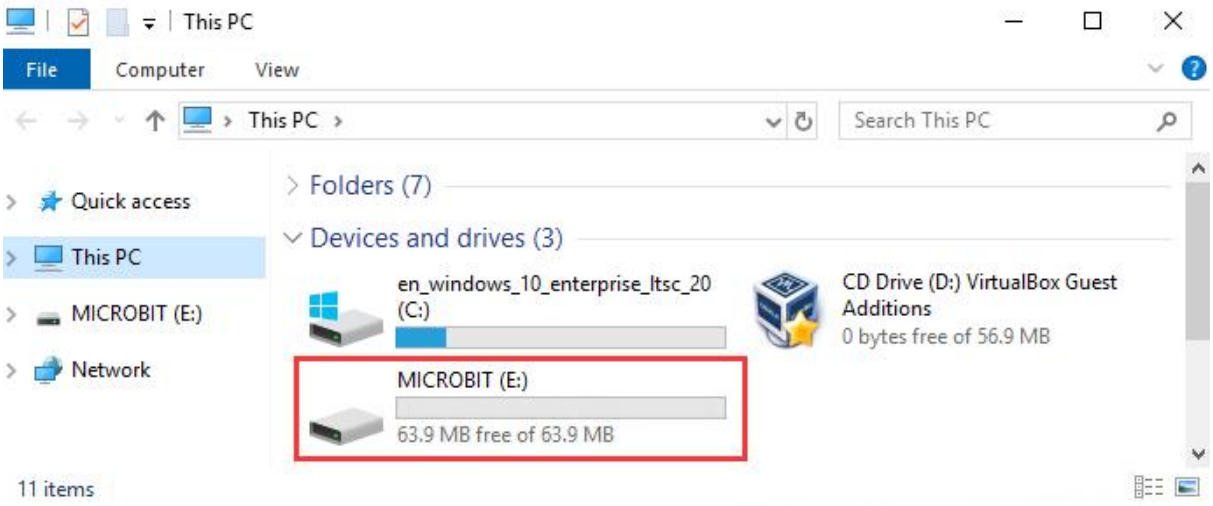
Get started with Micro:bit: Https://microbit.org/guide/quick/

Step 1: Connect Micro：bit Board

Link micro:bit board to computer with USB cable.（Guide to mobile apps：https://microbit.org/get-started/user-guide/mobile/）

Macs ,PCs, Chromebooks and Linux system（including Raspberry Pi) support micro：bit.

There will be a MICROBIT drive in your computer, as shown below:



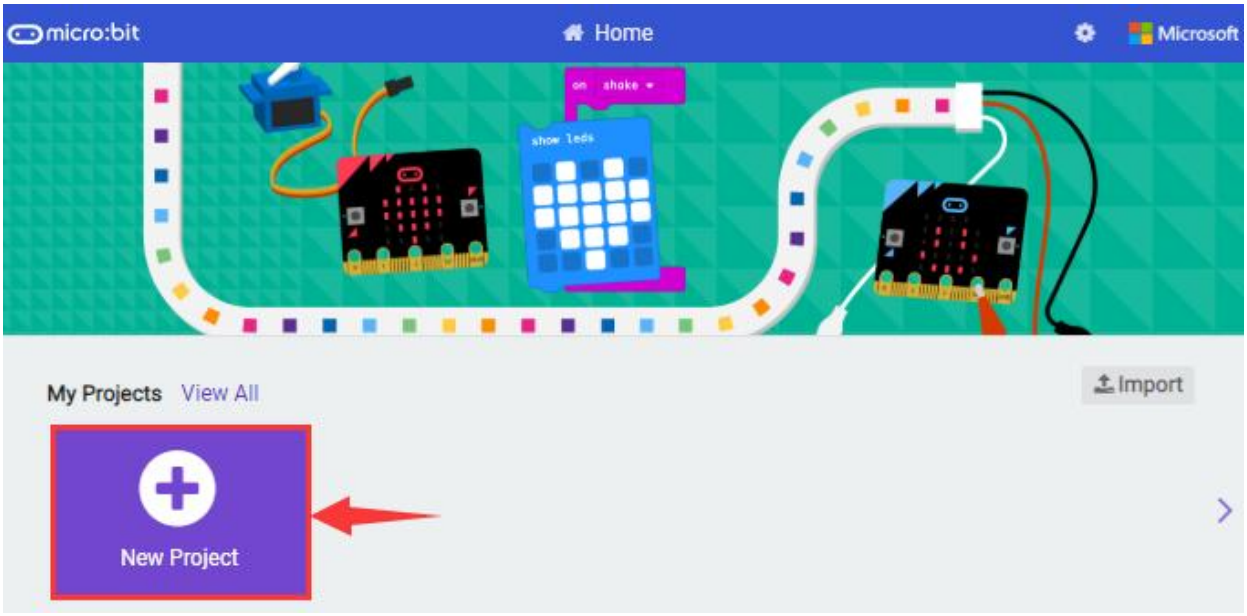
Step 2: Programming

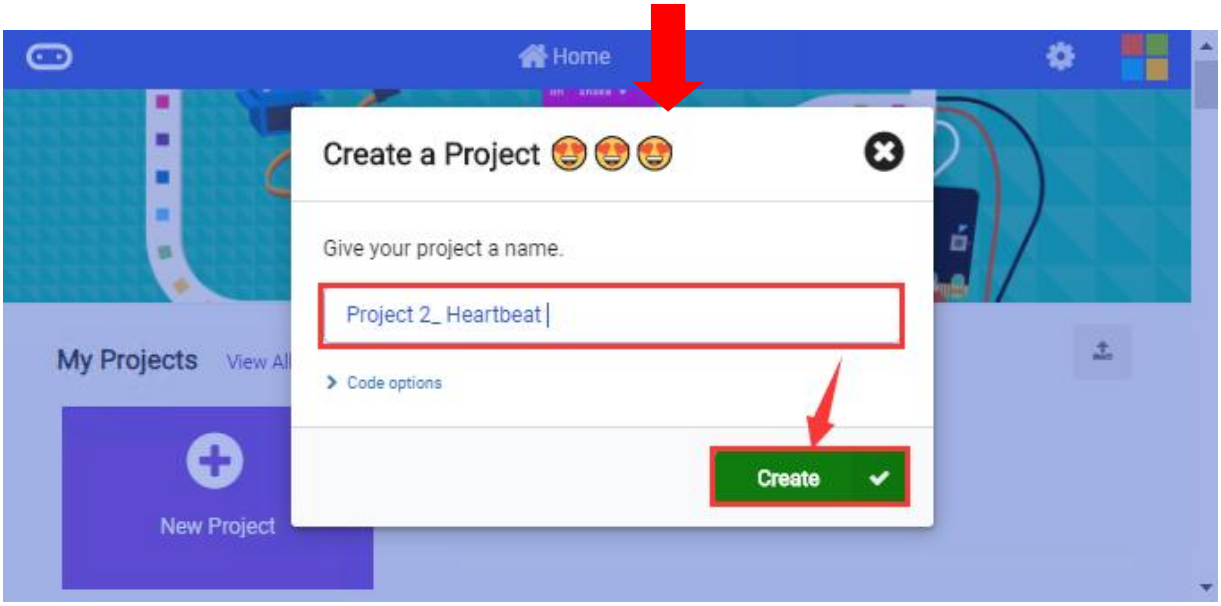
Enter https://makecode.microbit.org/ then click 

and you will view the dialog box.

We recommend you to use Google Chrome

Input “Project 2_ Heartbeat” to name your project and click “Create”

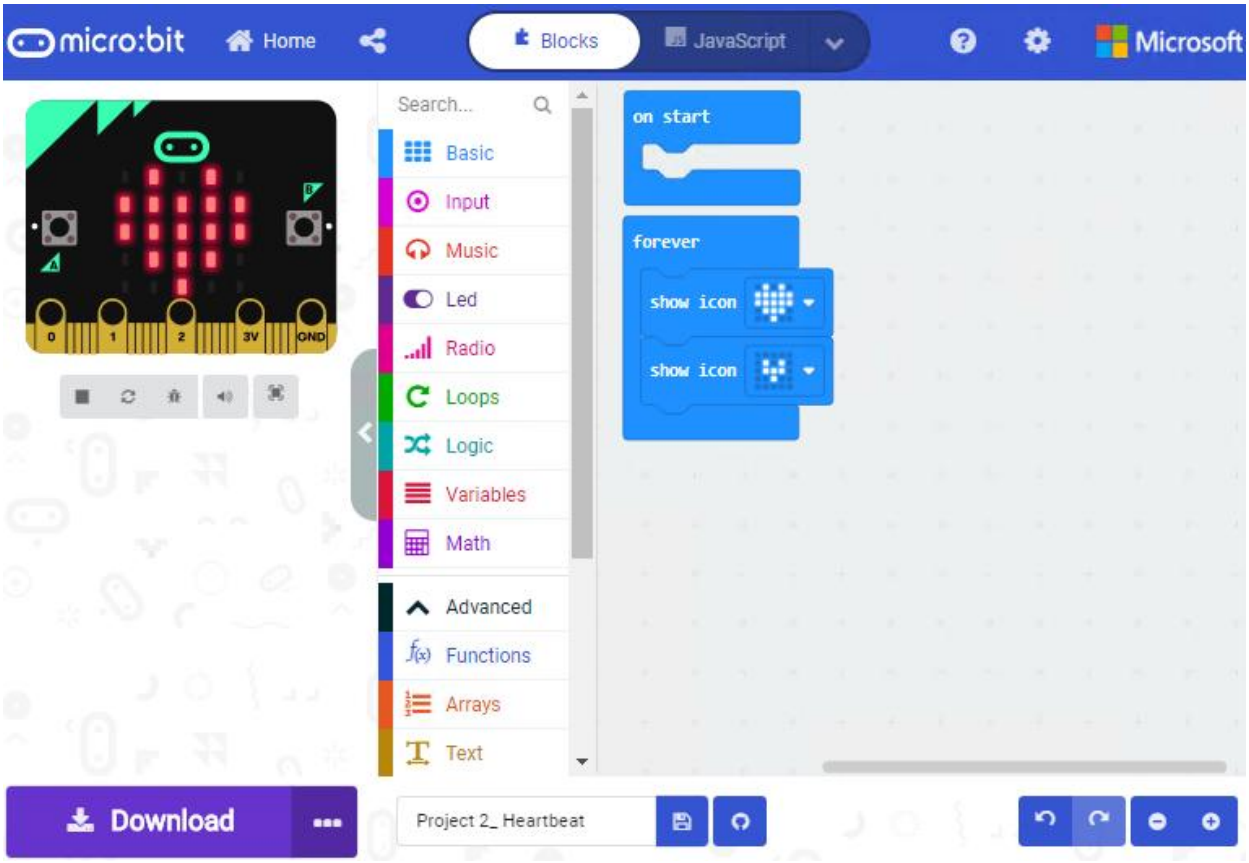




Through MakeCode editor, you just need to drag blocks into code editing area to design program. There is a video to show you how to finish “heartbeat” pattern.

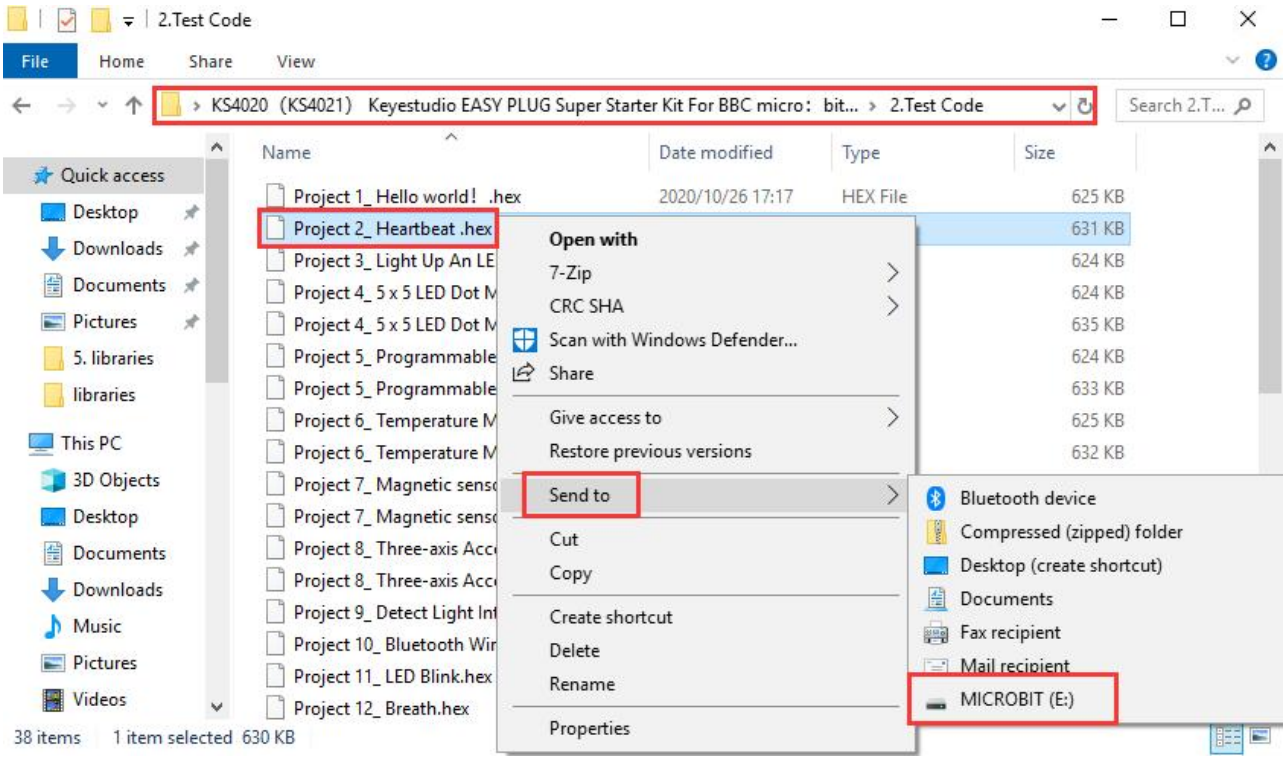
microbit-heartbeat.mp4

Next, we will introduce Makecode.



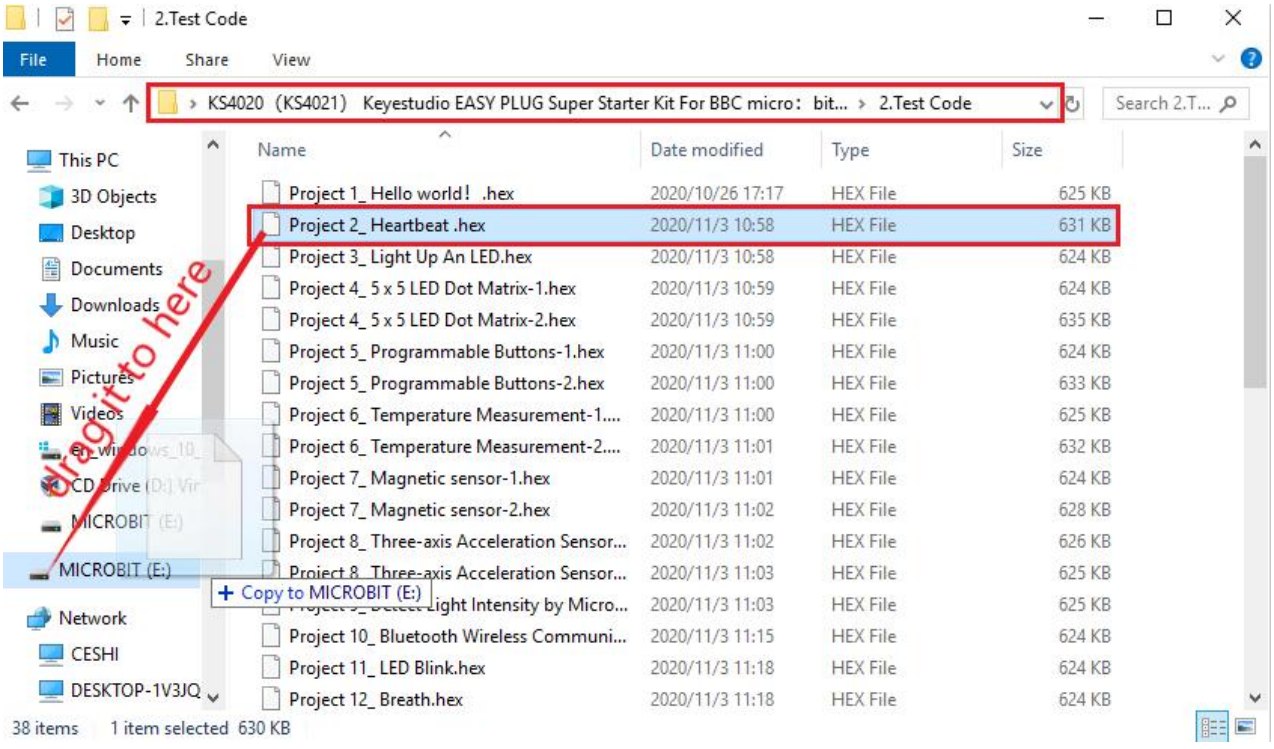
Step 3: Download Code

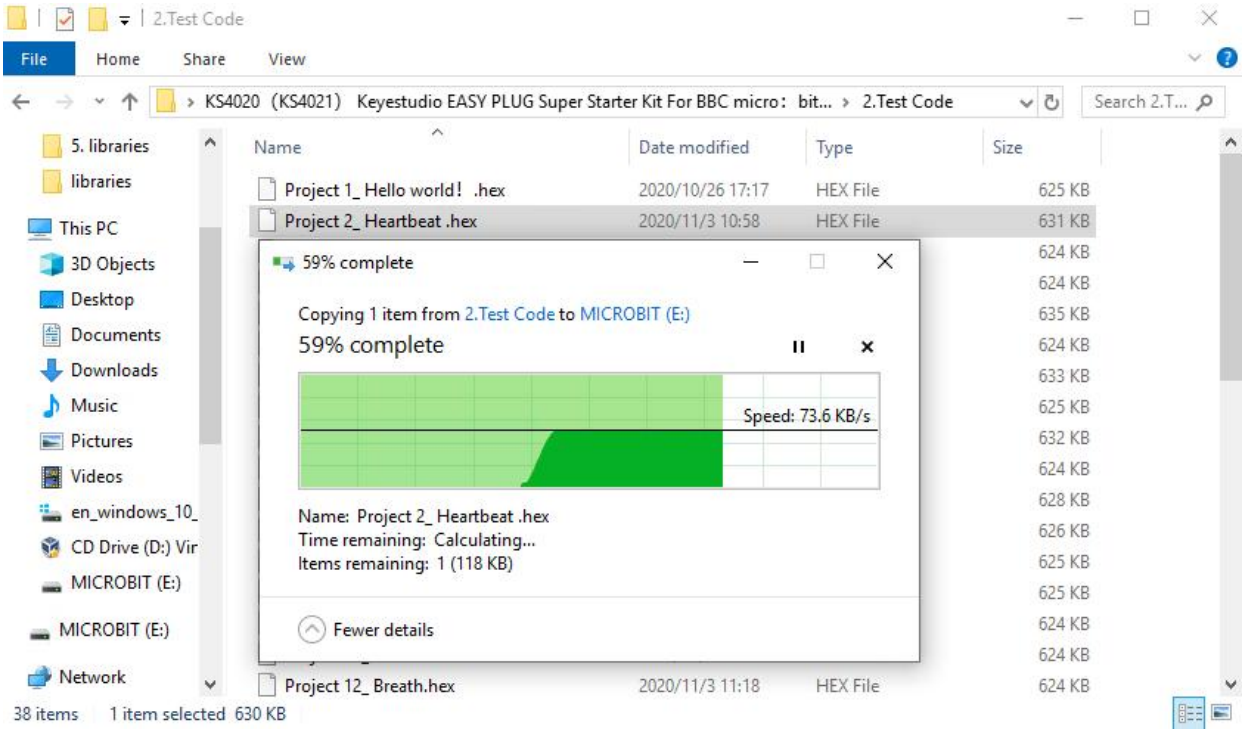
Enter Makecode editor, tap “Download” to get a “hex” file. Then copy it into MICROBIT drive.



Or you could find out "hex" file firstly and right-click to select "Send to" MICROBIT (E) " .

Then hex file will be copied on MICROBIT drive.



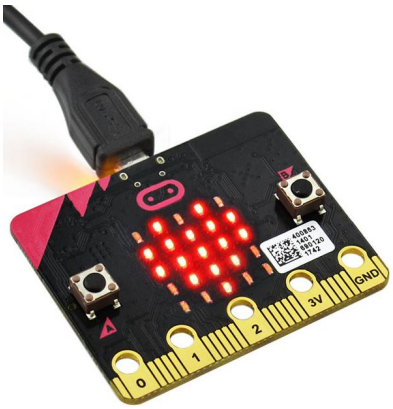


When the hex file is being copied, indicator on micro:bit will flash; after it is copied, the indicator will keep on.

Step 4: Run program

Upload code on micro:bit board and plug in power with USB cable.

LED dot matrix will display heartbeat pattern.



micro USB for power supply

Programming each time, MICROBIT drive will automatically eject and return. Micro:bit only receives hex files rather than save any file.

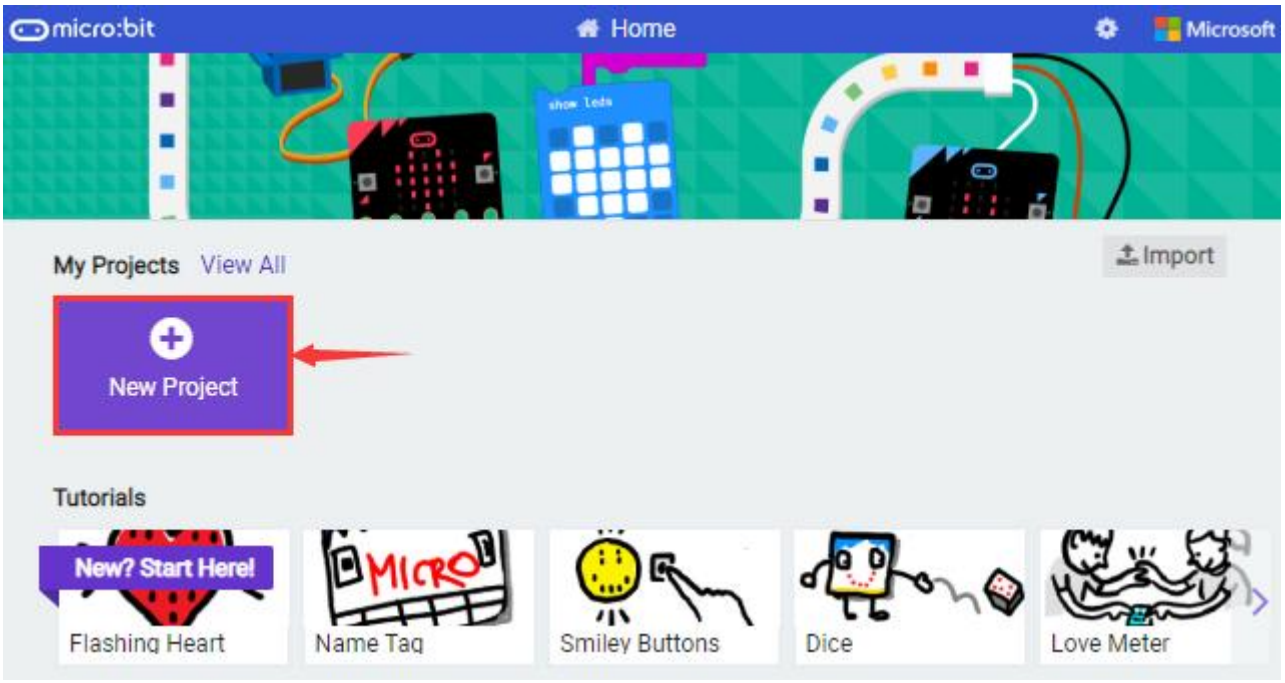
This chapter only shows you how to get started with micro:bit board. Python and JavaScript also support micro:bit board with the exception of Makecode.

https://microbit.org/code/

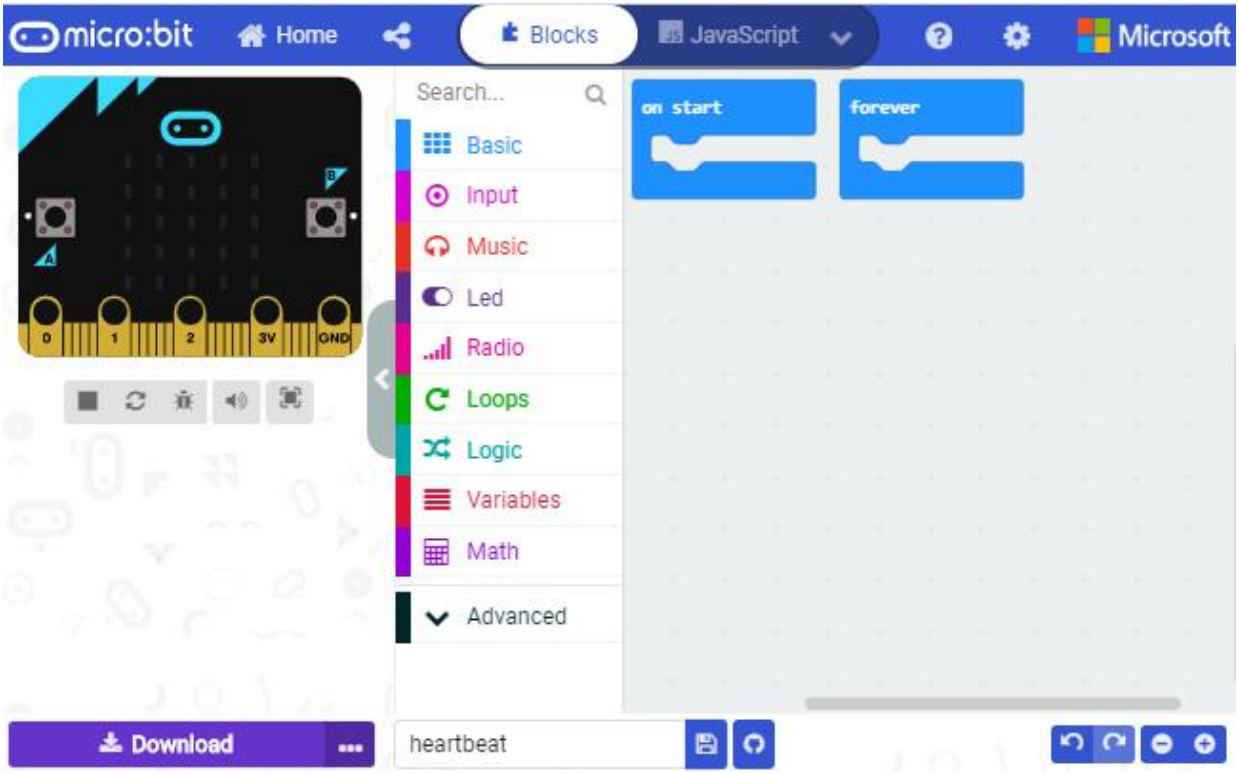
https://microbit.org/projects/

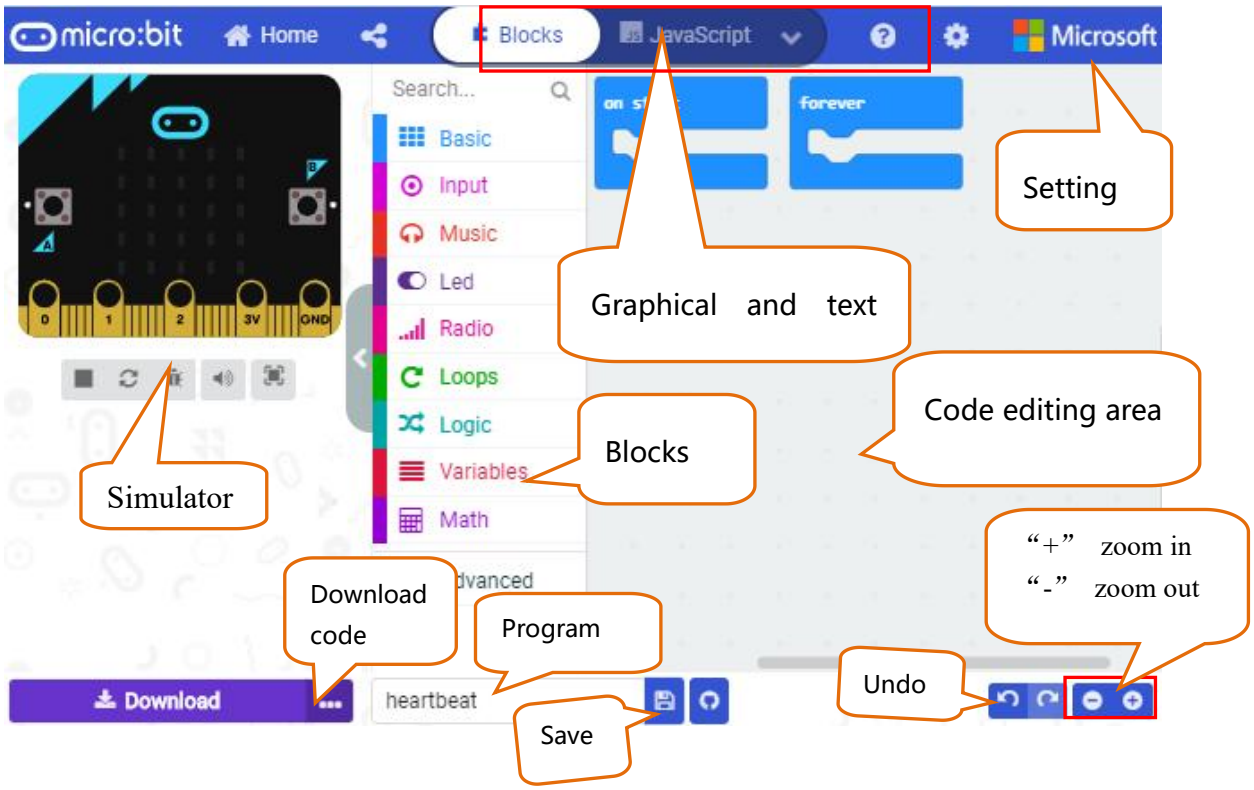
4.1 Makecode

Browse https://makecode.microbit.org/ and enter Makecode online editor.



Click “New Project”， and input “heartbeat”，then enter Makecode editor, as shown below:





There are block "on start" and "forever" in the code editing area. When plugging in power or resetting, "on start" means that command blocks in the code are only executed once, "forever" implies that code will runs cyclically.

4.2 Quick Download

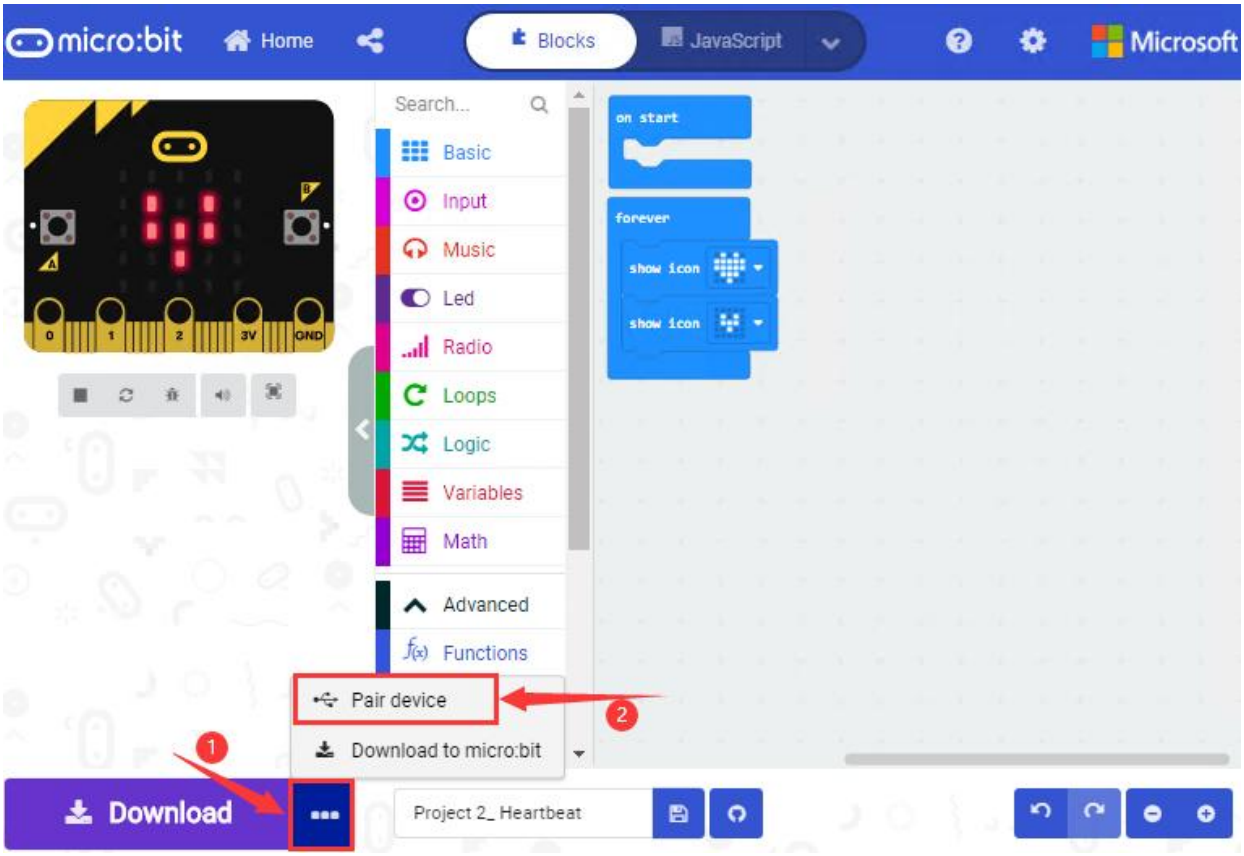
If you use Google Chrome on Android, ChromeOS, Linux, macOS and Windows 10 system, you will achieve the quick download.

We use the webUSB function of Chrome to allow the internet page to access the hardware device connected USB.

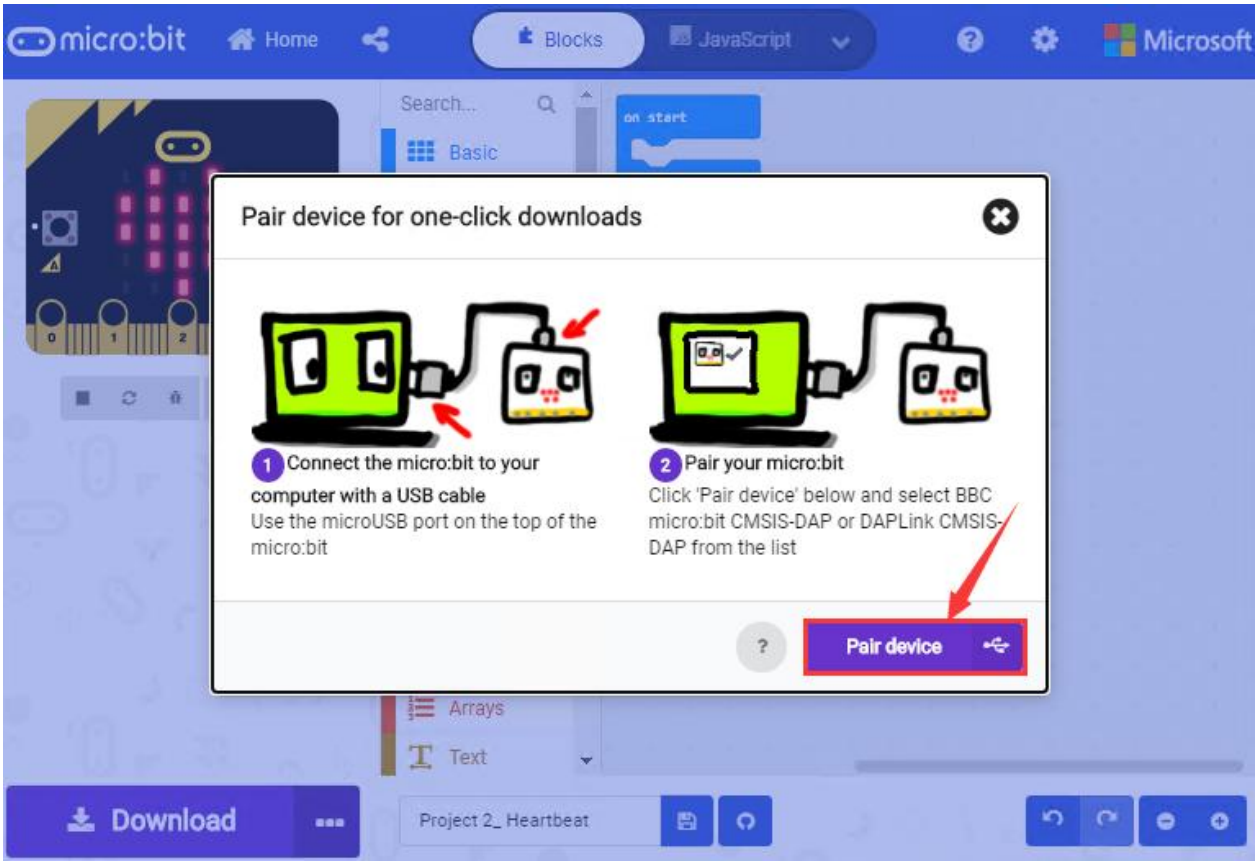
You could refer to the following steps to connect and pair device.

Pairing device

Connect to computer by USB cable. Click "..." beside "Download" and click "Pair device".



Continue to tap "Pair device"



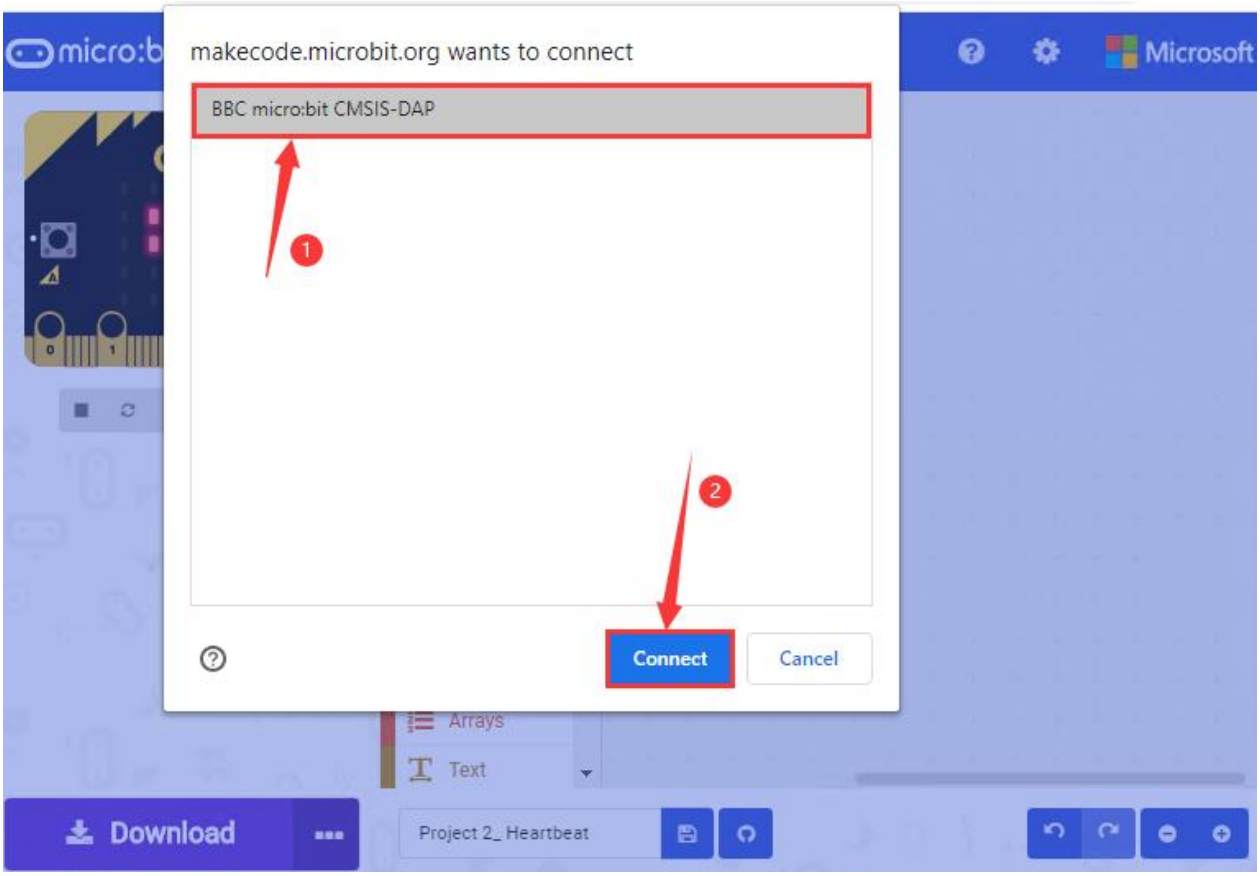
Then select the device you want to connect and "connect" in the window popping up

If there is no device in the window, please refer the following link:

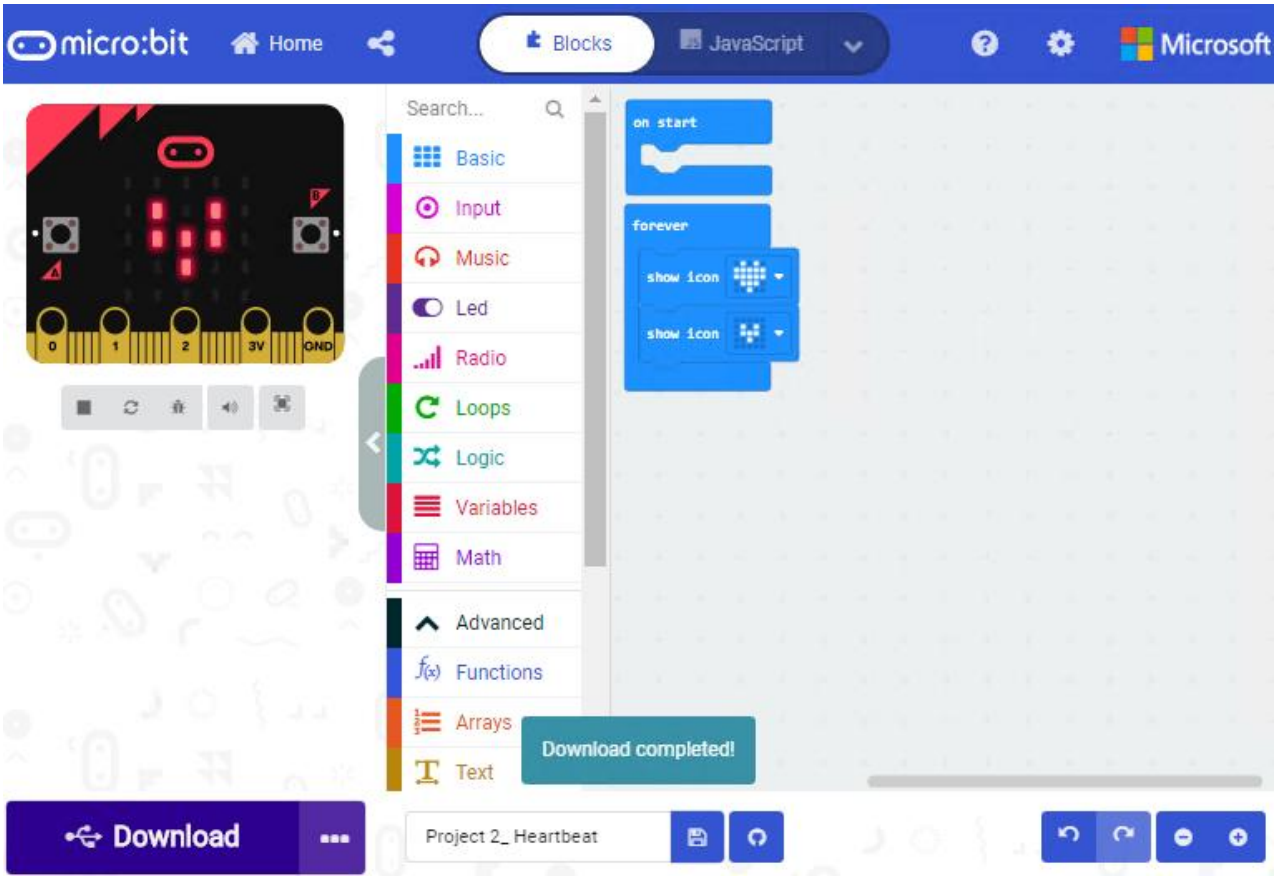
https://makecode.microbit.org/device/usb/webusb/troubleshoot

We also provide 6. Troubleshooting-WebUSB in the resource link.

What's more, if you don't know how to update the firmware of micro:bit, refer the link: https://microbit.org/guide/firmware/ or browse 4.Upgrad the Firmware we provide.



After connecting successfully, press buttons and download program to micro:bit board.

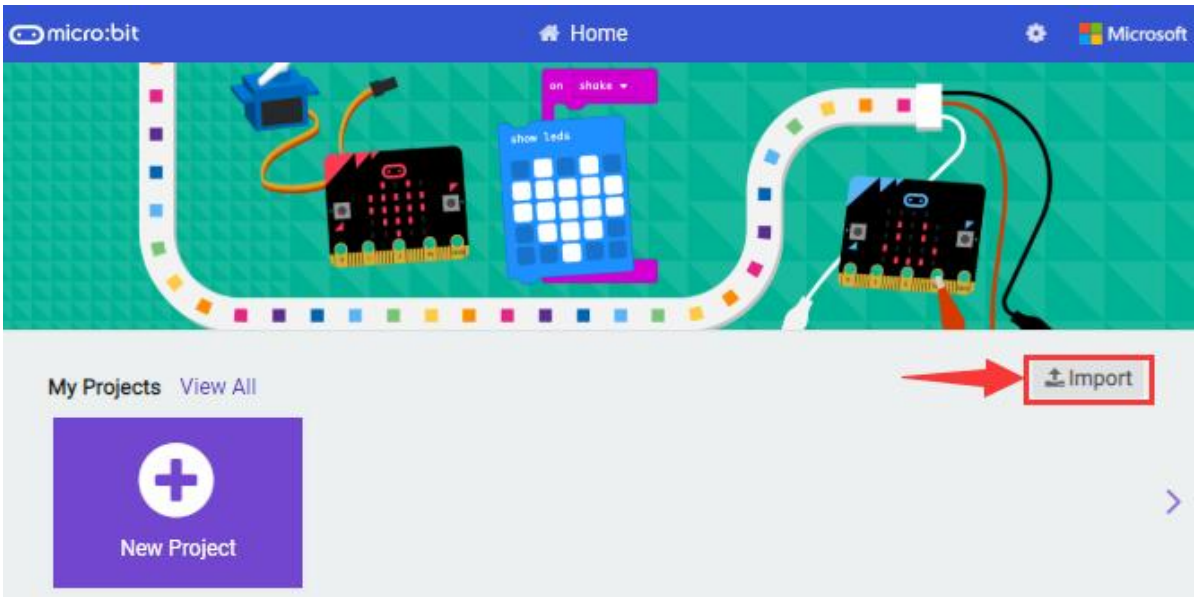


4.3 Import Code

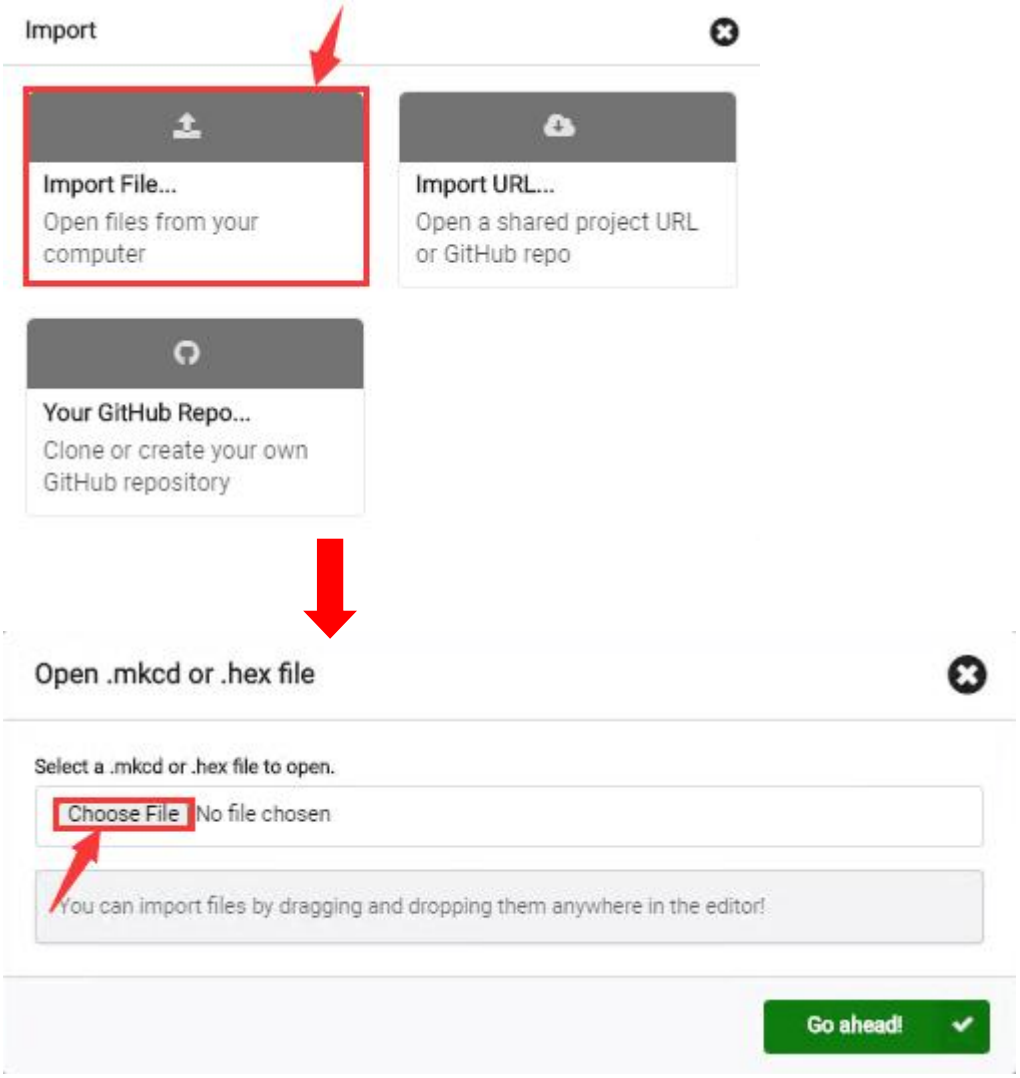
We provide every program with hex file. You could import it directly or program in Makecode blocks area, therefore, the extension library must be added.(How to add extension?)

Next, we will take "heartbeat" as example to introduce how to import code.

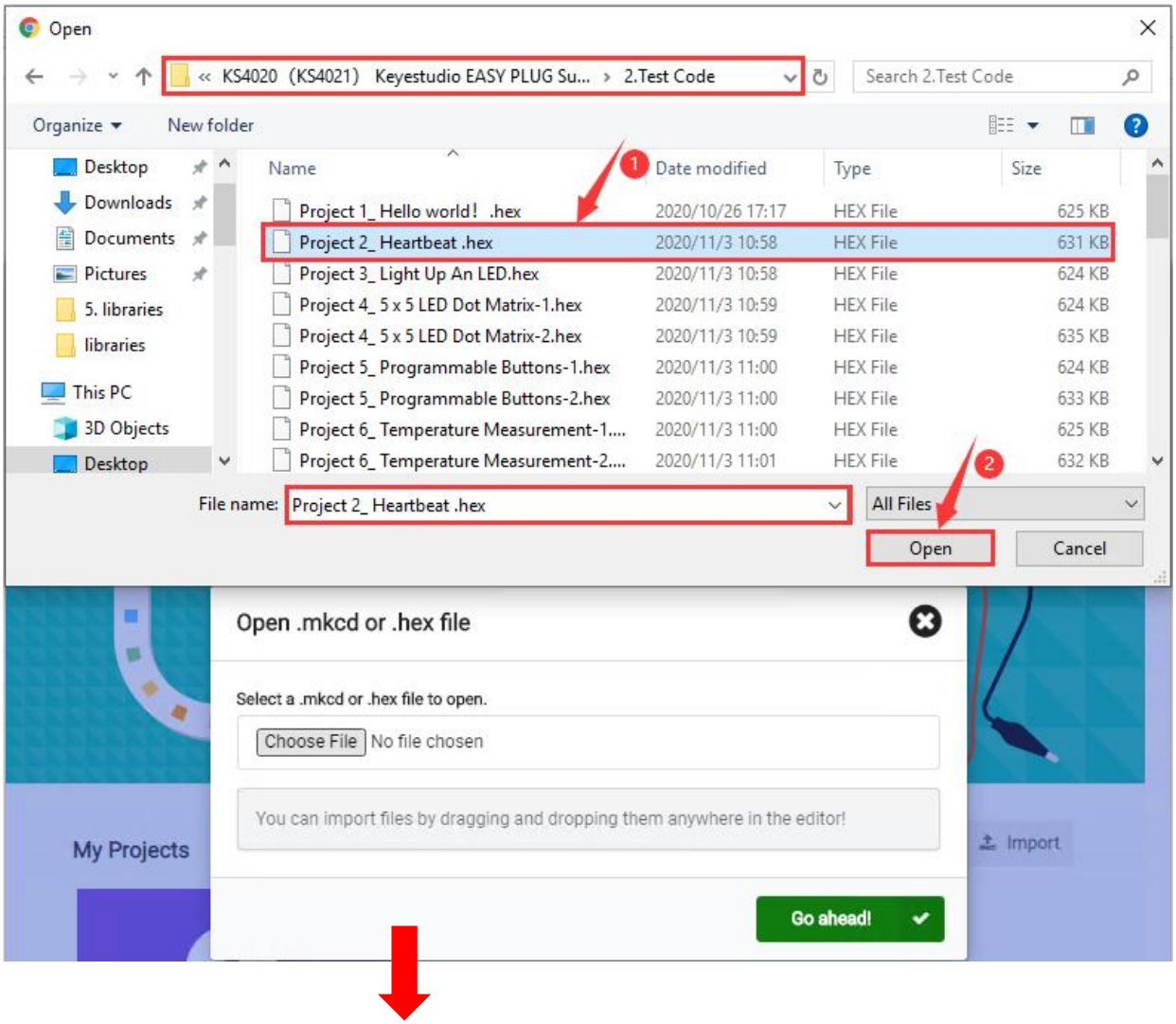
Open Makecode online editor on your computer.

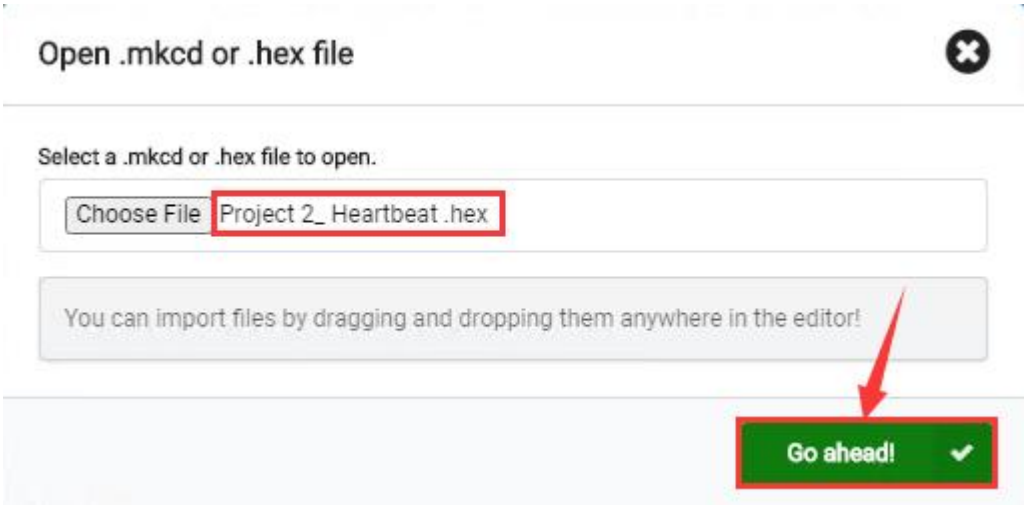


Click "Import" and "Import files"

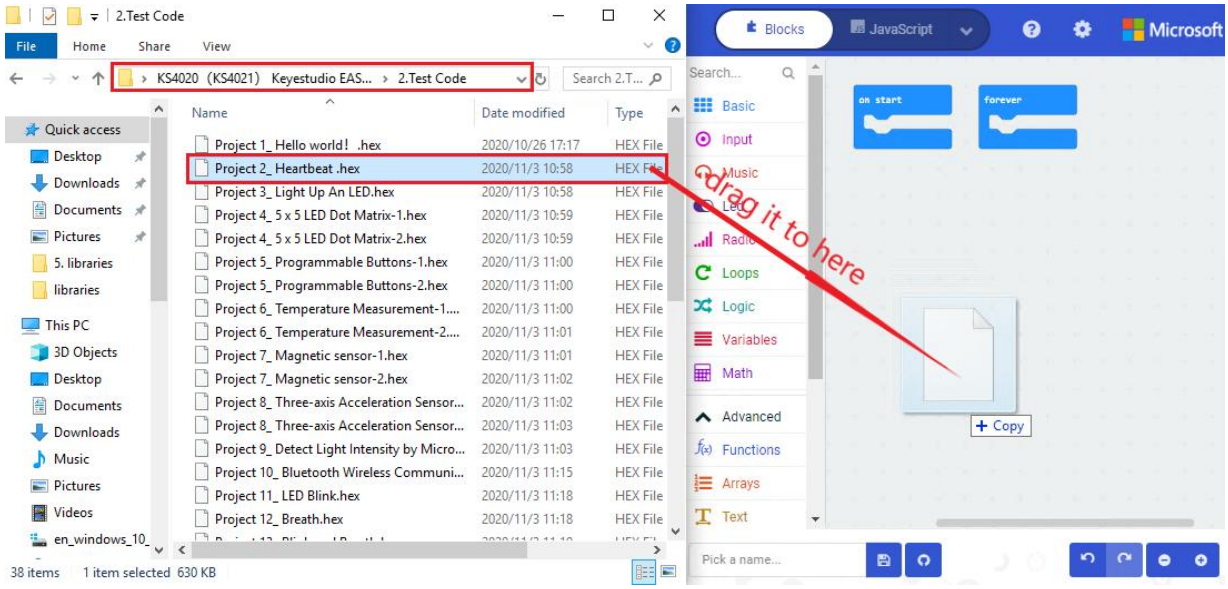

Import
Import File...
Open files from your computer
Import URL...
Open a shared project URL or GitHub repo
Your GitHub Repo...
Clone or create your own GitHub repository
Open .mkcd or .hex file
Select a .mkcd or .hex file to open.
Choose File
No file chosen
You can import files by dragging and dropping them anywhere in the editor!
Go ahead!

Choose file：../2.Test Code/Project 2_ Heartbeat.hex”，then tap “Go ahead”

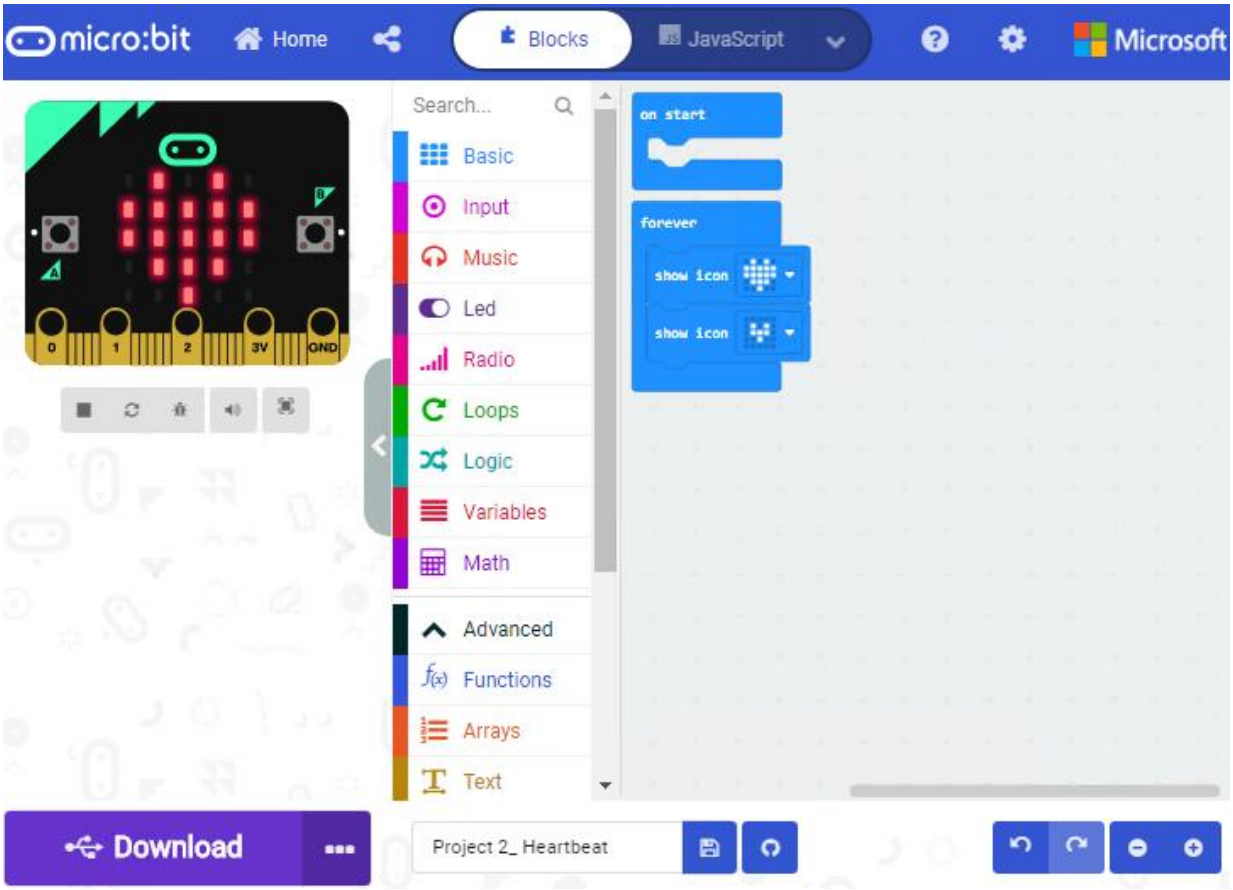




In addition to the above method of importing the provided project code program files directly into the Makecode compiler, you can also drag the provided project code program files directly into the Makecode compiler, as shown in the figure below:



The program is imported successfully after seconds



4.4 Install CoolTerm

CoolTerm program is used to read the serial communication.

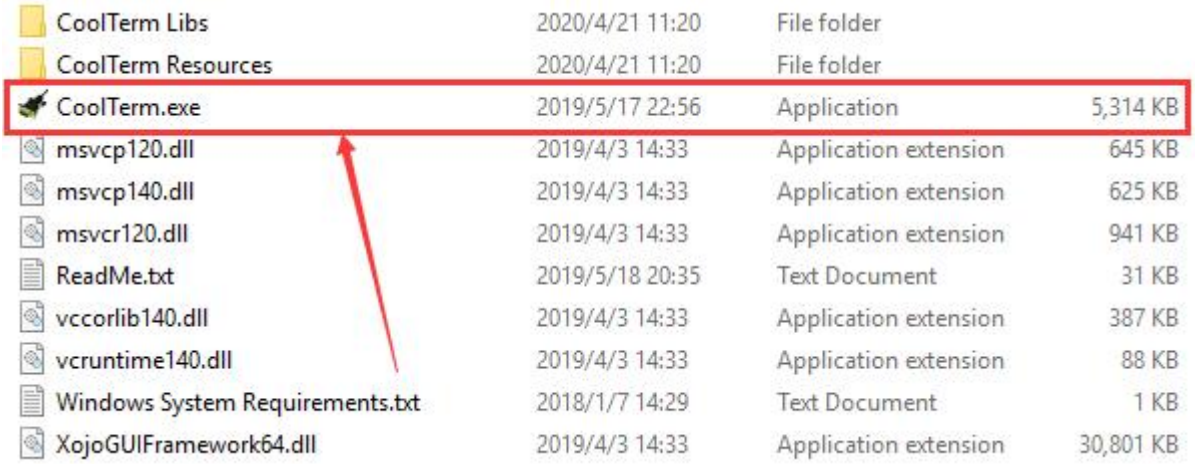
Download CoolTerm program:

https://freeware.the-meiers.org/

(1) After the download, we need to install CoolTerm program file, the Window system is taken as an example.

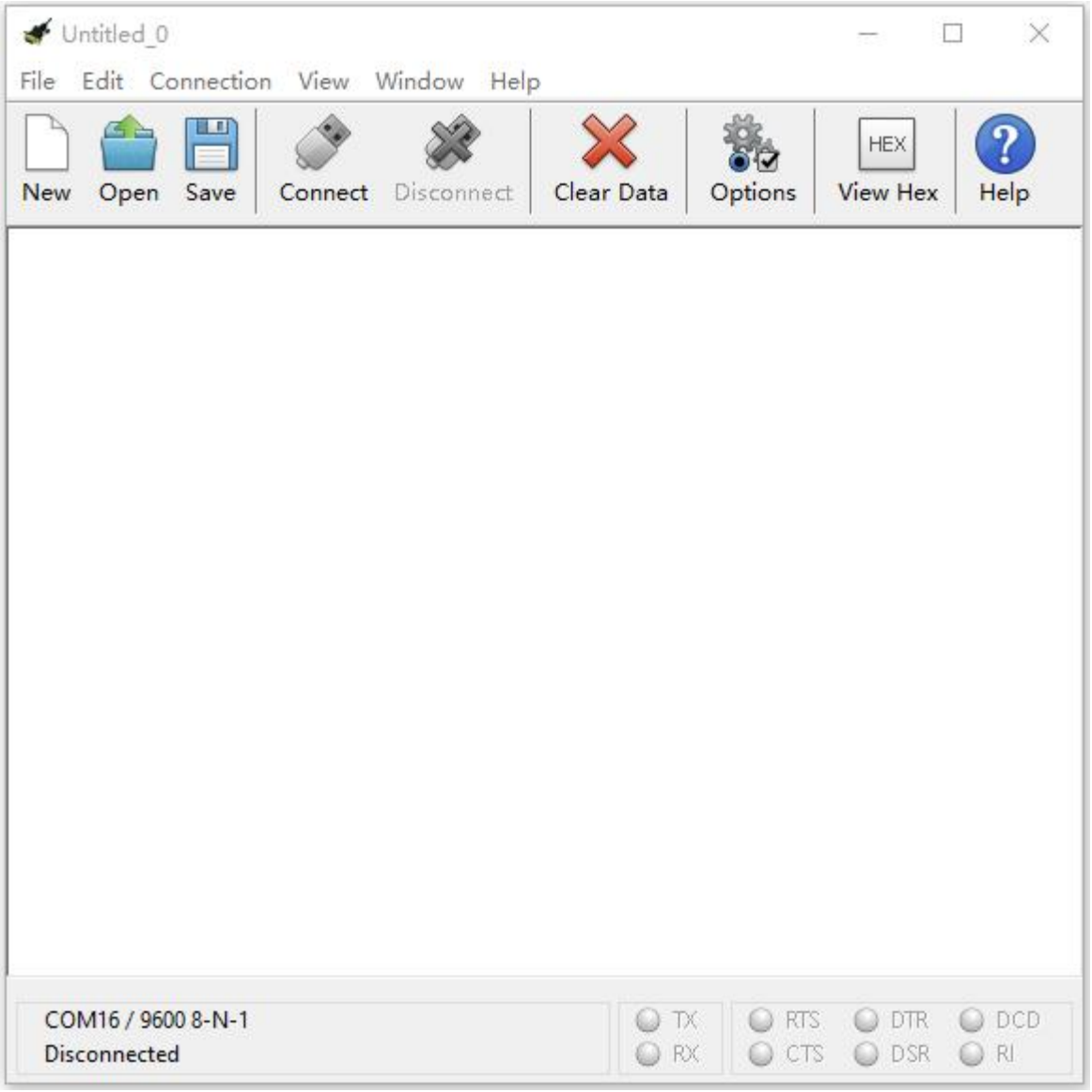
(2) Choose "win"

(3) Unzip file and open it. (also suitable for Mac and Linux system)

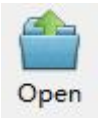
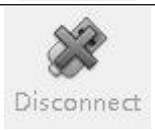
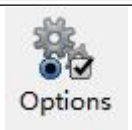


(4) Double-click 

Note: you have to install the driver of micro:bit and connect micro:bit to computer



The functions of each button on the Toolbar are listed below:

	Opens up a new Terminal
	Opens a saved Connection
	Saves the current Connection to disk
	Opens the Serial Connection
	Closes the Serial Connection
	Clears the Received Data
	Opens the Connection Options Dialog
	Displays the Terminal Data in Hexadecimal Format
	Displays the Help Window

5. Projects

Project 1: Hello world

1.Description:

In first project, we will demonstrate the easiest experiment to make you acquire the basic knowledge of micro:bit.

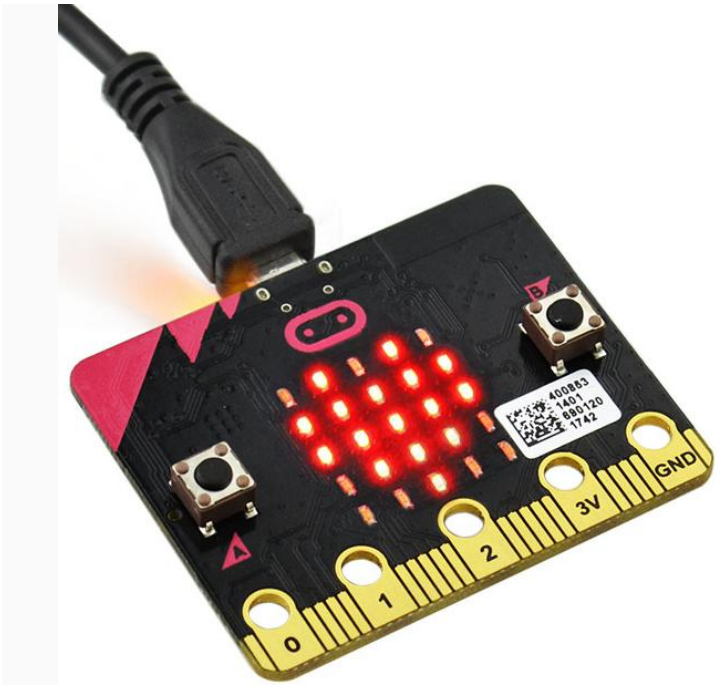
We make micro:bit display “Hello word!”. In addition, we need a serial communication software CoolTerm as well. It sounds simple, right? Let’s get started!

2.What You Need:

- Micro:bit Board*1
- Micro USB Cable*1

6. Connection:

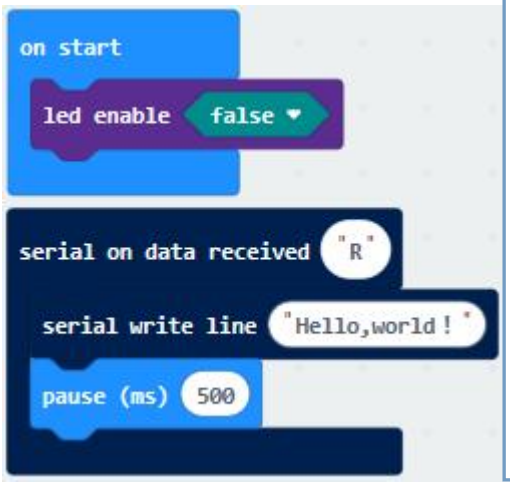
Connect micro:bit to your computer using micro USB cable.



7. Test Code:

You could navigate https://makecode.micro:bit.org/reference to have access to more details.

Browse link https://makecode.micro:bit.org/ to edit your program. The following test code is as for your reference.



"on start": command block only runs once to start program.

Turn off dot matrix on micro:bit

Serial transmits data when receiving "R"

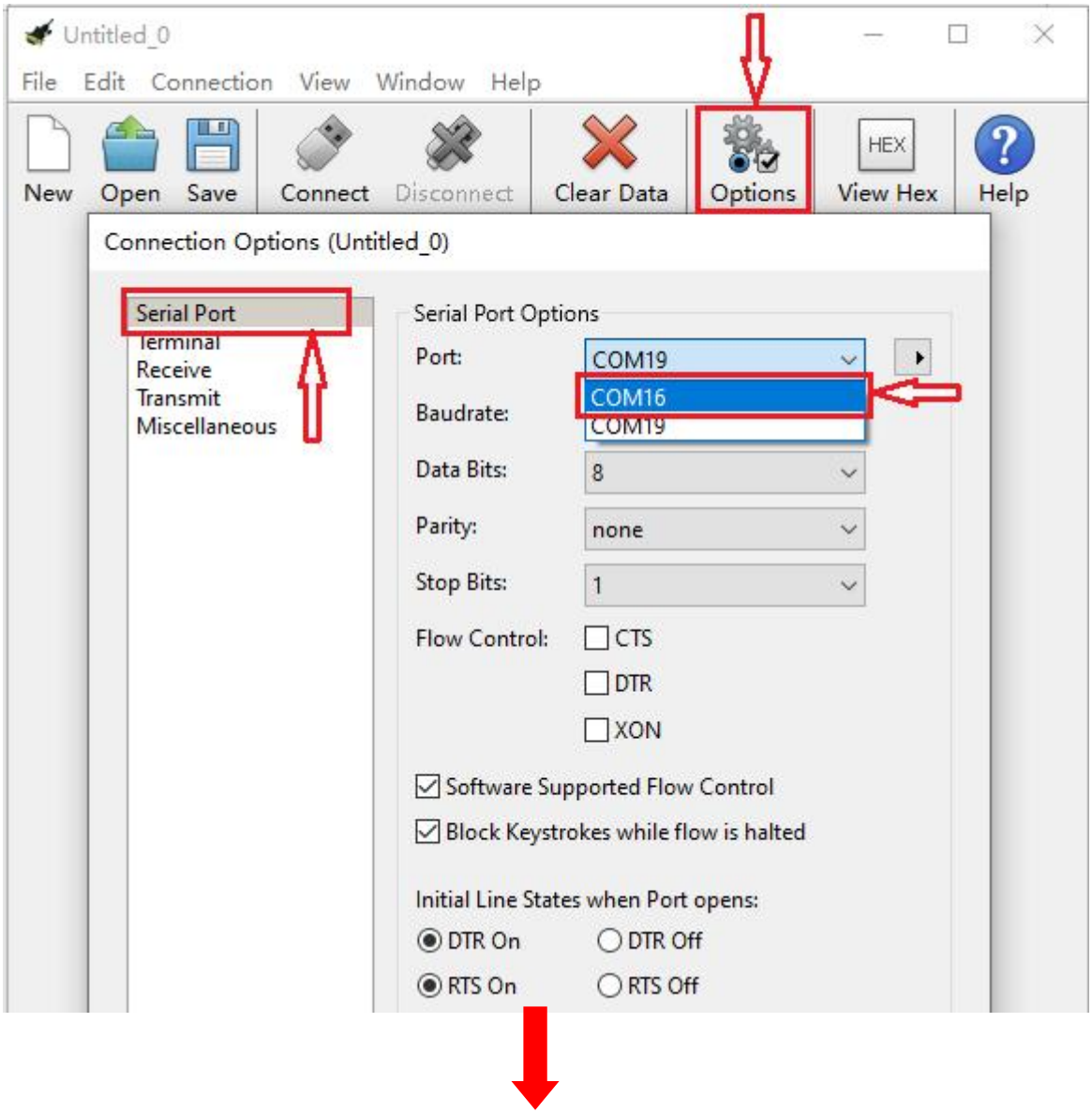
Serial writes "Hello World!"

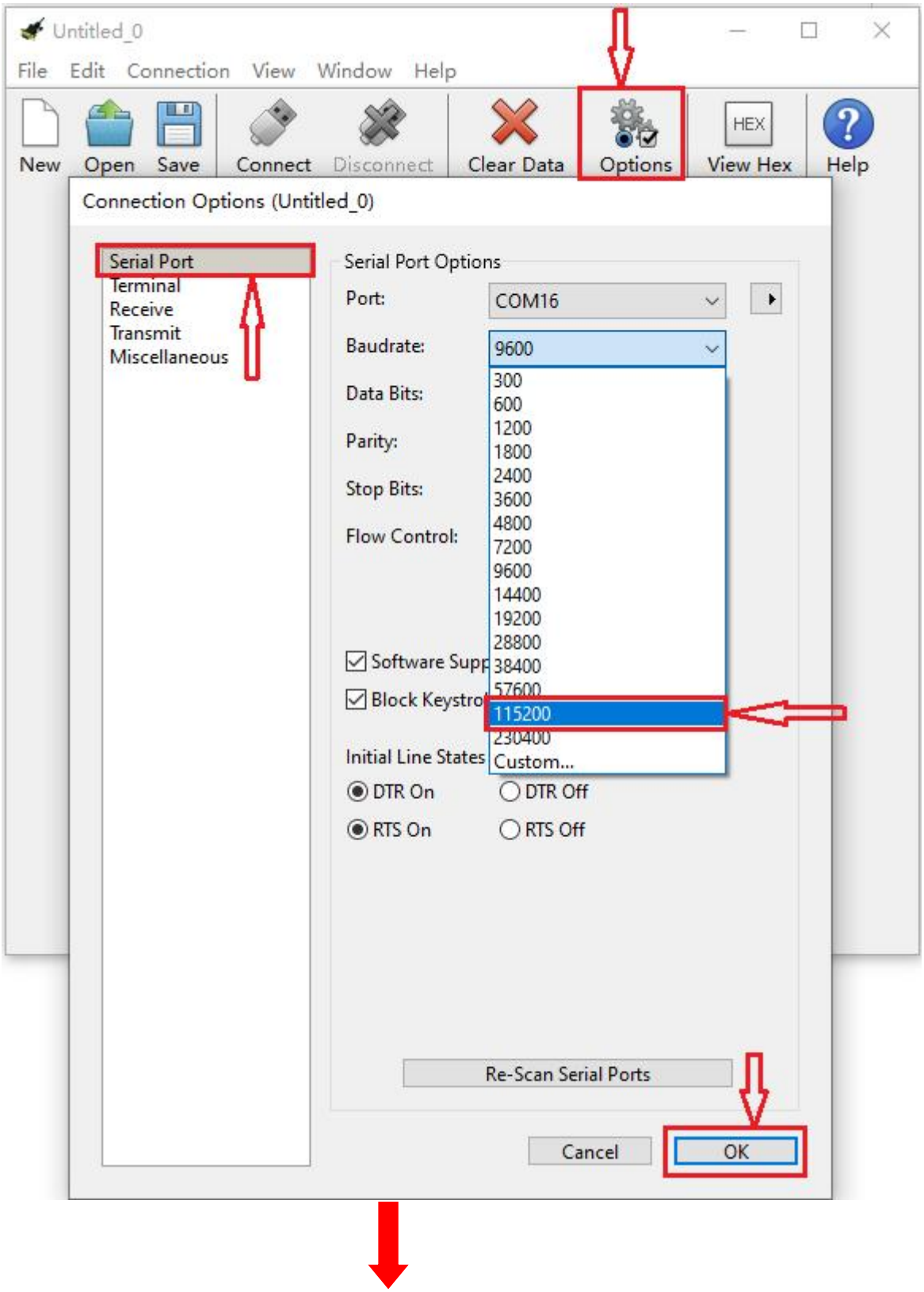
Delay in 500ms

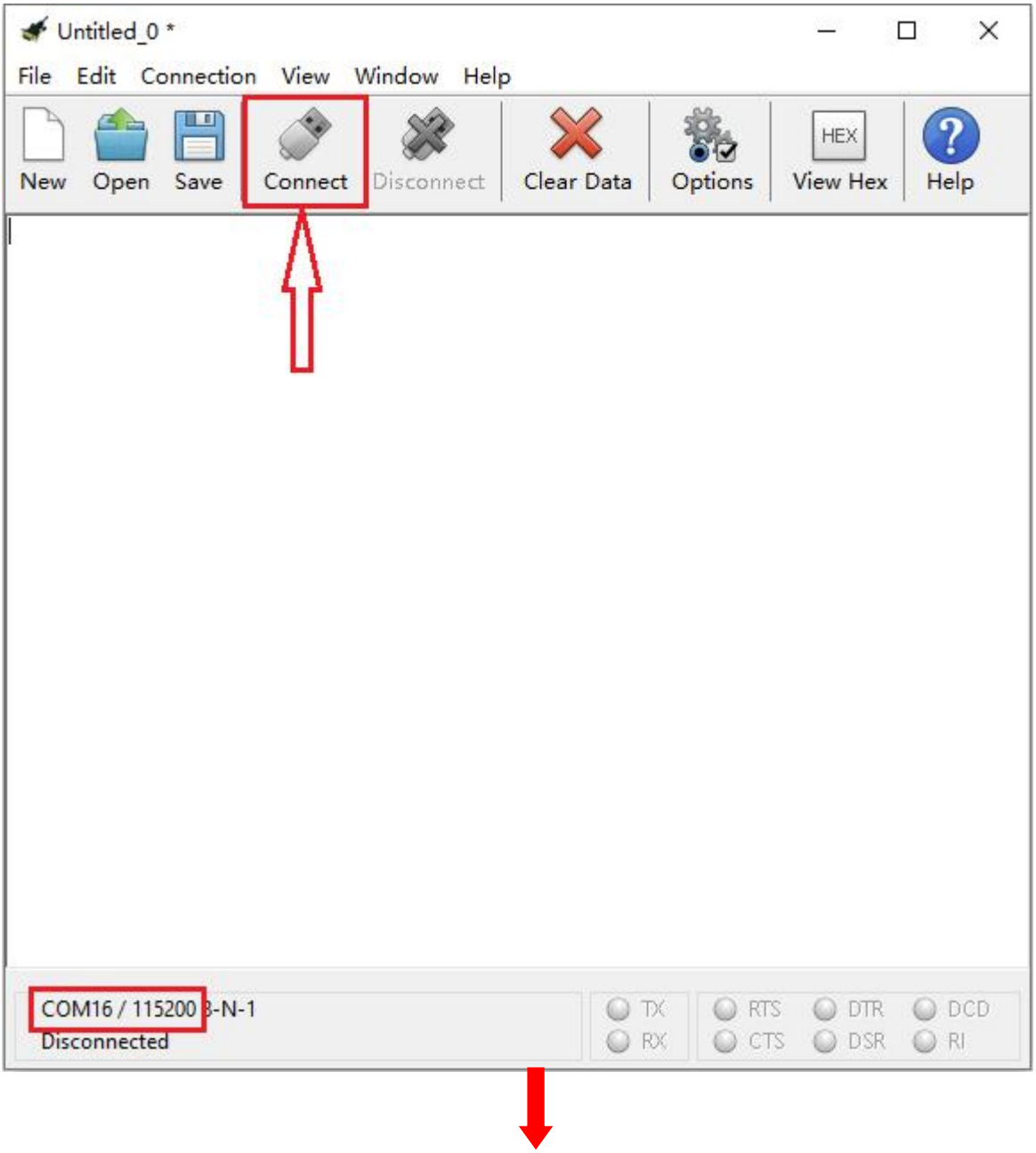
5.Test Result:

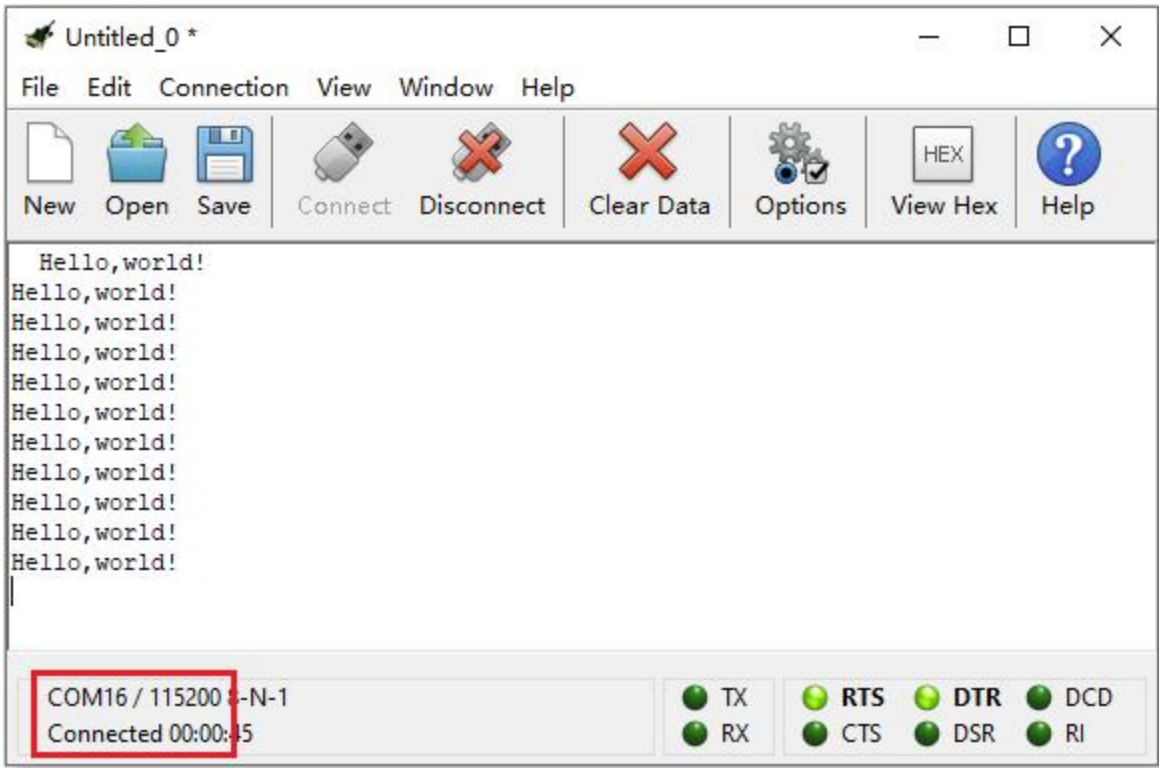
According to wiring diagram, upload code and plug micro:bit to power. Open CoolTerm to select "SerialPort", set COM port and baud rate to 115200 (the baud rate of USB serial communication of micro:bit is 115200 through the test). Click "OK" and "Connect".

Press “Capslock” and “R” on keyboard, “Hello World！” will be shown on CoolTerm monitor, as shown below:

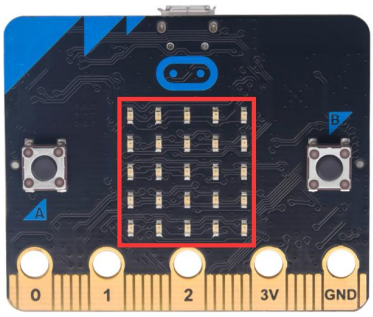



Untitled_0
File Edit Connection View Window Help
New Open Save Connect Disconnect Clear Data Options View Hex Help
Connection Options (Untitled_0)
Serial Port
Terminal
Receive
Transmit
Miscellaneous
Serial Port Options
Port: COM16
Baudrate: 9600
Data Bits:
Parity:
Stop Bits:
Flow Control:
300
600
1200
1800
2400
3600
4800
7200
9600
14400
19200
28800
38400
57600
115200
230400
Custom...
Software Supp
Block Keystro
Initial Line States
DTR On
DTR Off
RTS On
RTS Off
Re-Scan Serial Ports
Cancel
OK


Untitled_0 *
File Edit Connection View Window Help
New Open Save Connect Disconnect Clear Data Options View Hex Help
COM16 / 115200 8-N-1
Disconnected
TX RX RTS CTS DTR DSR DCD RI



Project 2: Heart beat



1.Description:

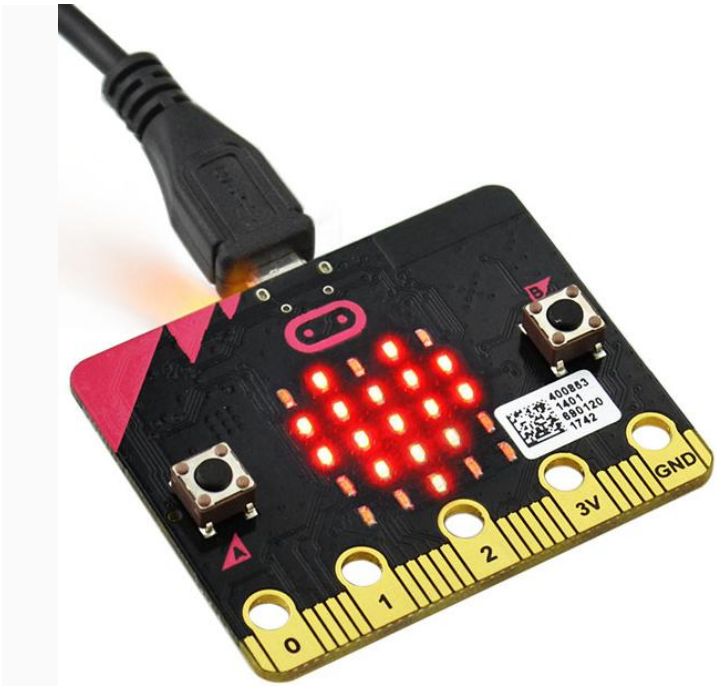
Next, we will make micro:bit display “Heart Beat” pattern.

2. What You Need:

- Micro:bit Board*1
- Micro USB Cable*1

3.Wiring Up:

Connect micro:bit to your computer using micro USB cable



4.Test Code:

You could navigate https://makecode.micro:bit.org/reference to have access to more details.

Browse link https://makecode.micro:bit.org/ to edit your program. The following test code is as for your reference.

"on start" : command block only runs once to start program.

The program under the block "forever" runs cyclically.

LED screen displays "❤"

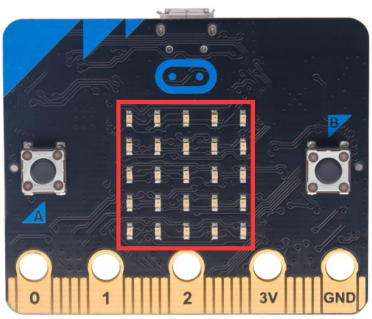
Micro:bit shows "  "

8. Test Result:

Download code to micro:bit and keep USB connected. Plug in power, micro:bit shows "❤" and "  " ceaselessly.

Please disconnect USB cable and reconnect it if there is something wrong with downloading code.

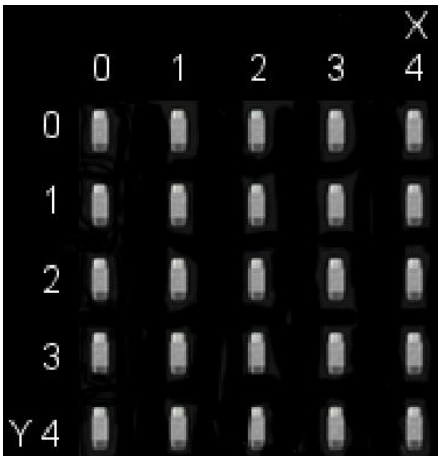
Project 3: Light Up a Single LED



1.Description:

Micro:bit motherboard consists of 25 light-emitting diodes, 5 pcs in a group. They correspond to x and y axis. Then the 5*5 matrix is formed. Moreover, every diode locates at the point of x and y axis.

Virtually, we could control a LED by setting coordinate points. For instance, set coordinate point（0，0）to turn on the LED at row 1 and column 1; light up LED at the row 1 and column 3, we could set（2，0）and so on.

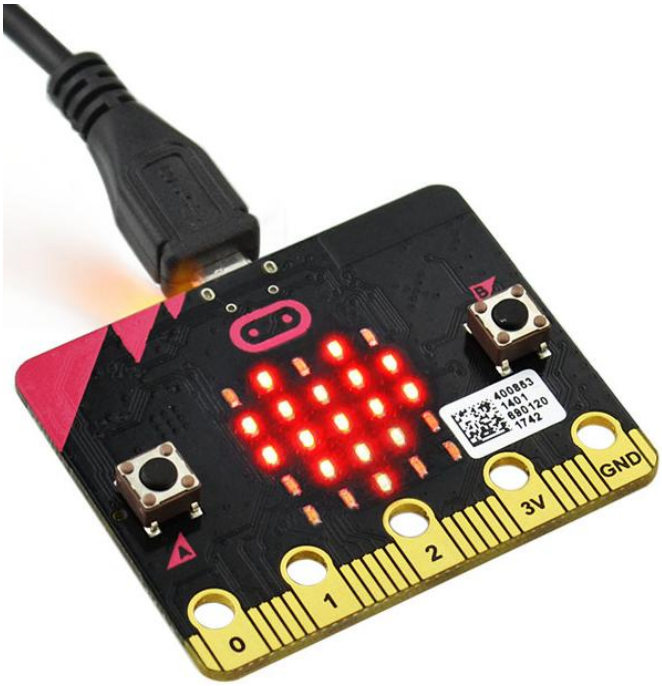


2.What You Need:

- Micro:bit Board*1Micro
- USB Cable*1

3.Wiring Up:

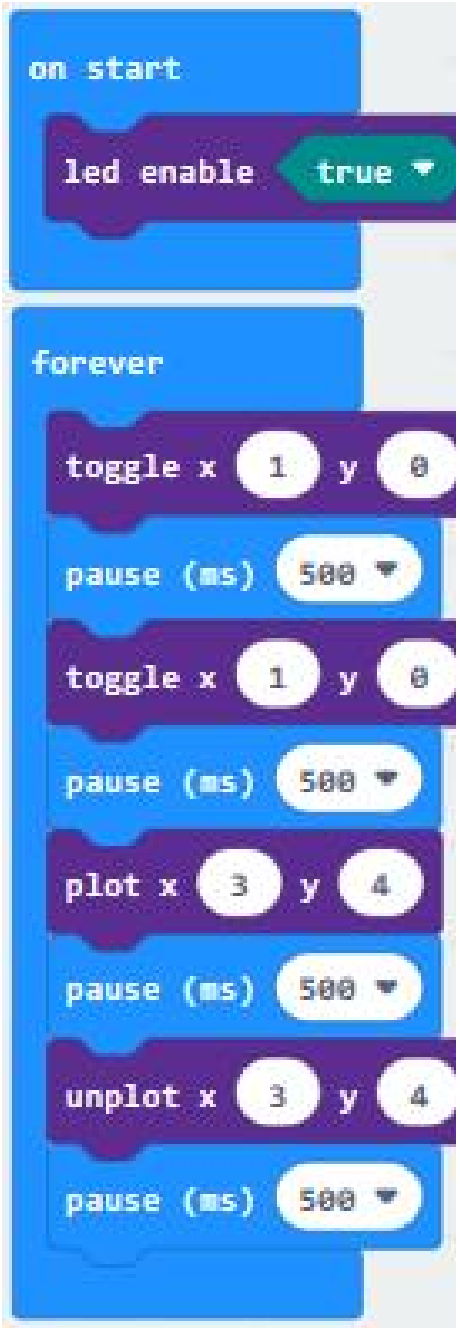
Connect micro:bit to your computer using micro USB cable



4.Test Code:

You could navigate https://makecode.micro:bit.org/reference to have access to more details.

Browse link https://makecode.micro:bit.org/ to edit your program. The following test code is as for your reference.



"on start" : command block only runs once to start program.

open LED dot matrix on micro:bit

The program under the block "forever" runs cyclically.

Toggle the LED brightness at coordinate point "x 1 y 0".

Delay in 500ms

Toggle the LED brightness at coordinate point "x 1 y 0".

Delay in 500ms

Turn on the LED at coordinate point "x3，y4".

Delay in 500ms

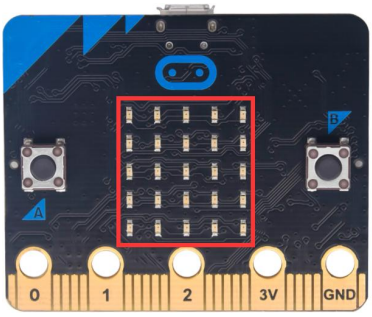
Turn off the LED at coordinate point "x3 y4".

Delay in 500ms

5.Test Result:

Download code to micro:bit and keep USB connected. We will view the LED at coordinate point (1,0) flashes for 0.5s, and the LED at (3,4) flashes for 0.5s alternately.

Project 4: 5×5 LED Dot Matrix



1.Description:

Dot matrix gains popularity in our life, such as LED screen, bus station and the mini TV in the lift.

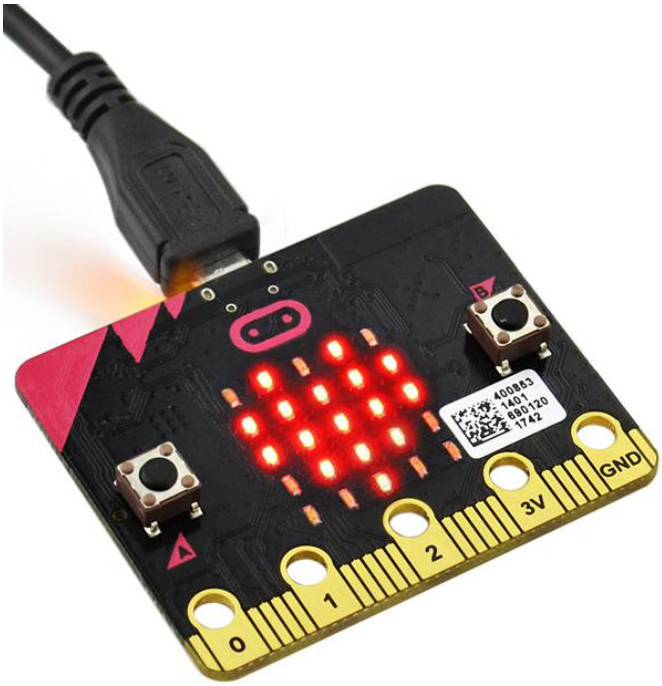
The dot matrix of Micro:bit board consists of 25 light emitting diodes. In previous lesson, we control LED of Micro:bit board to form patterns, numbers and character strings by setting the coordinate points. Moreover, we could adopt another way to complete the display of patterns, numbers and character strings.

2.What You Need:

- Micro:bit Board*1
- Micro USB Cable*1

3.Wiring Up:

Connect micro:bit to your computer using micro USB cable

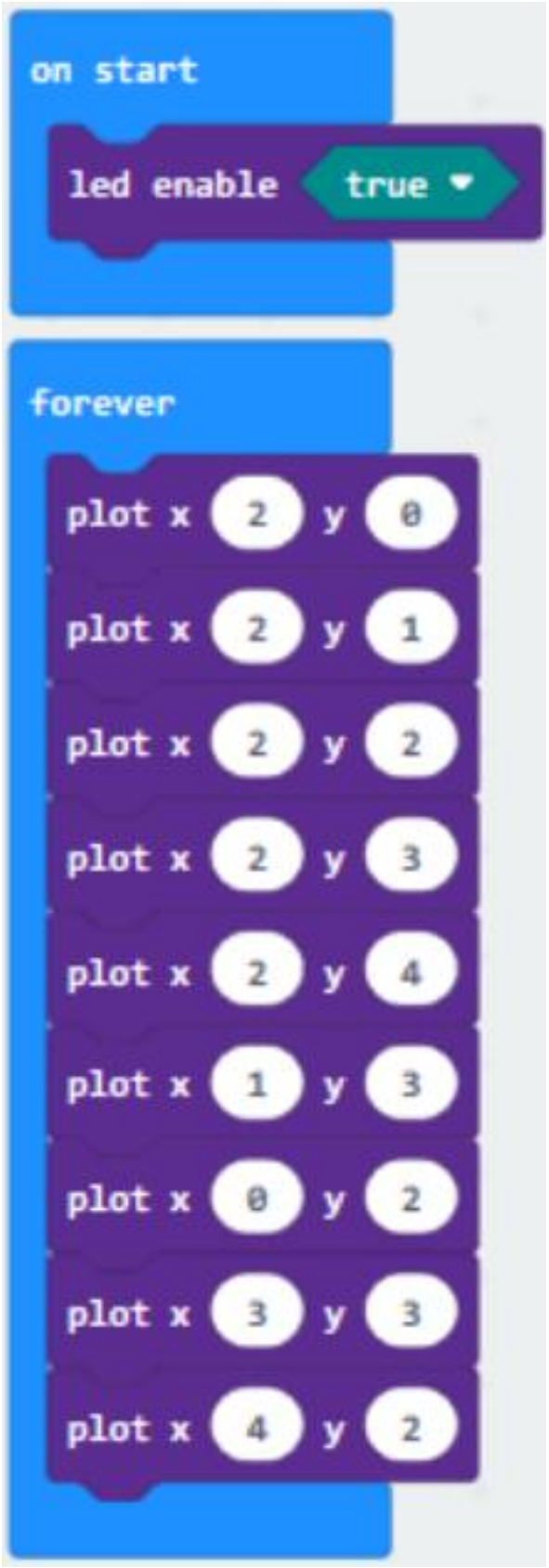


4.Test Code:

You could navigate https://makecode.micro:bit.org/reference to have access to more details.

Browse link https://makecode.micro:bit.org/ to edit your program. The following test code is as for your reference.

Code 1:


on start
led enable true
forever
plot x 2 y 0
plot x 2 y 1
plot x 2 y 2
plot x 2 y 3
plot x 2 y 4
plot x 1 y 3
plot x 0 y 2
plot x 3 y 3
plot x 4 y 2

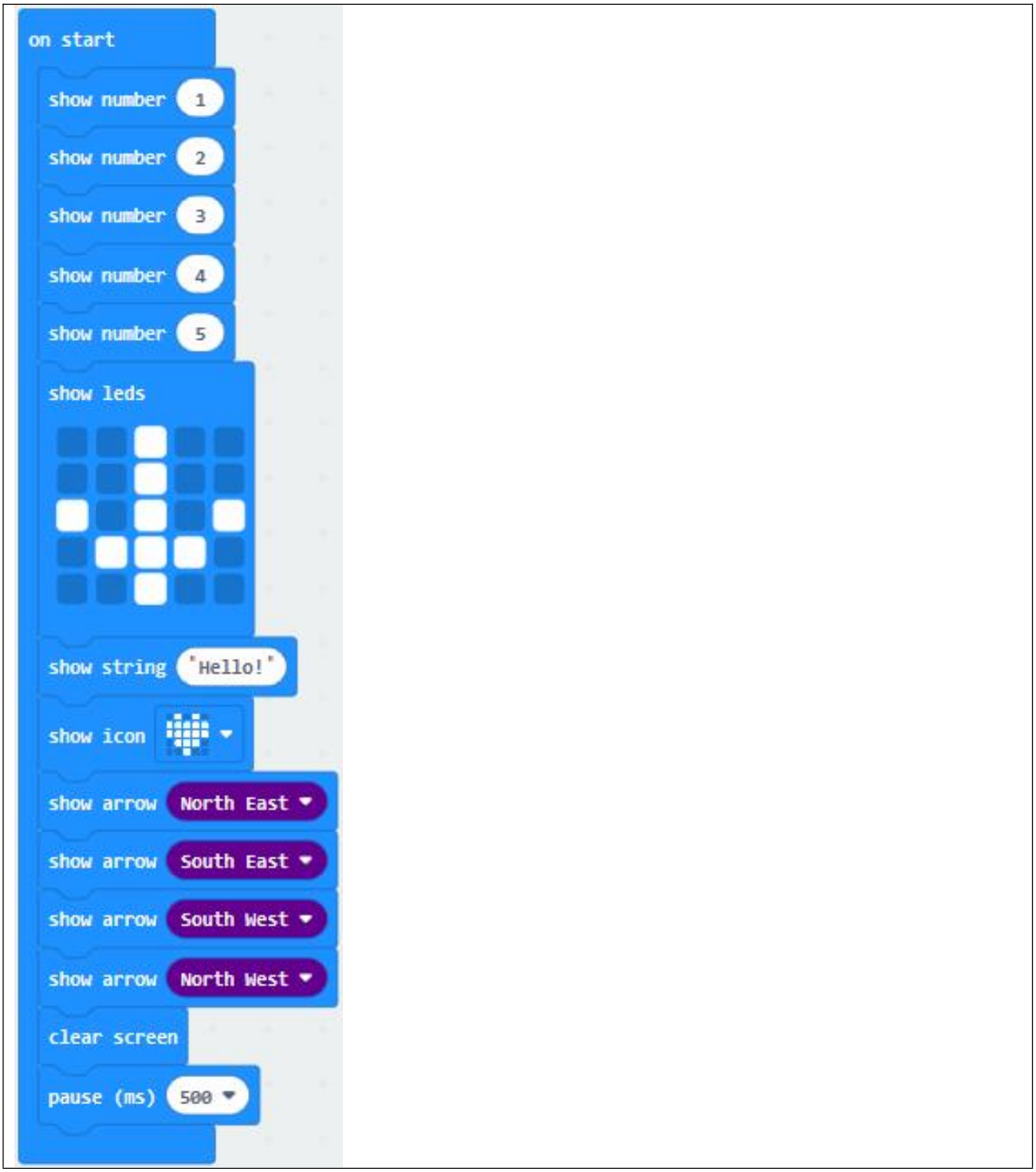
"on start": command block only runs once to start program.

open LED dot matrix on micro:bit

The program under the block "forever" runs cyclically.

.Toggle the LED brightness at coordinate point "x 2, y 0", "x 2, y 1", "x 2, y 2", "x 2, y 3", "x 2, y 4", "x 1, y 3", "x 0, y 2", "x 3, y 3" and "x 4, y 2"

Code 2


on start
show number 1
show number 2
show number 3
show number 4
show number 5
show leds
show string "Hello!"
show icon
show arrow North East
show arrow South East
show arrow South West
show arrow North West
clear screen
pause (ms) 500

"on start" : command block only runs once to start program.

LED dot matrix displays 1,2,3,4,5

Dot matrix shows the "↓" pattern

Under the block "forever", program runs cyclically.

Dot matrix shows the "↓" pattern

Dot matrix scrolls to show "Hello!"

"❤" is shown on dot matrix

LED dot matrix displays "North East" arrow.

The "South East" arrow shows up on LED dot matrix

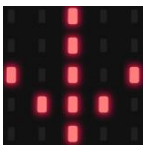
The "South West" arrow appears up on LED dot matrix

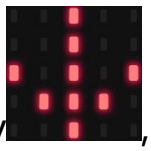
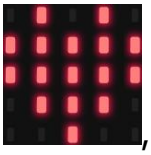
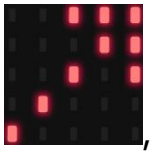
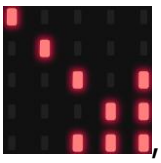
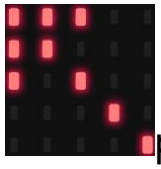
The "North West" arrow is displayed on LED dot matrix

Clear the screen

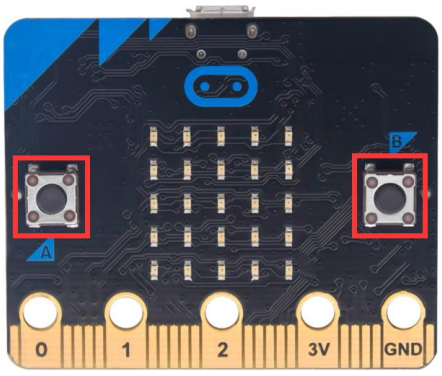
Delay in 500ms

5.Test Result:

Upload code 1 and power on , keep USB cable connected, we will see the  icon.

Transfer code 2 to micro:bit. Micro: bit starts showing number 1, 2, 3, 4, and 5, then cyclically display  , “Hello!”,  ,  ,  ,  and  patterns.

Project 5: Micro:bit’ s Buttons



1. Description:

The buttons are common input devices. You will have used a power button to switch off the mobile or tablet, or volume buttons to turn the audio level up or down. The buttons on the BBC micro:bit are input devices that can be pressed to trigger an action. You can write a program to tell the micro:bit what actions should happen when the

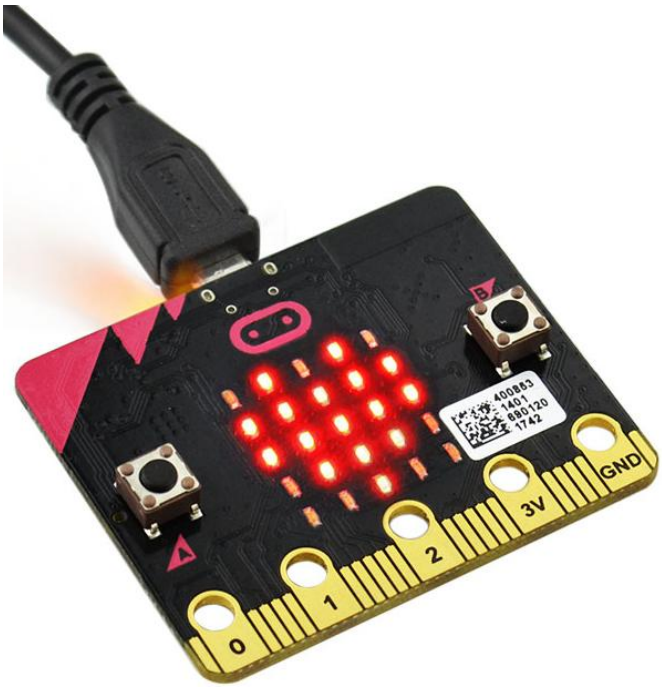
button is pressed, and there are lots of you can program. There are two buttons on the micro:bit, button A and button B. The button can be pressed separately or together. There is a third button on the other side, that’ s for resetting your micro:bit and start your program from the beginning.

2. What You Need:

- Micro:bit Board*1
- Micro USB Cable*1

3. Wiring Up:

Connect micro:bit to your computer using micro USB cable

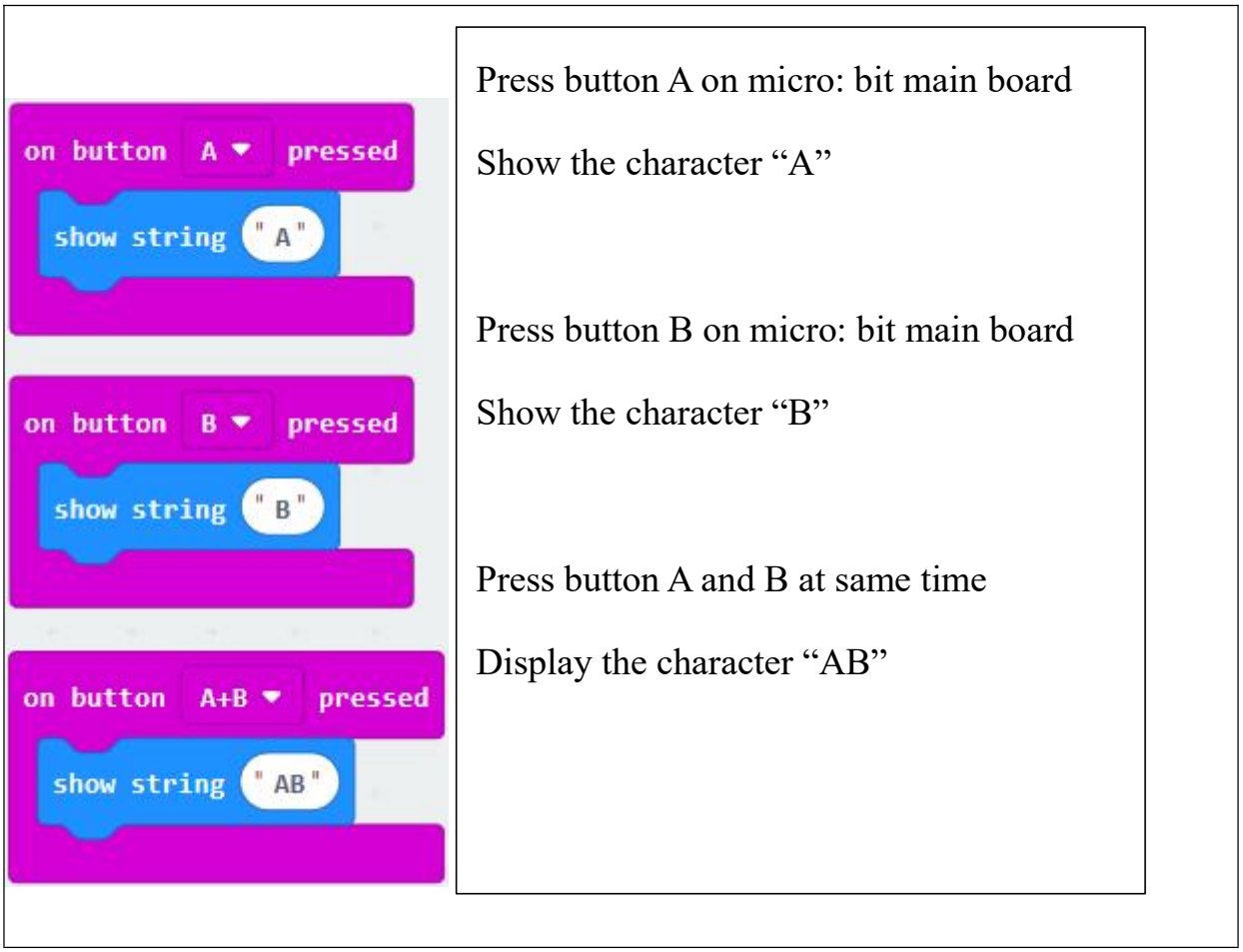


4. Test Code:

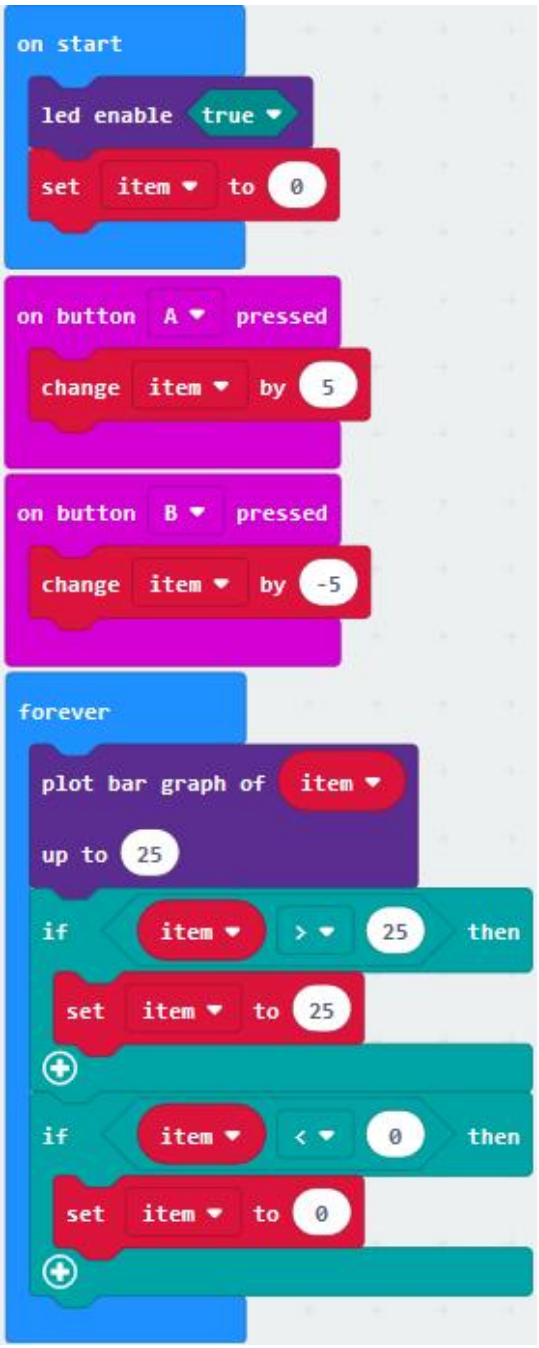
You could navigate https://makecode.micro:bit.org/reference to have access to more details.

Browse link https://makecode.micro:bit.org/ to edit your program. The following test code is as for your reference.

Code 1:



Code 2



"on start": command block runs once

to start program.

Turn on LED dot matrix

Set the initial value of item to 0

Press button A on Micro:bit board

Change item by 5

Press button B on Micro:bit board

Change item by -5

The program under the block "forever" runs cyclically.Light on LED in dot matric to draw bar graph, light up up to 25 LEDs

If item is greater than 25

Then set item to 25

If item is less than 0

Then Set item to 0

4. Test Result:

Download code 1 to micro:bit and keep USB connected. Press "A" on micro:bit board, character "A" will be displayed; in case that B is pressed, letter "B" will appear. So will "AB" if you press A and B buttons simultaneously.

Then download code 2 in same way. Press button A, a row of LEDs are added, when B is pressed, a row of LEDs are deducted.

Project 6: Temperature Measurement

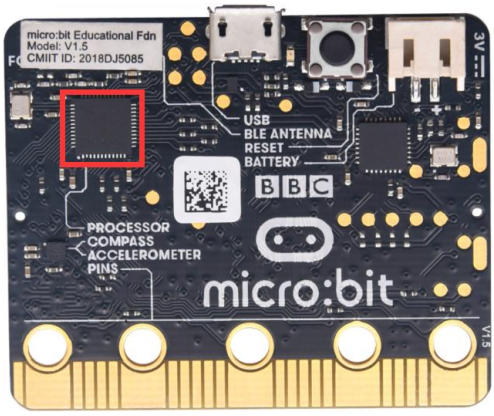
1.Description:

Micro:bit main board contains temperature sensor, as micro:bit is small pocket-sized computer, it has a micro processor. That means this is a tiny electronic component with less power than normal computer processor, which is one of the reason your micro:bit is so small and can run on batteries.

The micro:bit processor runs the program you create for your micro:bit

so when you write a program in online editors, then transfer it to your micro:bit. The processor is where your program runs.

Note: the temperature sensor is included in the processor

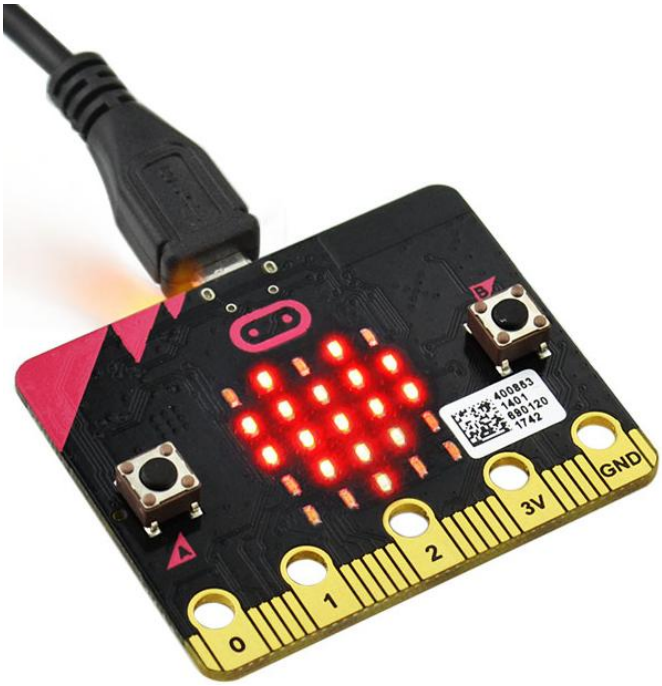


2.What You Need:

- Micro:bit Board*1
- Micro USB Cable*1

3.Wiring Up:

Connect micro:bit to your computer using micro USB cable

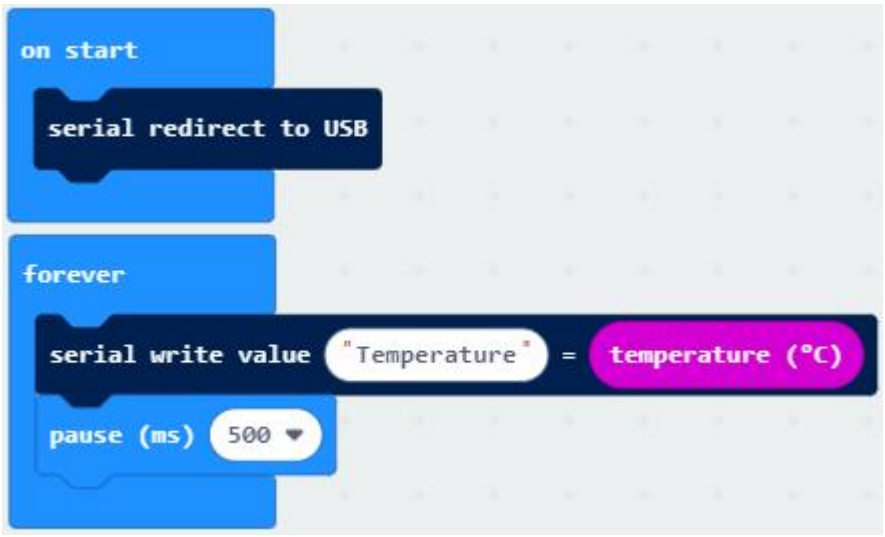


4.Test Code:

You could navigate https://makecode.micro:bit.org/reference to have access to more details.

Browse link https://makecode.micro:bit.org/ to edit your program. The following test code is as for your reference.

Code 1:



"on start": command block only runs once to start program.

Serial redirect to USB

The program under the block "forever" runs cyclically.

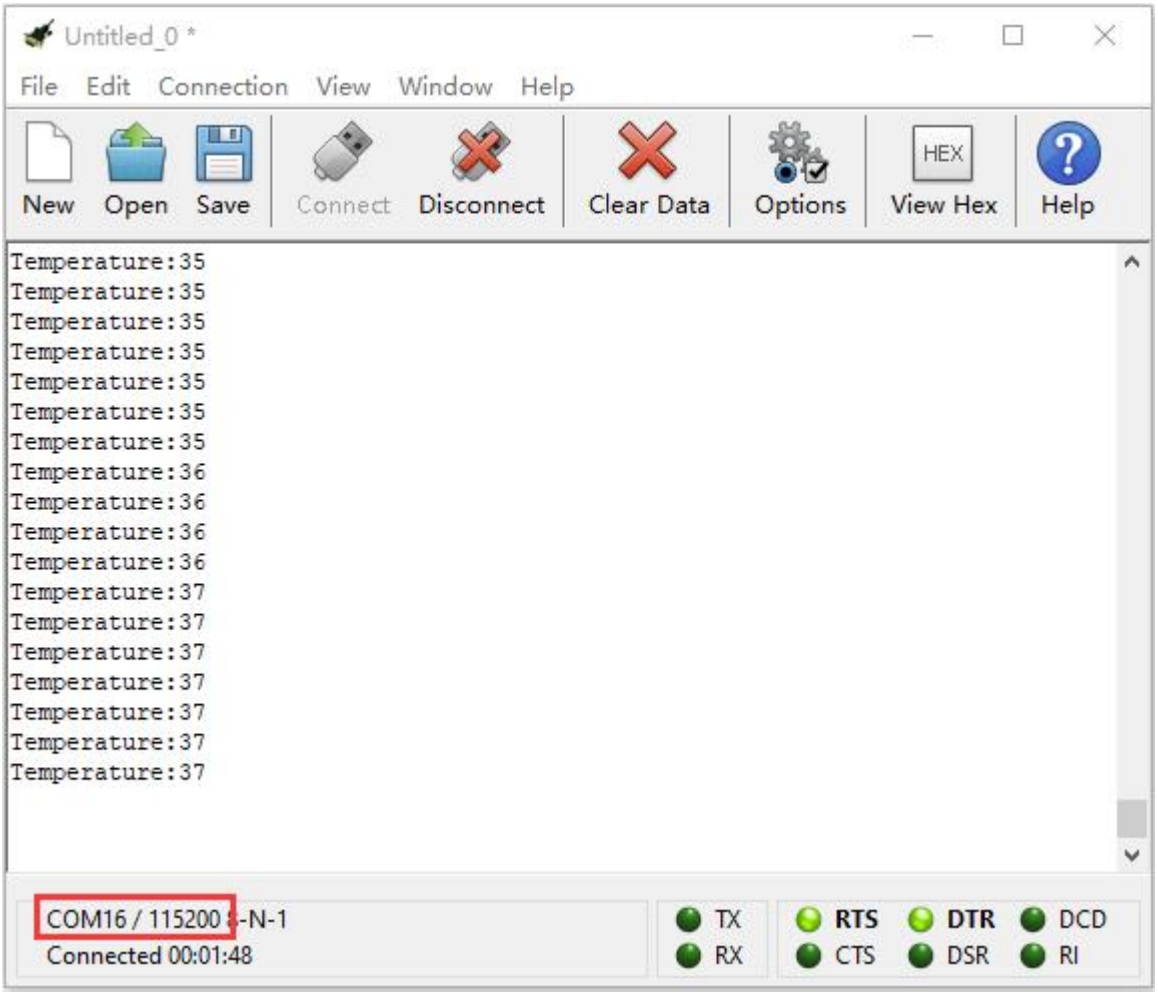
Serial writes Temperature=Temperature (℃)

Delay in 500ms

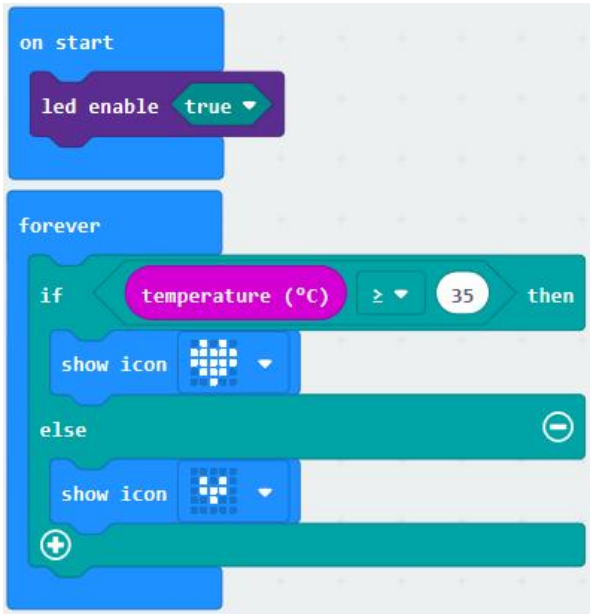
According to wiring diagram, upload code and plug micro:bit to power.

Open CoolTerm to select "SerialPort", set COM port and baud rate to 115200 (the baud rate of USB serial communication of micro:bit is 115200 through the test).

Click "OK" and "Connect".



Code 2 (Note: temperature value can be adjusted)



"on start" : command block runs once to start program.

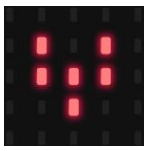
Turn on LED dot matrix

Under the block "forever", program runs cyclically.

If the detected temperature ≥ 35 °, the next program will be executed.

Dot matrix shows "❤"

5.Test Result:

Then transfer code 2 in micro:bit, when the ambient temperature is less than 35 ℃, micro:bit will show  . When the temperature is equivalent to or greater than 35℃, the pattern  will appear.

Project 7: Micro:bit Compass

1.Description:

This project mainly introduces the use of the micro:bit magnetic sensor. In addition to detecting the strength of the magnetic field, it can also be used as an electronic compass to determine the direction, an important part of the heading and attitude reference system (AHRS) as well.

It uses FreescaleMAG3110 three-axis magnetometer. Its I2C interface communicates with the outside, the range is ±1000μT, the maximum data update rate is 80Hz. Combined with accelerometer, it can calculate the position. Additionally, it is applied to magnetic detection and compass blocks.

Then we could read the value detected by magnetic sensor to determine the location. We need to calibrate the micro:bit board when magnetic sensor works.

The correct calibration method is to rotate the micro:bit board.

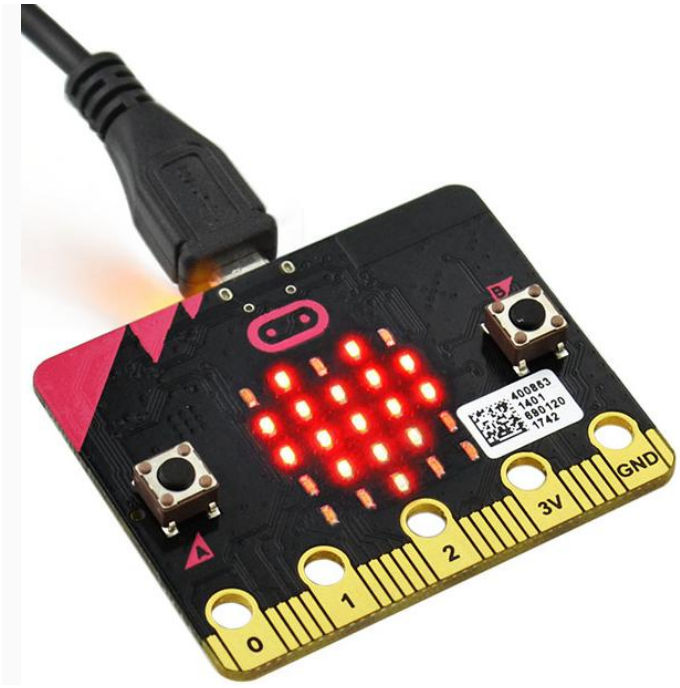
In addition, the objects nearby may affect the accuracy of readings and calibration.

2.What You Need:

- Micro:bit Board*1
- Micro USB Cable*1

3.Wiring Up:

Connect micro:bit to your computer using micro USB cable.

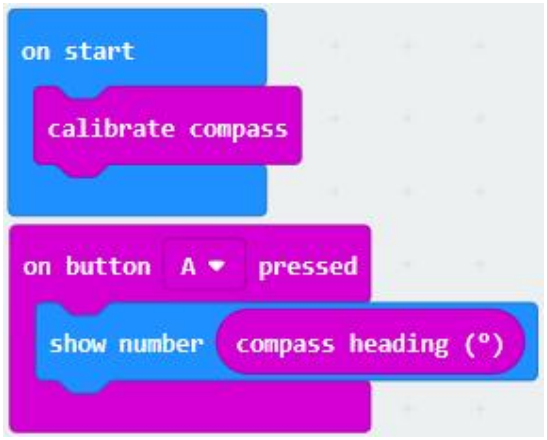


3. Test Code:

You could navigate https://makecode.micro:bit.org/reference to have access to more details.

Browse link https://makecode.micro:bit.org/ to edit your program. The following test code is as for your reference.

Code 1:



"on start": command block only runs once to start program.

Calibrate compass

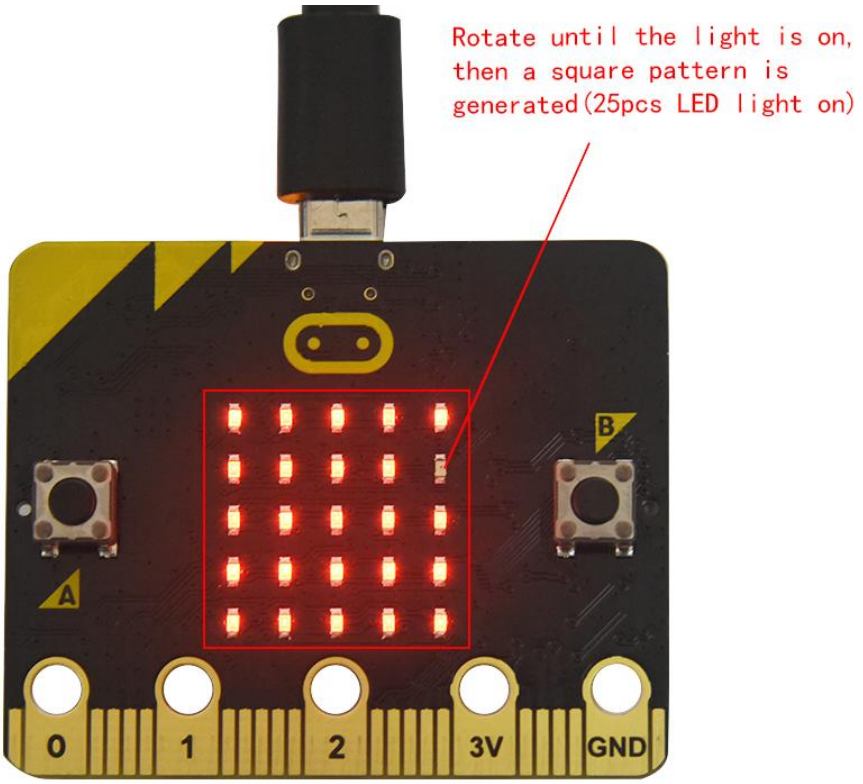
Press button A on Micro:bit main board

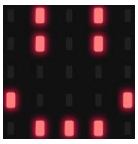
Dot matrix shows the direction of compass heading

Code Explanation:

Calibrate micro:bit first due to different magnetic field everywhere. Micro:bit will prompt the need of calibration if it is the first time to use it.

Download code 1 to micro:bit and keep USB cable connected. Press button A, LED dot matrix will show "TILT TO FILL SCREEN". Then enter the calibration interface, rotate the micro:bit board to make a full square (25 LEDs are on) on dot matrix, as shown below:

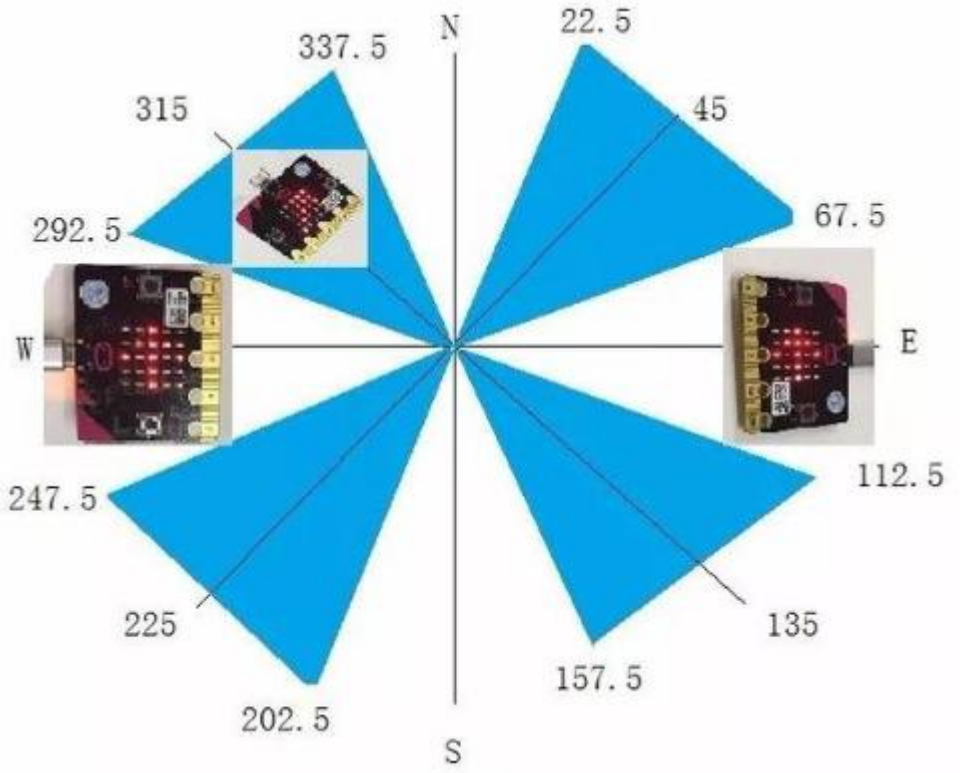


A smile  will appear if calibration is finished.

After calibrating, press A each time, the serial monitor will show 0°, 90°, 180°and 270°(correspond to North, East, South, West)

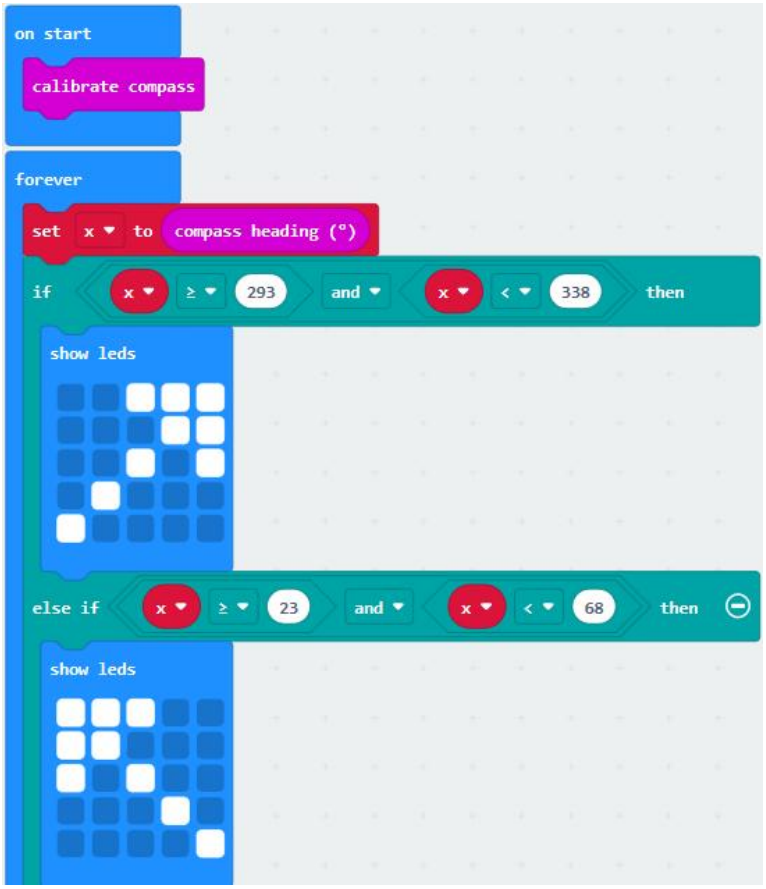
Code 2

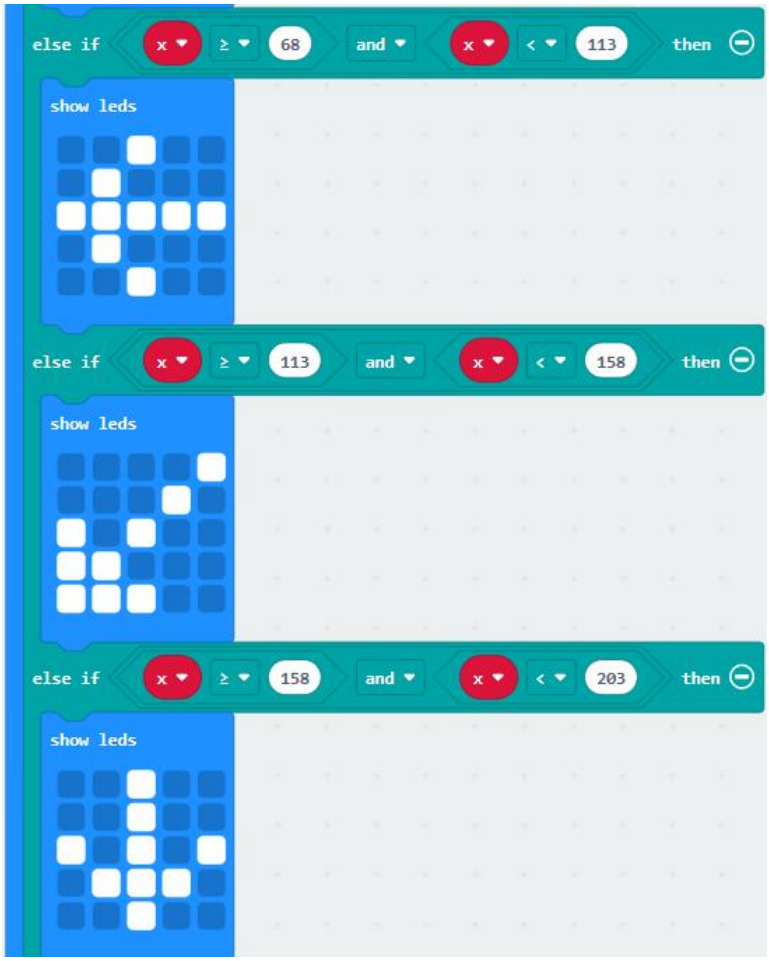
This code string complies that we read the value detected incessantly and determine the direction by the value range. The arrow is toward North.

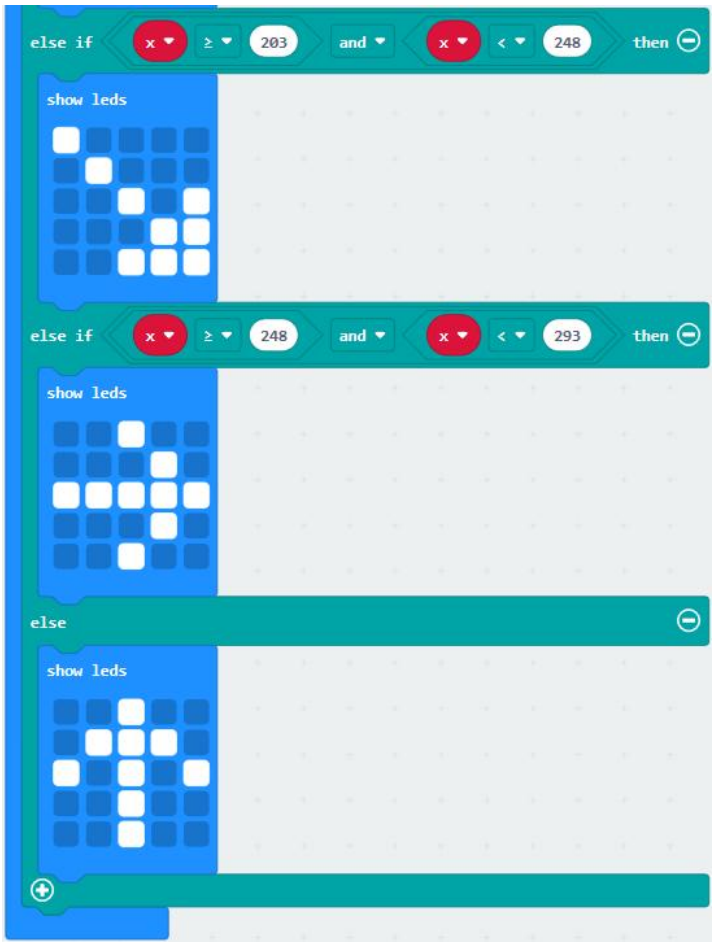


For the above picture, the arrow pointing to the upper right when the value ranges from 292.5 to 337.5. 0.5 can’ t be input in the code, thereby, the values we get are 293 and 338

Complete Code:


on start
calibrate compass
forever
set x to compass heading (°)
if x ≥ 293 and x < 338 then
show leds
else if x ≥ 23 and x < 68 then
show leds


else if x ≥ 68 and x < 113 then
show leds
else if x ≥ 113 and x < 158 then
show leds
else if x ≥ 158 and x < 203 then
show leds


else if x ≥ 203 and x < 248 then
show leds
else if x ≥ 248 and x < 293 then
show leds
else
show leds

"on start" : command block only runs once to start program.

Calibrate compass

The program under the block "forever" runs cyclically.

Store the angle of the compass heading into the variable x

Save the angle of

When 293≤x<338, execute the program under then block

Micro:bit shows 

When 23≤x<68, execute the program under then block

Micro:bit shows 

When 68≤x<113, execute the program under then block

Micro" bit shows "  "

When 113≤x<158, execute the program under then block

Micro" bit shows "  "

When 158≤x<203,execute the program under then block

Micro" bit shows "  "

When 203≤x<248, execute the program under then block

Micro:bit shows "  "

When 248≤x<293, execute the program under then block

Micro:bit shows "  "

When x is not among the above rang, the next program will be executed under else block

Micro:bit shows " "  "

5.Test Result:

Download code 2 to micro:bit and keep USB connected.

After calibration, tilt micro:bit board, the LED dot matrix displays the direction signs.

Project 8: Micro:bit Acceleration Sensor

1.Description:

The micro:bit board has a built-in Freescale MMA8653FC three-axis acceleration sensor (accelerometer). Its I2C interface works on external communication, the range can be set to ±2g, ±4g, and ±8g, and the maximum data update rate can reach 800Hz.

When the micro:bit is stationary or moving at a constant speed, the accelerometer only detects the gravitational acceleration; when the micro:bit is slightly shaken, the acceleration detected is much smaller than the gravitational acceleration and can be ignored. Therefore, in the process of using micro:bit, the main purpose is to detect the changes of the gravitational acceleration on the x, y, and z axes when the attitude changes.

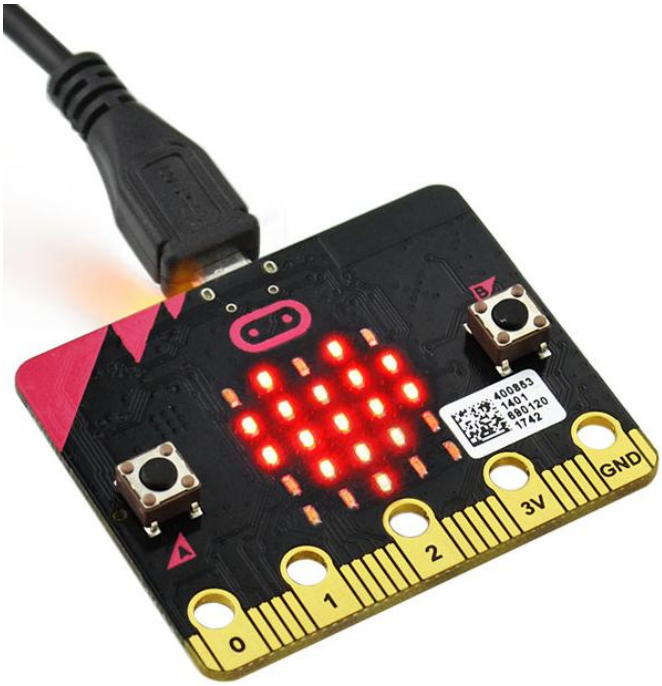
For this project, we will introduce the detection of several special postures by the accelerometer.

2.What You Need:

- Micro:bit Board*1
- Micro USB Cable*1

3.Wiring Up:

Connect micro:bit to your computer using micro USB cable.



4.Test Code:

You could navigate https://makecode.micro:bit.org/reference to have access to more details.

Browse link https://makecode.micro:bit.org/ to edit your program. The following test code is as for your reference.

Code 1:

Shake micro:bit

Micro:bit shows 1

Micro:bit’ s logo is upward

Micro:bit shows 2

Micro:bit’ s logo is download

Micro:bit shows 3

Dot matrix of micro:bit is upward

Micro:bit shows 4

Dot matrix of micro:bit is downward

Micro:bit shows 5

micro:bit tilts left

Micro:bit shows 6

micro:bit tilts right

Micro:bit shows 7

When the Micro:bit board is free fall

Micro:bit shows 8

Code 2:

"on start": command block only runs once to start program.

The program under the block "forever" runs cyclically.

Serial writes value X=acceleration value of x axis

Delay in 100ms

Serial writes value Y=acceleration value of Y axis

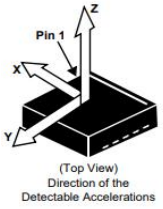
Delay in 100ms

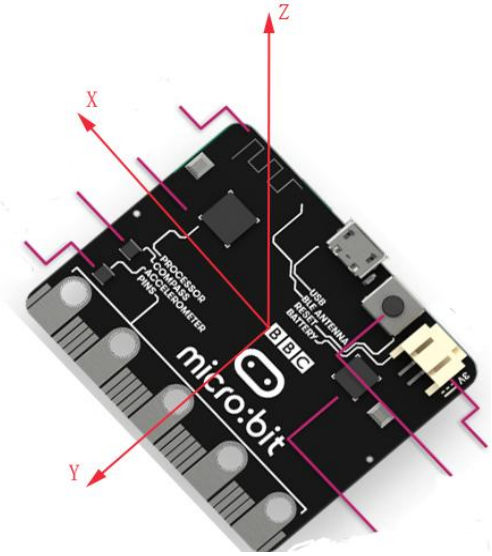
Serial writes value Z=acceleration value of Z axis

Delay in 100ms

Download code 2 to micro:bit, keep USB cable connected.

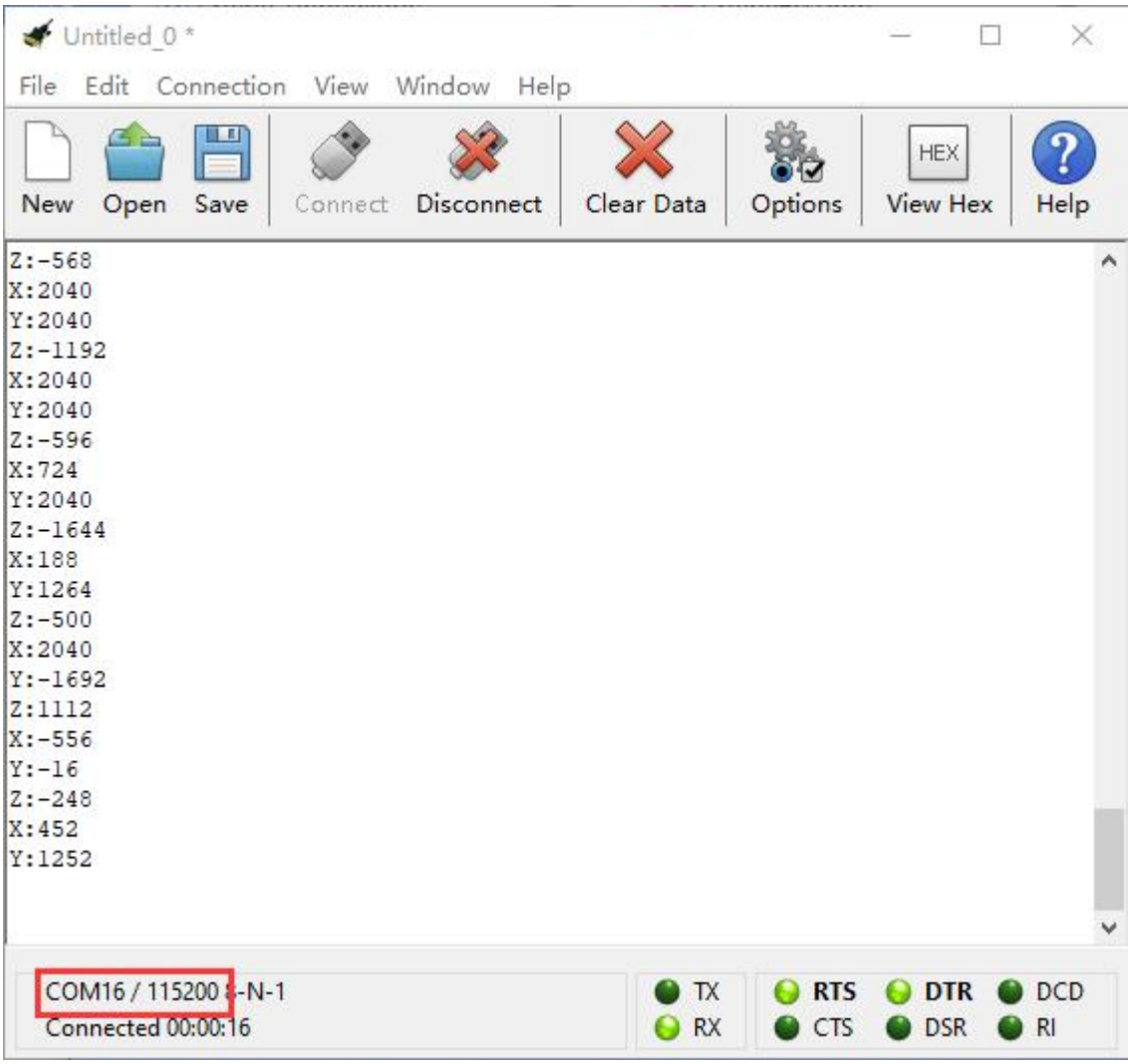
The coordinates of the micro:bit accelerometer are shown in the following figure:





Hook the components up, upload code, power on and open CoolTerm, click Options to select SerialPort. Set COM port and baud rate is 115200(the baud rate of USB serial communication of micro:bit is 115200 through the test). Click "OK" and "Connect".

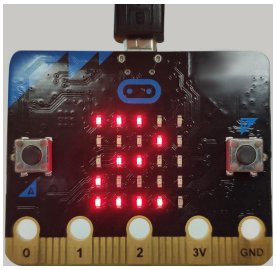
The serial monitor separately displays the decomposition value of acceleration on the X-axis, Y-axis, and Z-axis, as well as the synthesis value of acceleration (the synthesis of gravitational acceleration and other external forces).



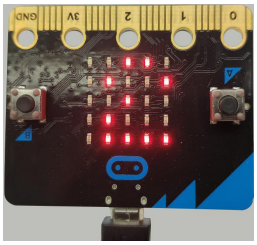
5.Test Result:

Download code 1 to micro:bit and plug in power with USB cable. Shake micro:bit then the number 1 appears.

When the logo points to the North, the number 2 is displayed:



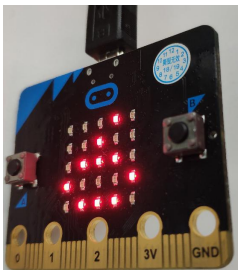
When the logo points to the South, the number 3 is displayed:



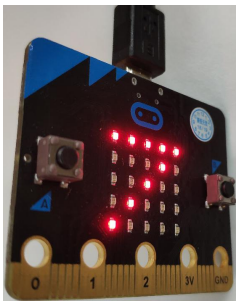
When the screen is upward, the number 4 is shown.

On the contrary, the number 5 is displayed when the screen is downward.

When micro:bit board is tilt to the left, number 6 is shown.

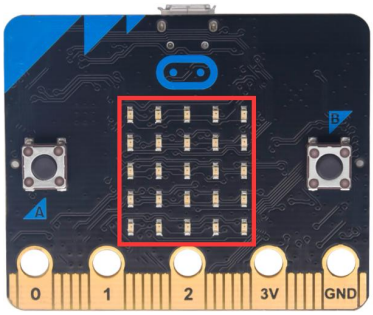


When micro:bit board is inclined to the right, number 7 is displayed.



When it is free fall(accidentally making it fall), number 8 appear on dot matrix. (Note: we don't recommend you to make it free fall, it will cause board damage)

Project 9: Detect Light Intensity by Micro:bit



1.Description:

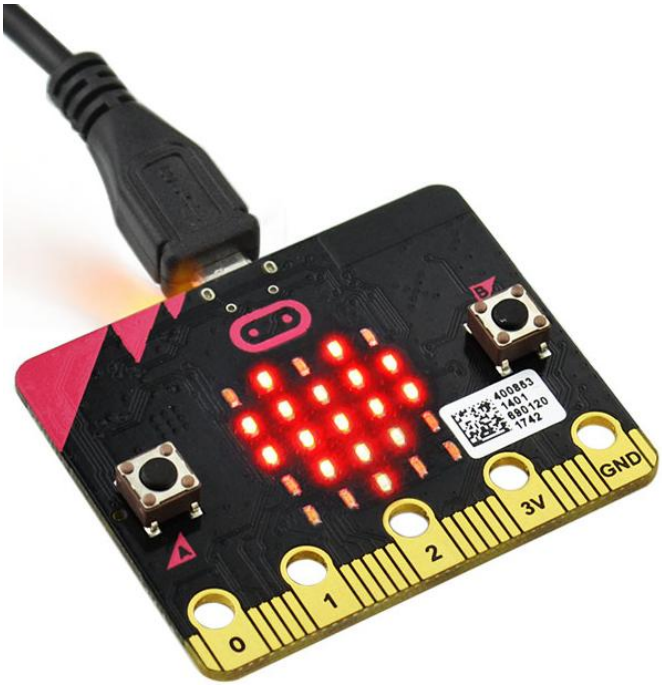
This project will introduce how micro:bit detects the external light intensity. Since micro:bit doesn't come with photosensitive sensor, the detection of light intensity is completed through the LED matrix. When the light irradiates the LED matrix, the voltage change will be produced. Therefore, we could determine the light intensity by voltage change.

2.What You Need:

- Micro:bit Board*1
- Micro USB Cable*1

3.Wiring Up:

Connect micro:bit to your computer using micro USB cable.



4.Test Code:

You could navigate https://makecode.micro:bit.org/reference to have access to more details.

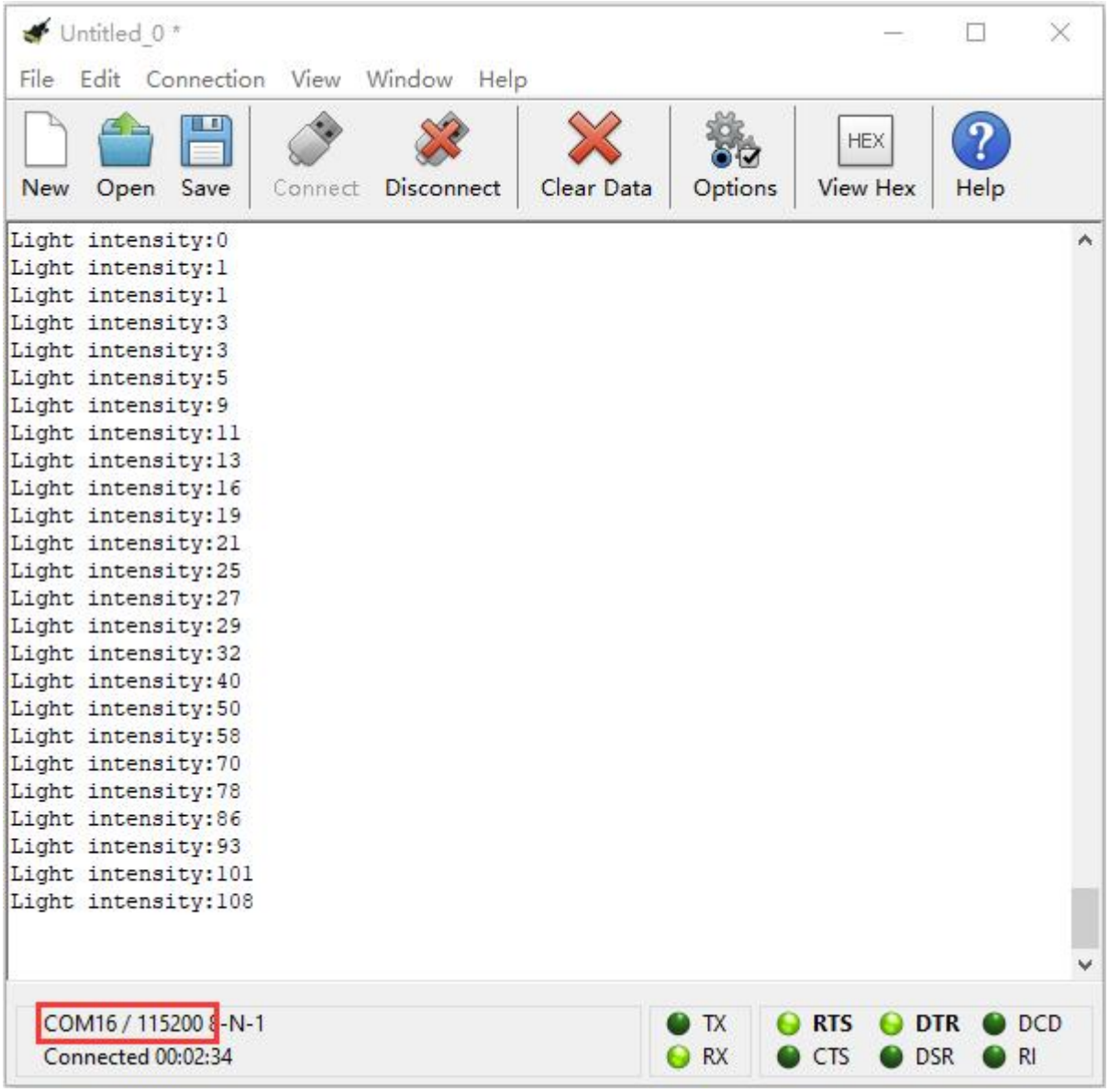
Browse link https://makecode.micro:bit.org/ to edit your program. The following test code is as for your reference.

"on start": command block runs once to start program.
Serial redirects to USB
The program under the block "forever" runs cyclically.
Serial write value "Light intensity" = light level
Delay in 100ms

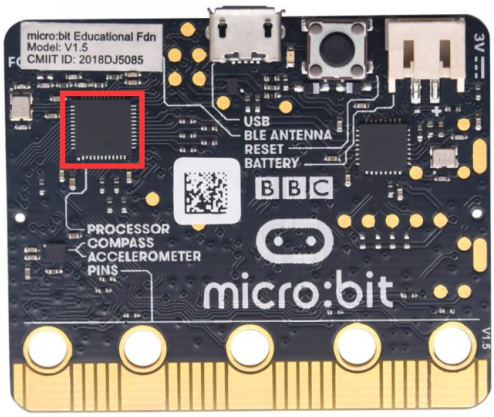
5.Test Result:

Wire the components up, download code to micro:bit, keep USB cable connected and open CoolTerm, click Options to select SerialPort. Set COM port and baud rate is 115200(the baud rate of USB serial communication of micro:bit is 115200 through the test). Click "OK" and "Connect".

CoolTerm monitor displays the light intensity value. When covering LED dot matrix by hand, the light intensity is 0; when putting it under the sun, the intensity value varies with the light intensity.



Project 10:Bluetooth Wireless Communication



1.Description:

Micro:bit board comes with NRF51822 processor, Bluetooth and

2.4GHz RF antenna, which work with Bluetooth and 2.4G wireless communication.

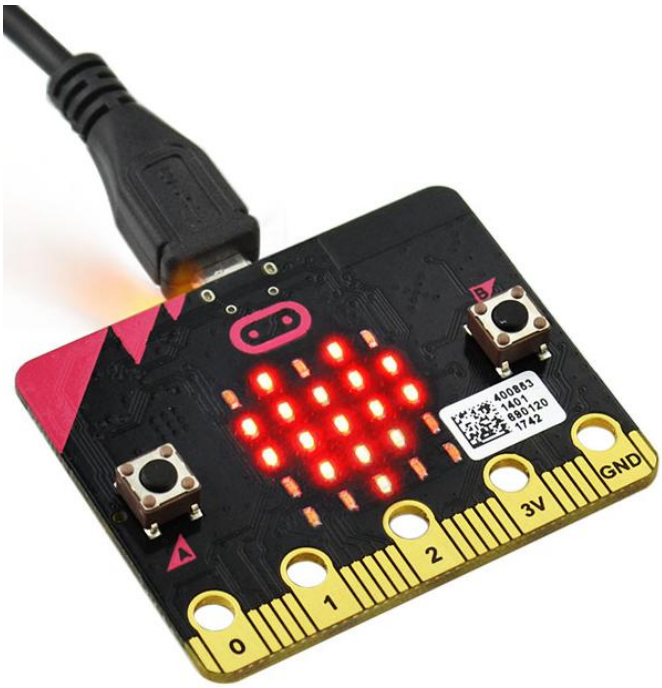
In this project, we connect cellphone to micro:bit motherboard to complete the wireless connection.

2.What You Need:

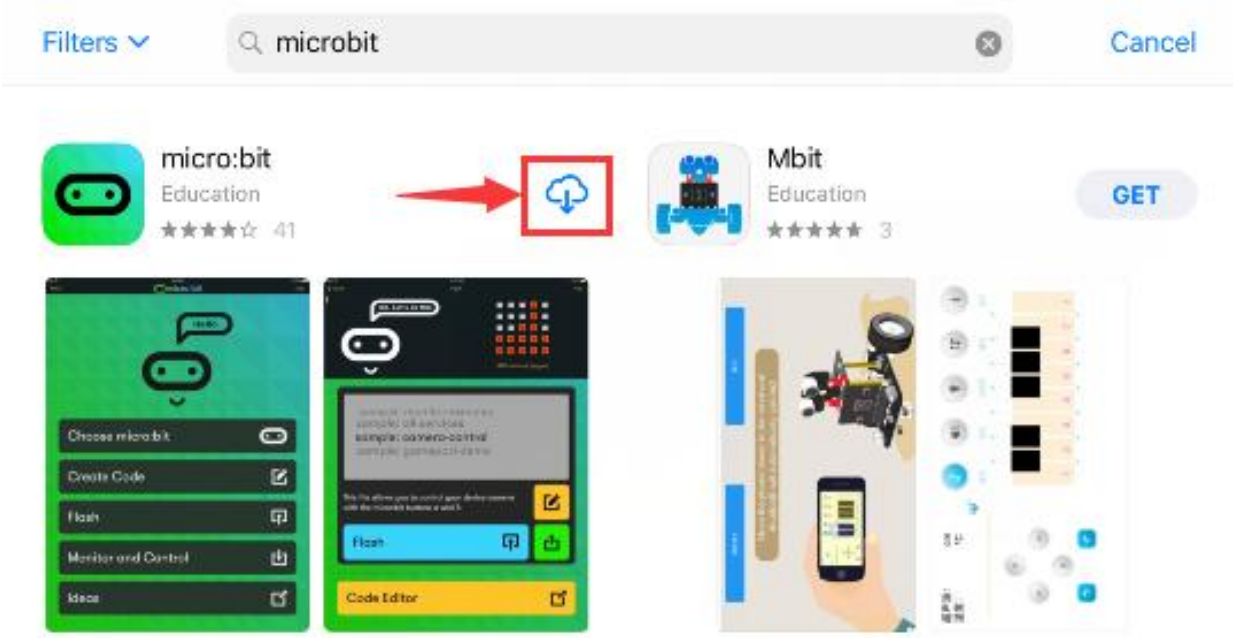
- Micro:bit Board*1
- Micro USB Cable*1
- Cellphone*1

3.Wiring Up:

Connect micro:bit to your computer using micro USB cable



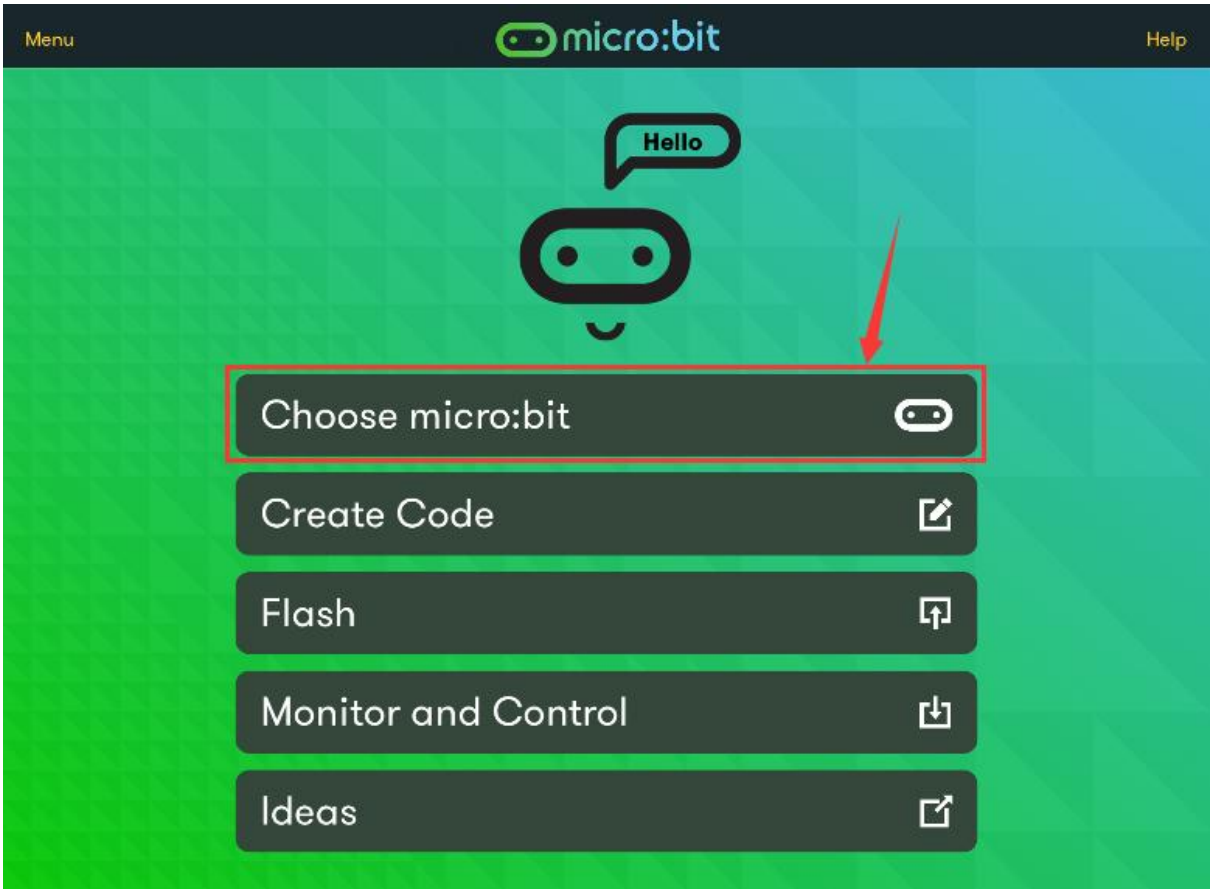
Search micro bit in App store and install it.



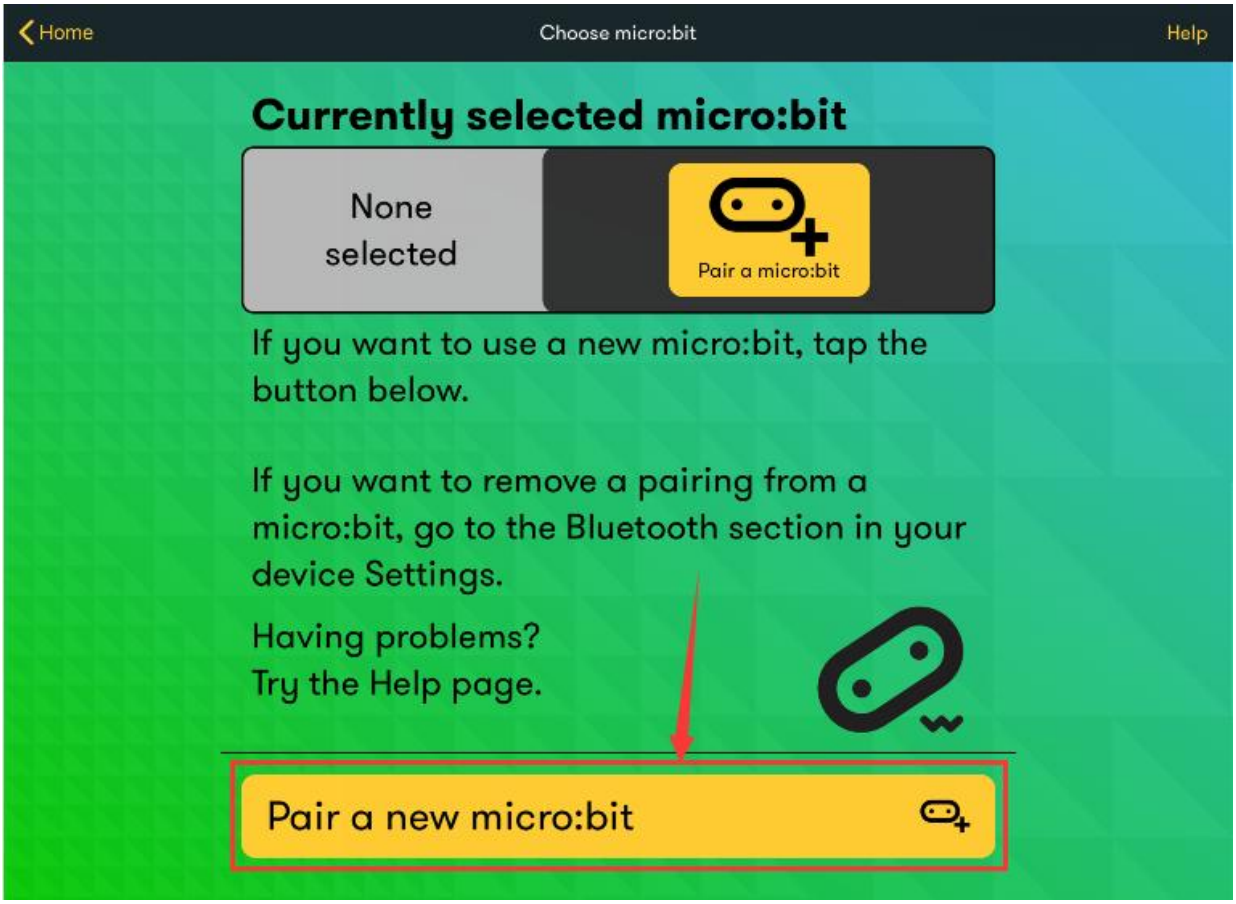
Pair BBC micro:bit with cellphone or iPad

a. After installing APP successfully, click 

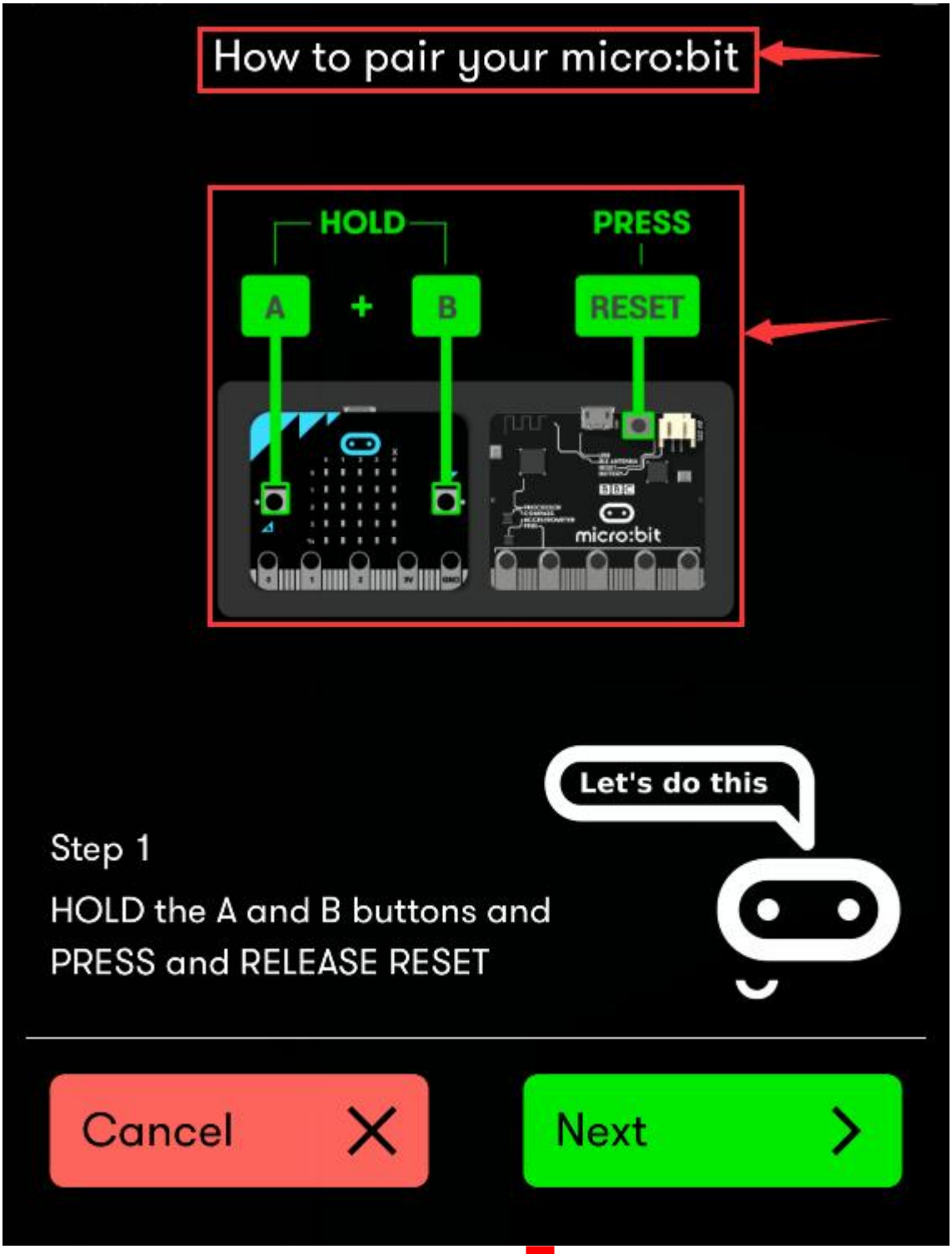
to enter app. plug in micro:bit , click “Choose Micro:bit” to start Bluetooth pairing.

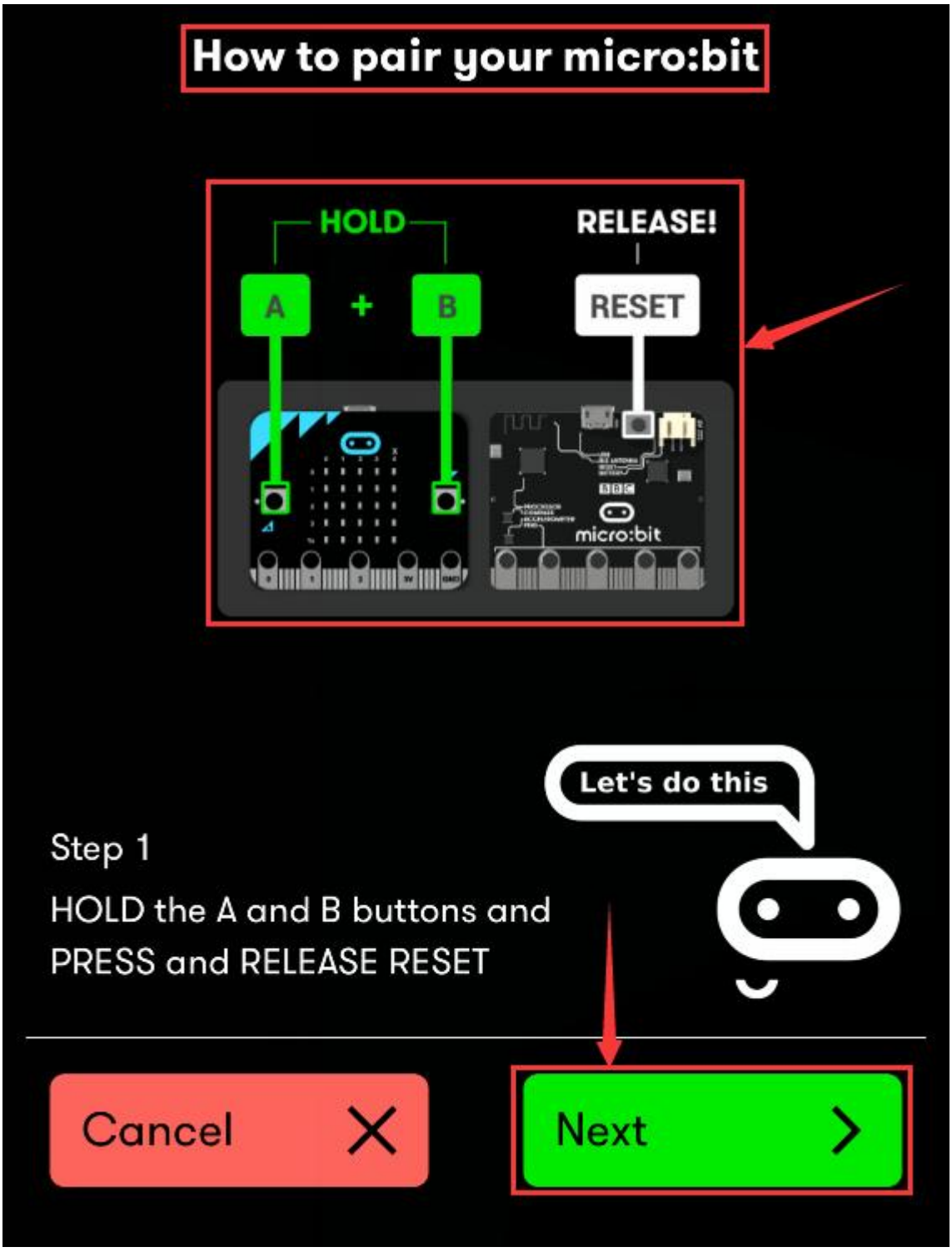


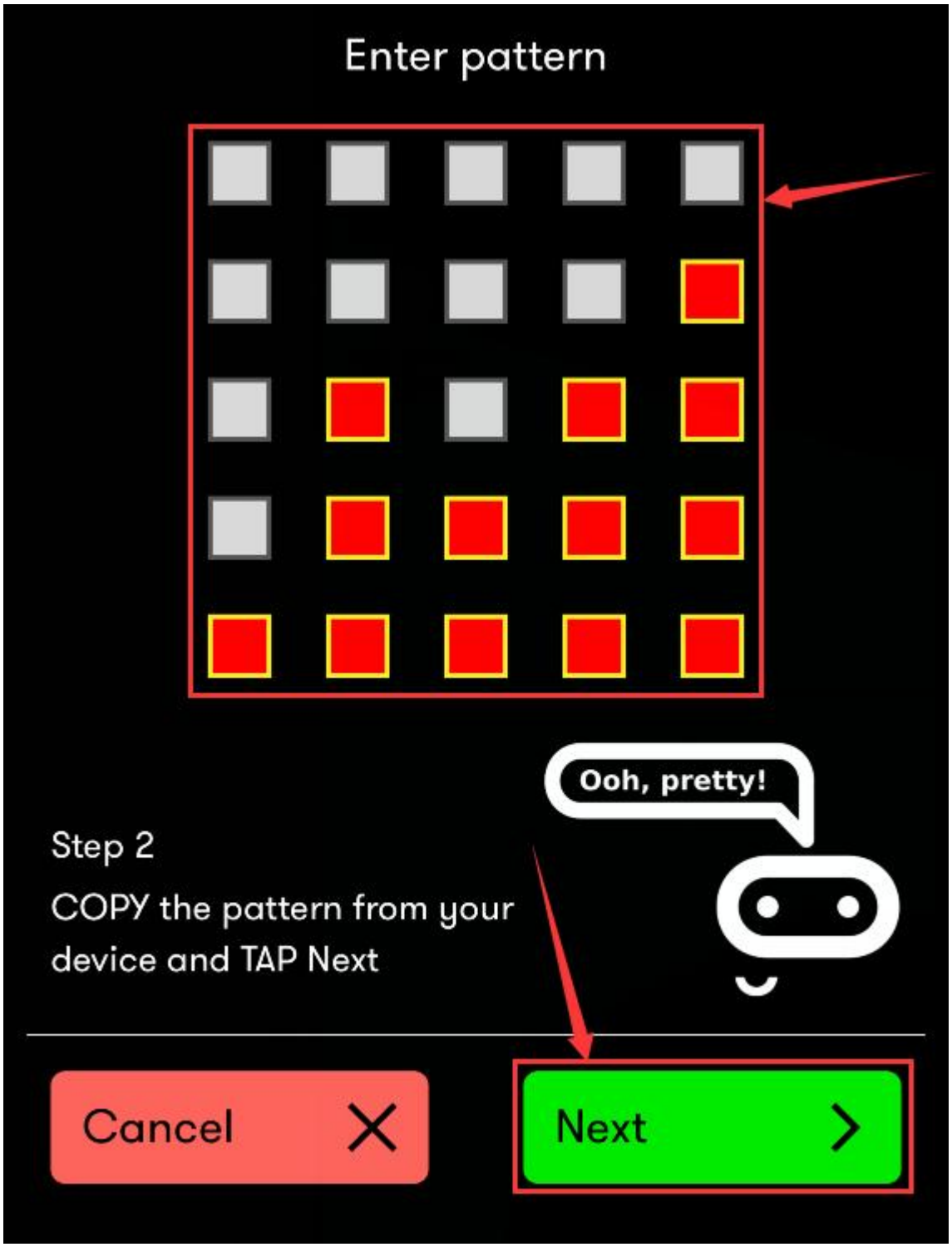
b. Click “Pair a new Micro:bit”



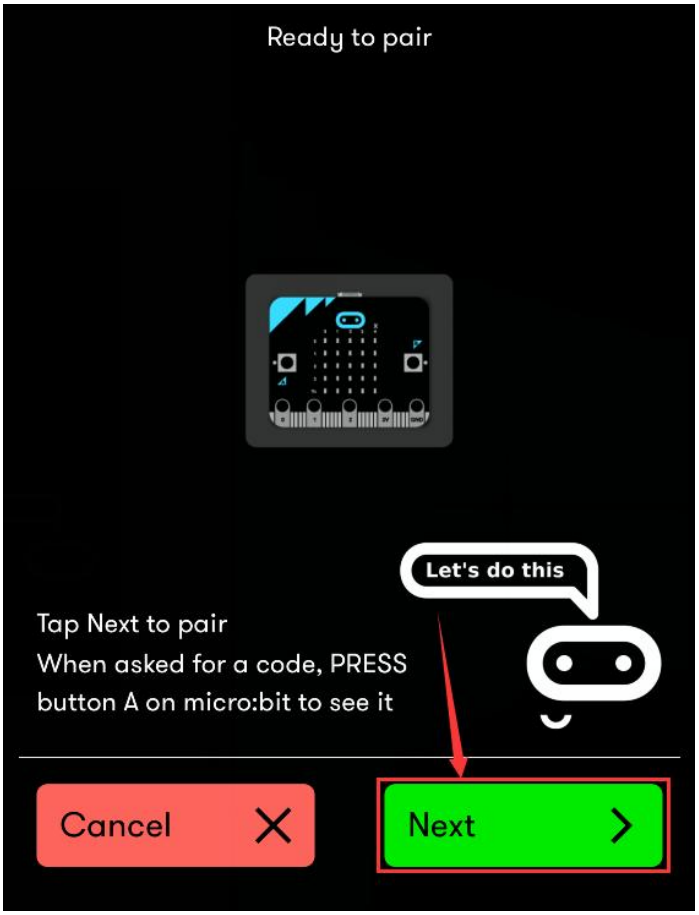
c. Hold down button A and B, then press and release the reset button. LED dot matrix will show a pattern. At last, release the button A and B and click “Next”.

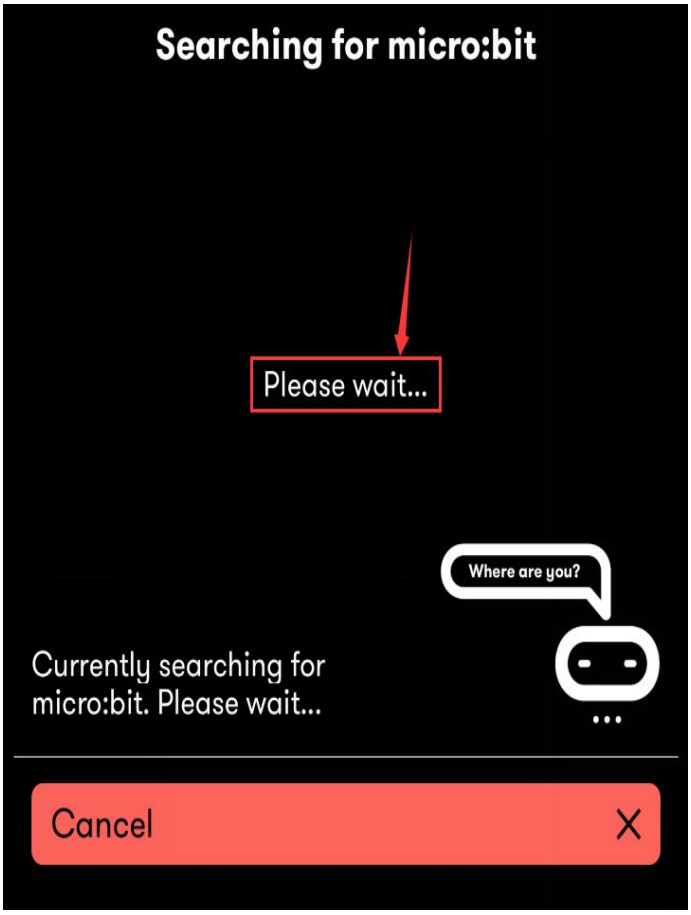



How to pair your micro:bit
HOLD
A
+
B
RELEASE!
RESET
micro:bit
Let's do this
Step 1
HOLD the A and B buttons and
PRESS and RELEASE RESET
Cancel
Next

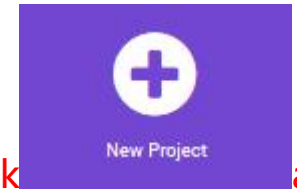


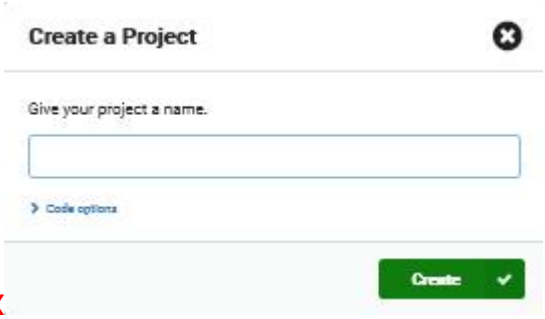
Tap “Next” to pair.


Ready to pair
Let's do this
Tap Next to pair
When asked for a code, PRESS
button A on micro:bit to see it
Cancel
Next


Searching for micro:bit
Please wait...
Where are you?
Currently searching for
micro:bit. Please wait...
Cancel

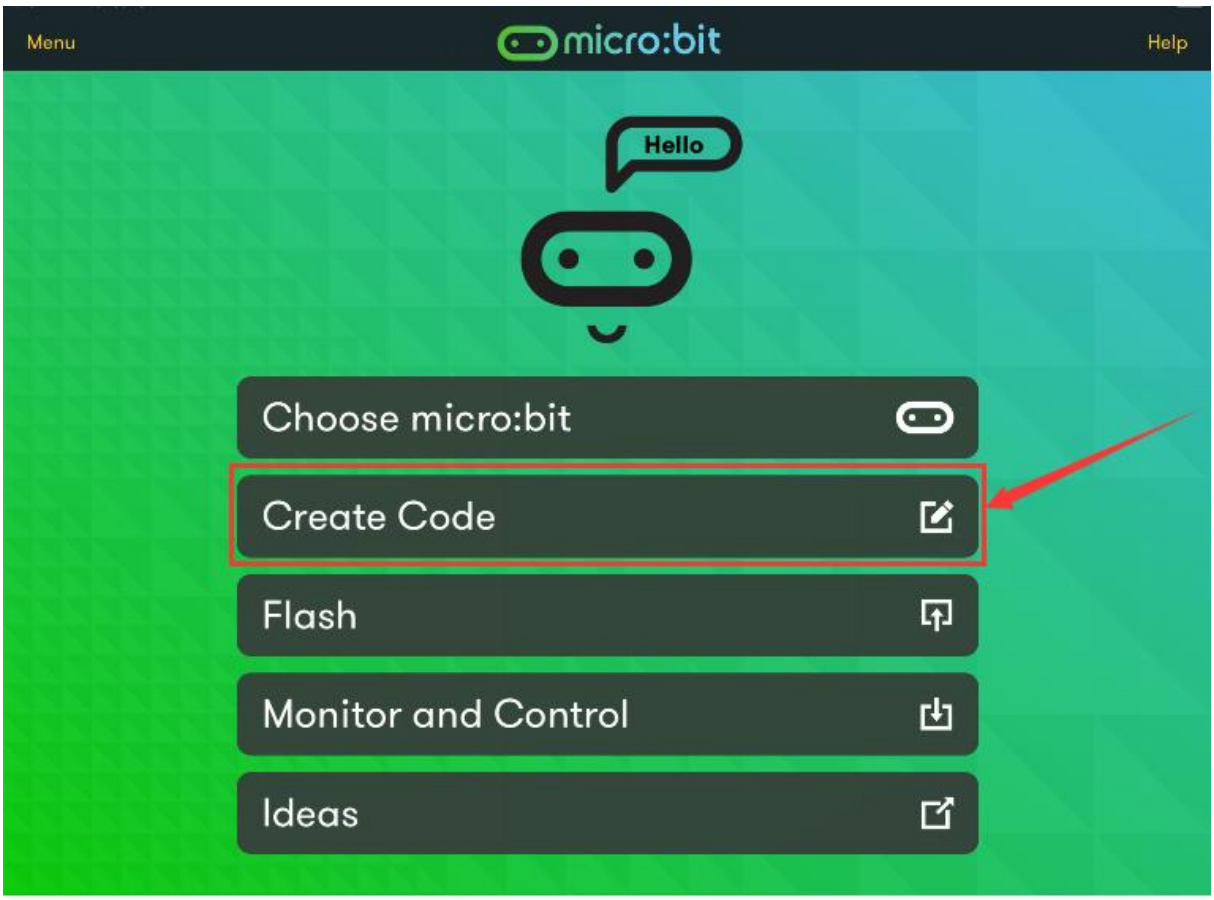
After pairing successfully, edit code via APP and upload code.

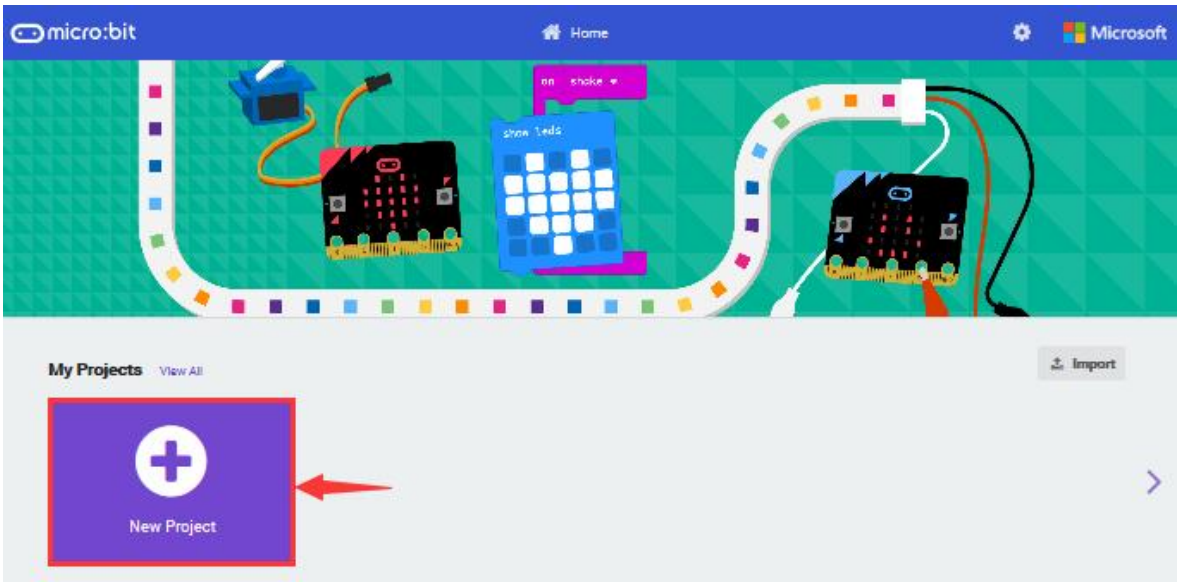
Select “Create Code” (Click 

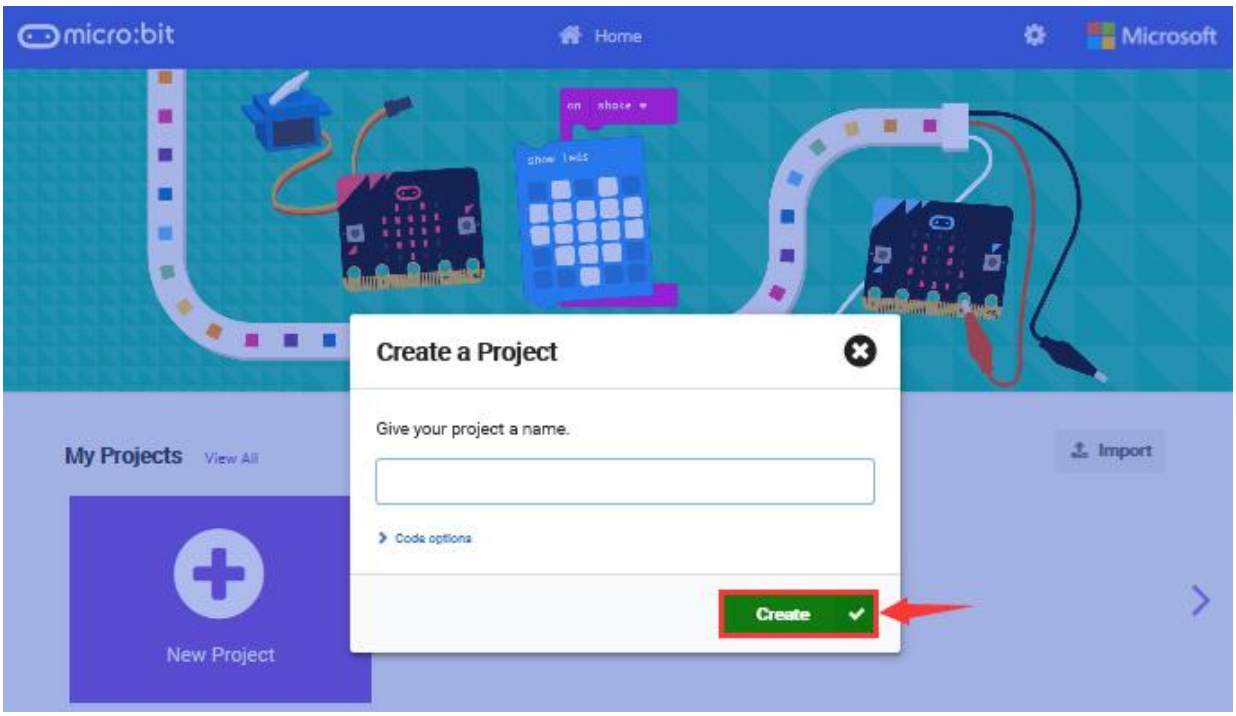
and appear the dialog box 

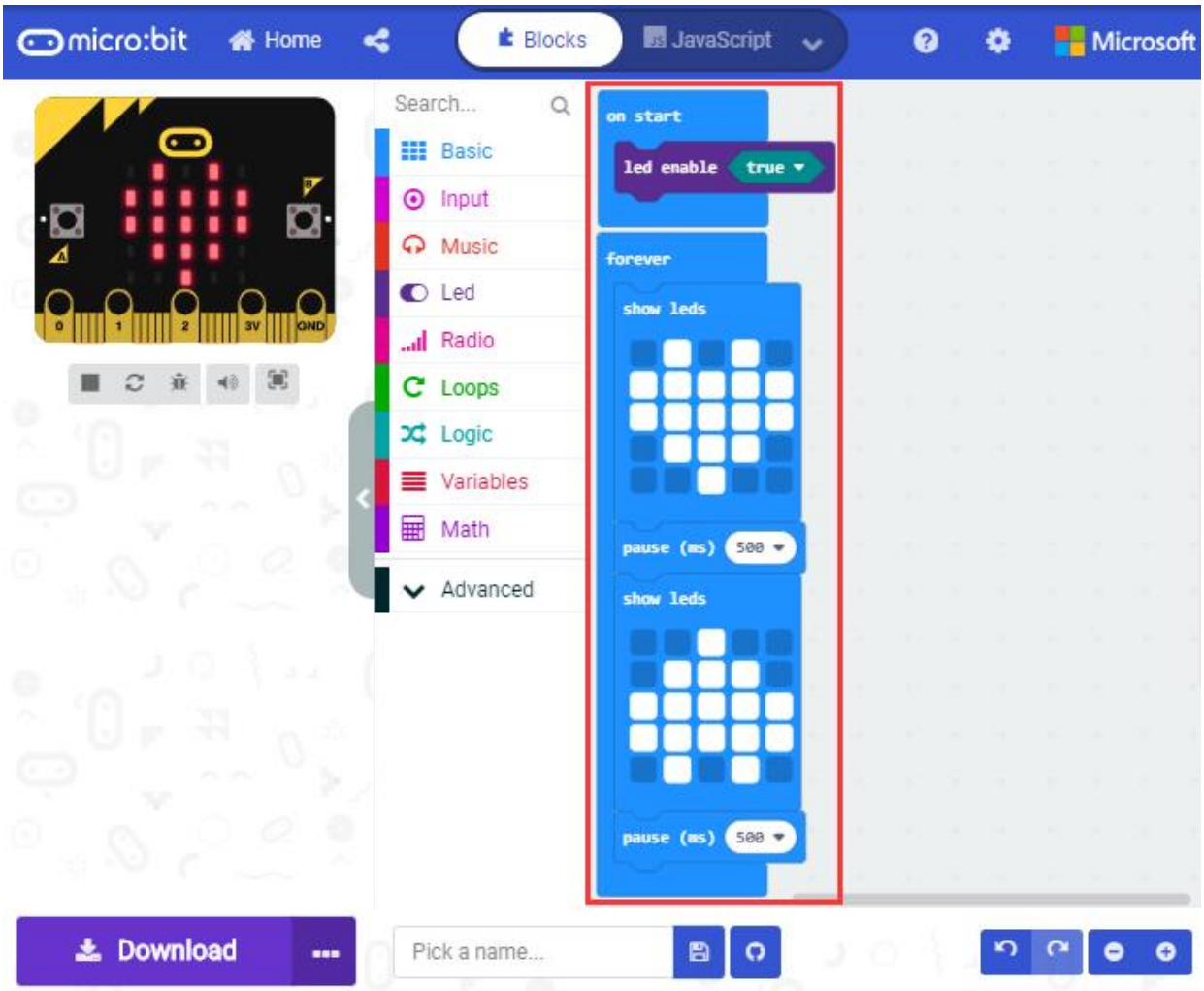
, click icon 

to enter the programming interface.

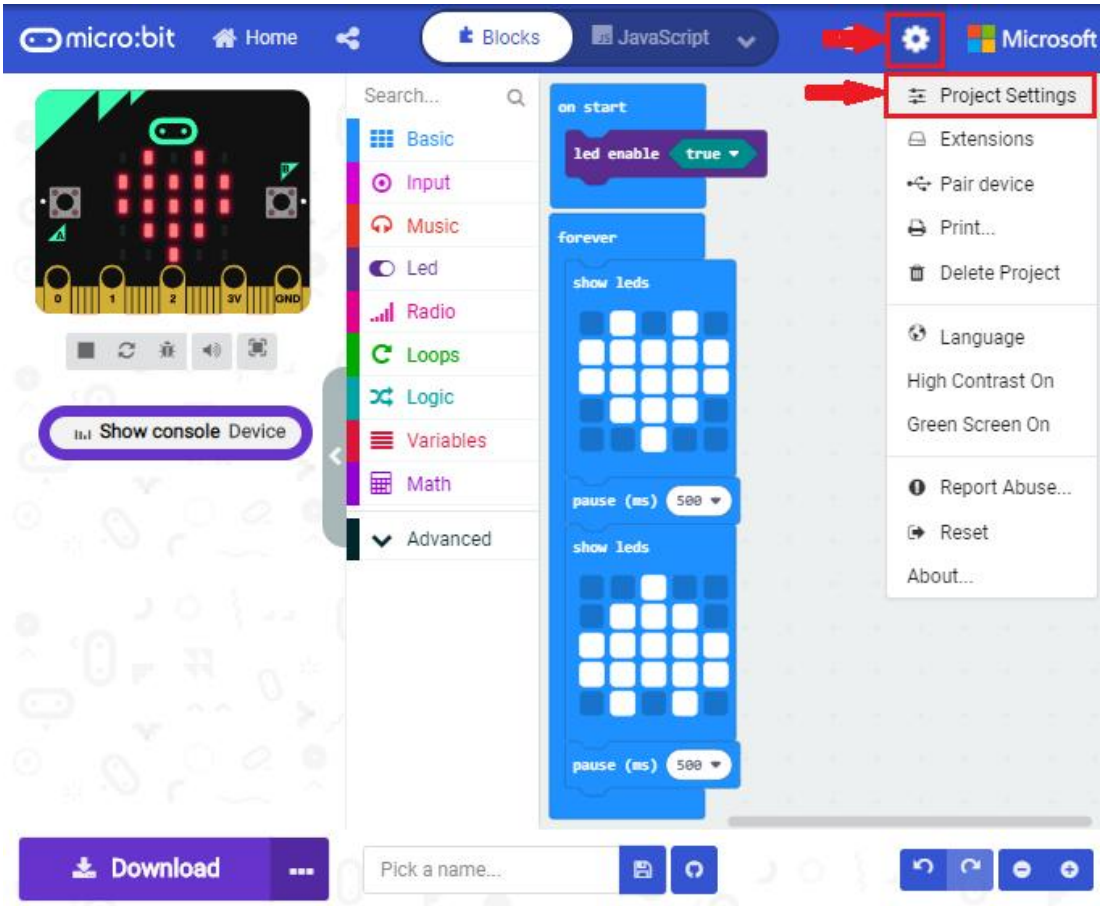

Menu
micro:bit
Help
Hello
Choose micro:bit
Create Code
Flash
Monitor and Control
Ideas


micro:bit
Home
Microsoft
My Projects
View All
Import
New Project

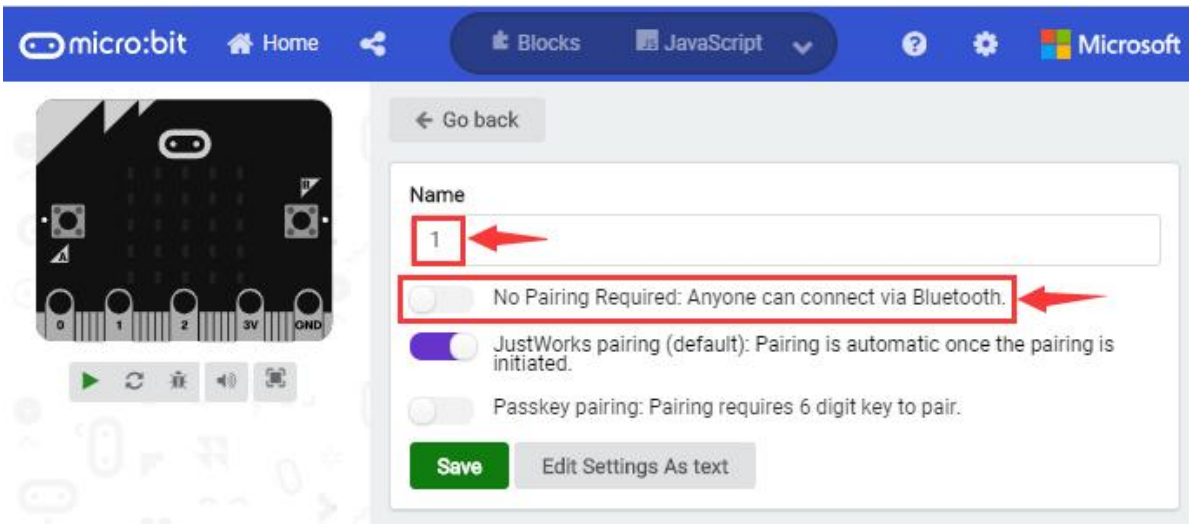

micro:bit
Home
Microsoft
Create a Project
Give your project a name.
Code options
Create
My Projects
View All
Import
New Project

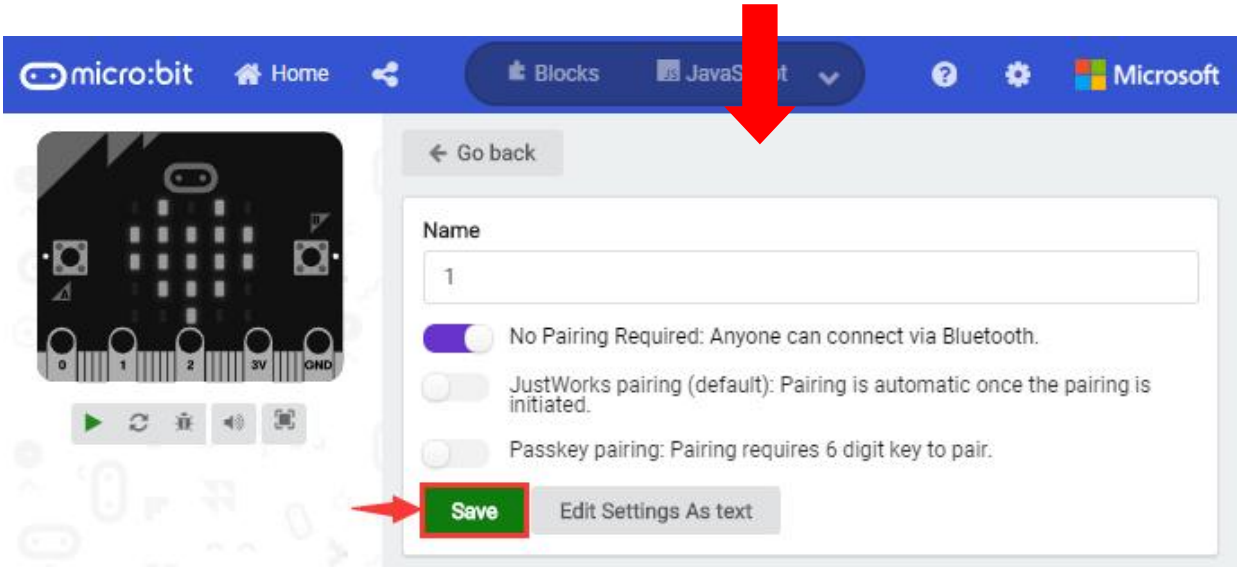


After finish programming, click  to select “Project Setting”.



Input 1 in the blank box to name your project. Enable button No Pairing Required: Anyone can connect via Bluetooth. . The page will return to the initial page. Then click the button and "Project Setting" to come back and tap "save"

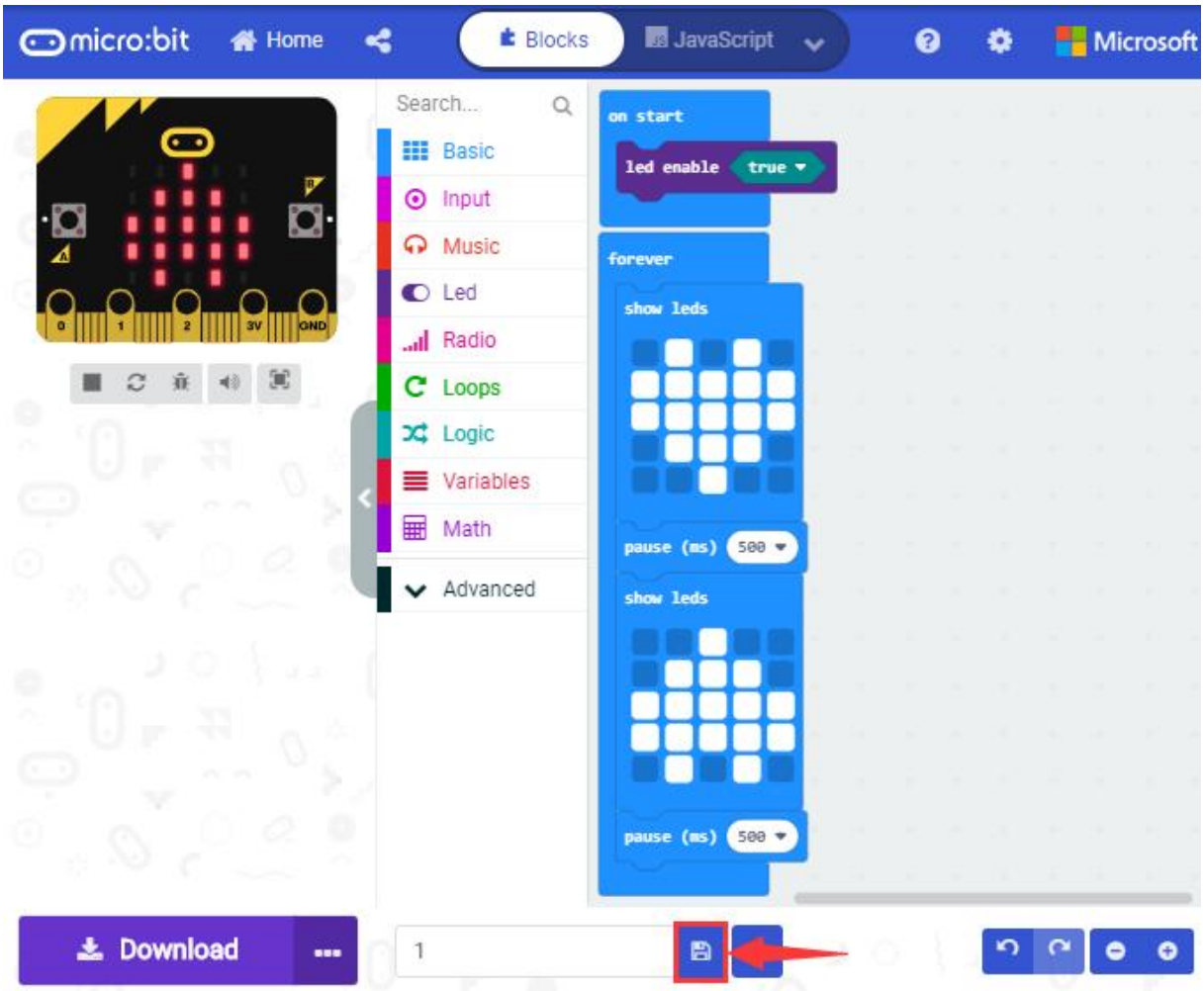




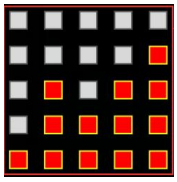
The program “1” is set well, click

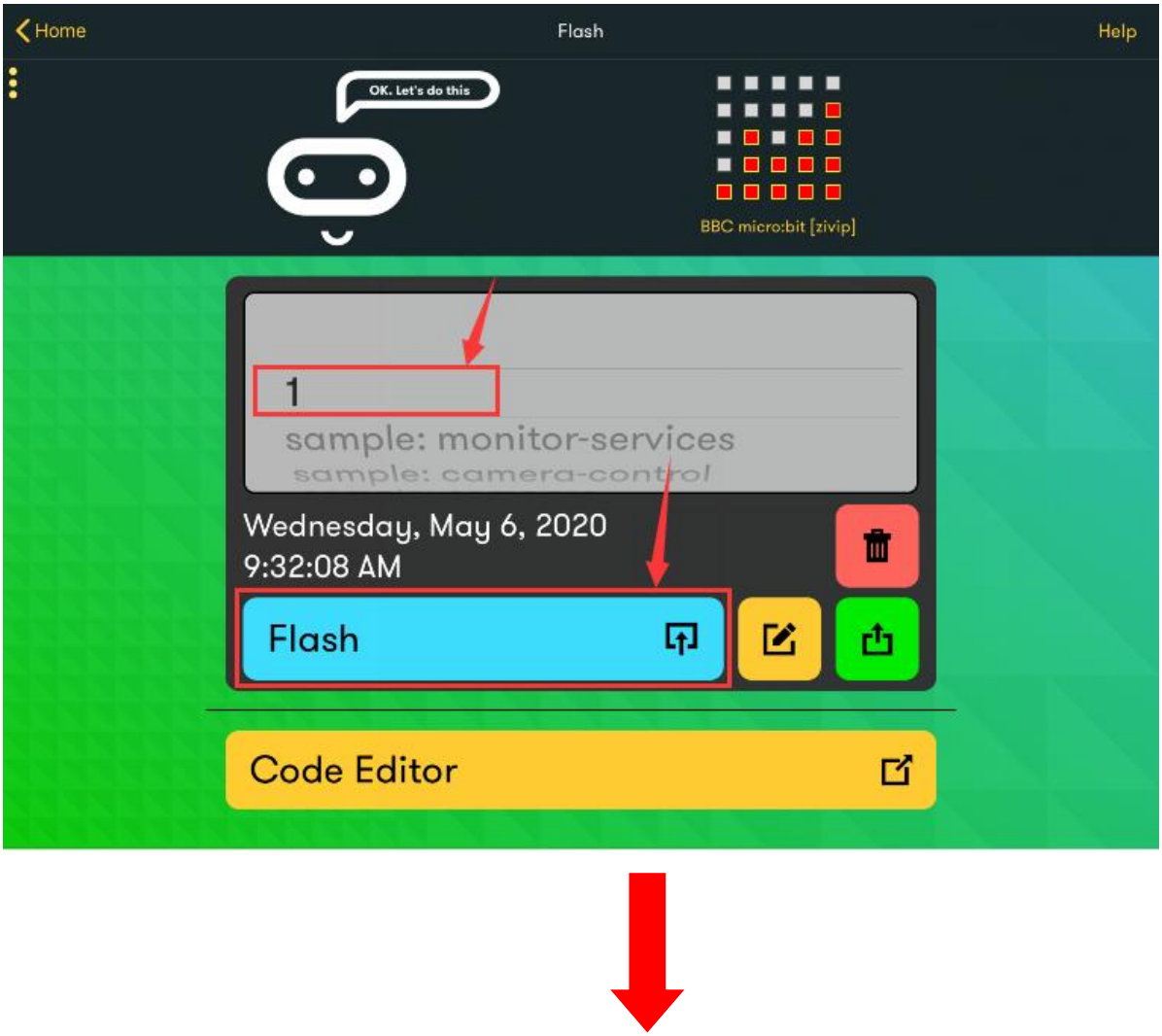
icon 

to save the program.

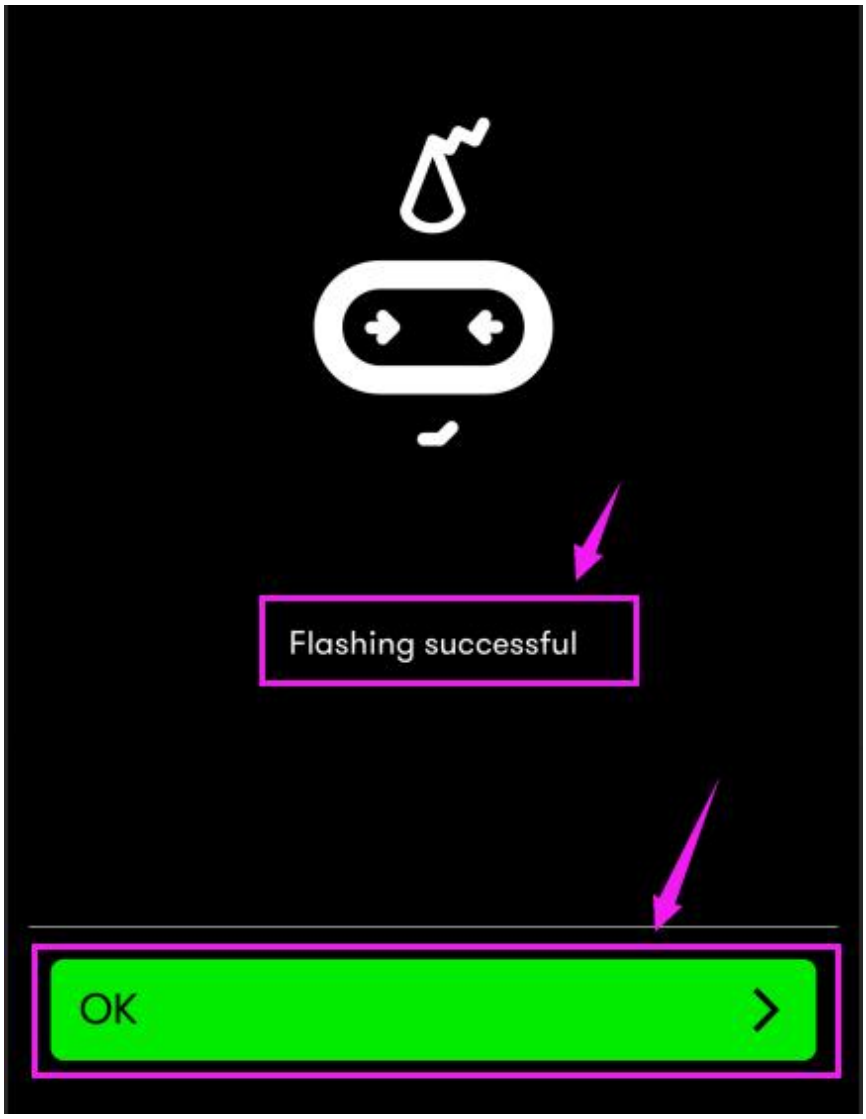


Then download the code to micro:bit directly(default program name is 1) and click “Flash”.

Note: the code will be downloaded after micro:bit shows the 


Home
Flash
Help
OK. Let's do this
BBC micro:bit [zivip]
1
sample: monitor-services
sample: camera-control
Wednesday, May 6, 2020
9:32:08 AM
Flash
Code Editor

Upload the program successfully, as shown below:



Project 11: LED Blink

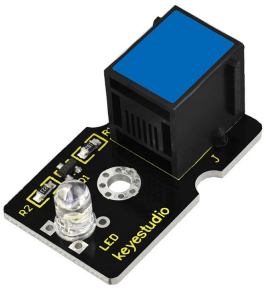
1.Description:

LED blink is a basic experiment. You will learn how to make white LED blink through code. Please turn off dot matrix on micro:bit before testing.

2. What You Need:

- Micro:bit Board*1
- EASY Plug Shield for micro bit V1.1*1
- Micro USB Cable*1
- EASY Plug White LED Module*1
- RJ11 Cable*1
- 6-Slot AA Battery Holder*1
- 1.5V AA Battery*6

EASY Plug White LED Module



The LED light modules have shiny colors, ideal for Arduino starters. It can be easily connected to IO/Sensor shield.

Note: this module needs to be used together with EASY Plug Shield for micro bit V1.1. You can also choose other LED to emit different color of light like white, blue, green, yellow and red.

3. Specification:

- Interface: Easy plug
- Sensor type: Digital
- Working voltage: 5V
- Easy to use
- Useful for light projects

EASY Plug Shield for micro bit V1.1

Micro:bit is a basic development board designed by the British Broadcasting Corporation for youth programming education. It supports the PXT graphical programming interface developed by Microsoft, without the need to download an additional compiler, and can be used under Windows, macOS, IOS, Android and other operating systems.

We combine EASY Plug shield with micro:bit due to the inconvenience of wiring up micro:bit .

The golden finger interfaces ,as well as 10 pcs easy plug ports (RJ11 6P6C interfaces)could be connected to other modules and sensors, therefore, you don’ t need to worry about wiring up components incorrectly.

The shield comes with 4 pcs WS2812 LEDs controlled by P9, P0 controls passive buzzer; and two dial switches--Power_Switch and Voltmeter_Switch(3.3V, 5V).

The voltage of power supply is DC 6-10V

The Easy Plug port only supports the sensors and modules with RJ11 6P6C port.

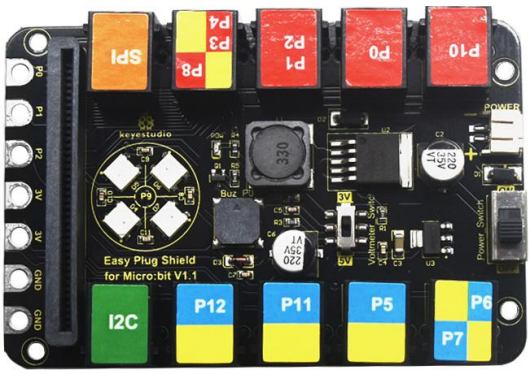
4. Specification:

Power supply: DC 6-10V

Output current: 1.5A

Interface: RJ11 6P6C interface and golden finger interface

Size: 98*65*17mm



5. Interface Description:

G: GND

V: Voltmeter_Switch control, dial to 5V end, 5V; dial to 3V end, 3.3V

I2C Communication Port

G	V	SDA
	SCL	

SDA: P20

SCL: P19

SPI Communication Port

G	V	P16
SCK	MISO	MOSI

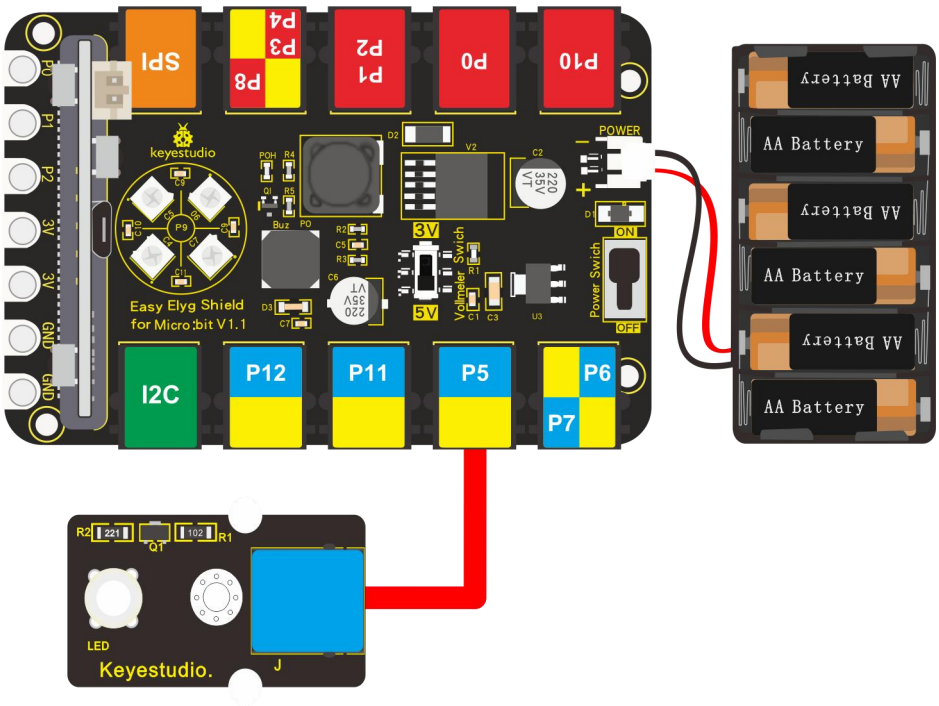
MOSI：P15

MISO：P14

SCK：P13

6. Wiring Up:

Insert micro:bit onto EASY Plug shield, link white LED module with P5 port of shield and plug in power.



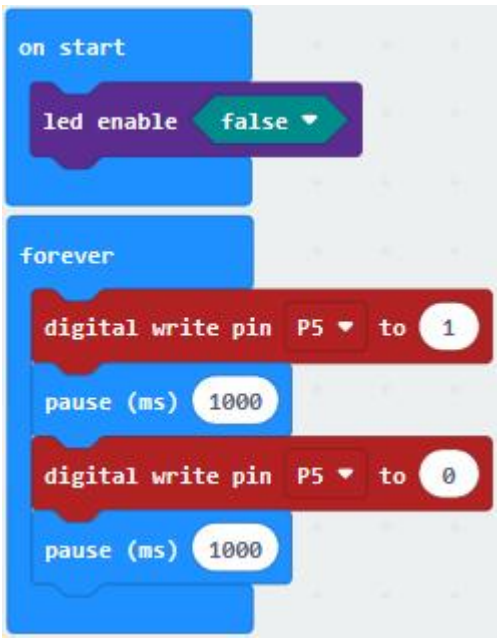
Note: Dial Voltmeter_Switch to 3V end

7. Test Code:

You could navigate https://makecode.micro:bit.org/reference to have access to more details.

Browse link https://makecode.micro:bit.org/ to edit your program. The

following test code is as for your reference.



"on start" : command block only runs once to start program.
Turn off dot matrix on micro:bit
The program under the block "forever" runs cyclically.
Set P5 to high level(1), turn on LED
Delay in 1000ms
Set P5 to low level (0), turn off LED
Delay in 1000ms

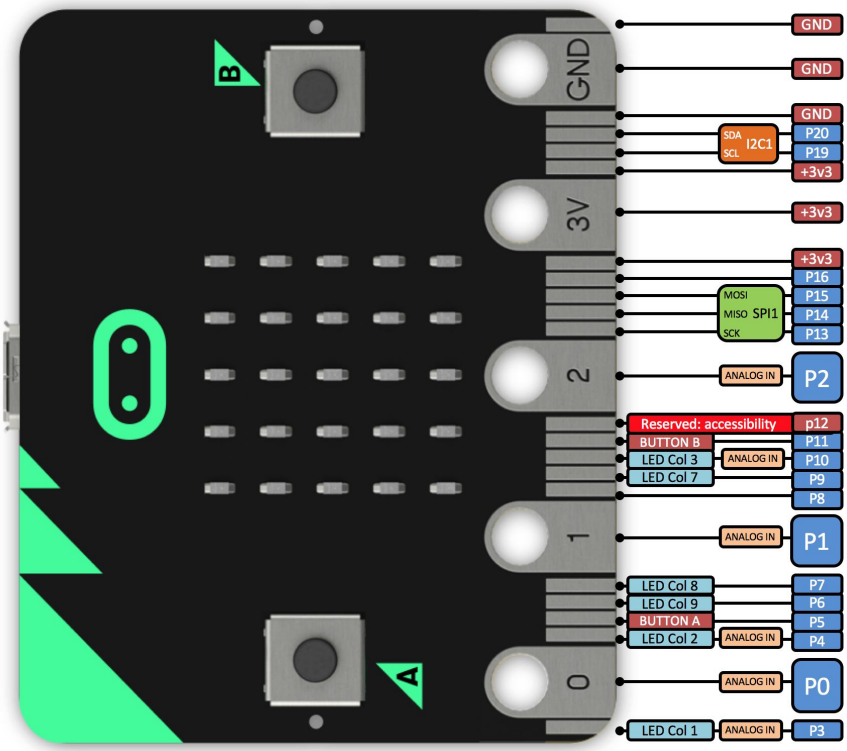
8. Test Result:

Wire up, dial Voltmeter_Switch to 5V end, plug in external power and dial Power_Switch to ON end. Upload code to micro:bit and you will view LED flashing, with interval of 1s.

Project 12: Breathing Light

1.Description:

The light breath experiment is a little bit similar to the previous project. This time we connect the EASY Plug Red Led module to the EASY Plug Shield for micro bit V1.1. Connect the pin of LED module to P10 of micro:bit. From the Pinout diagram of micro:bit, you can get the P10 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.



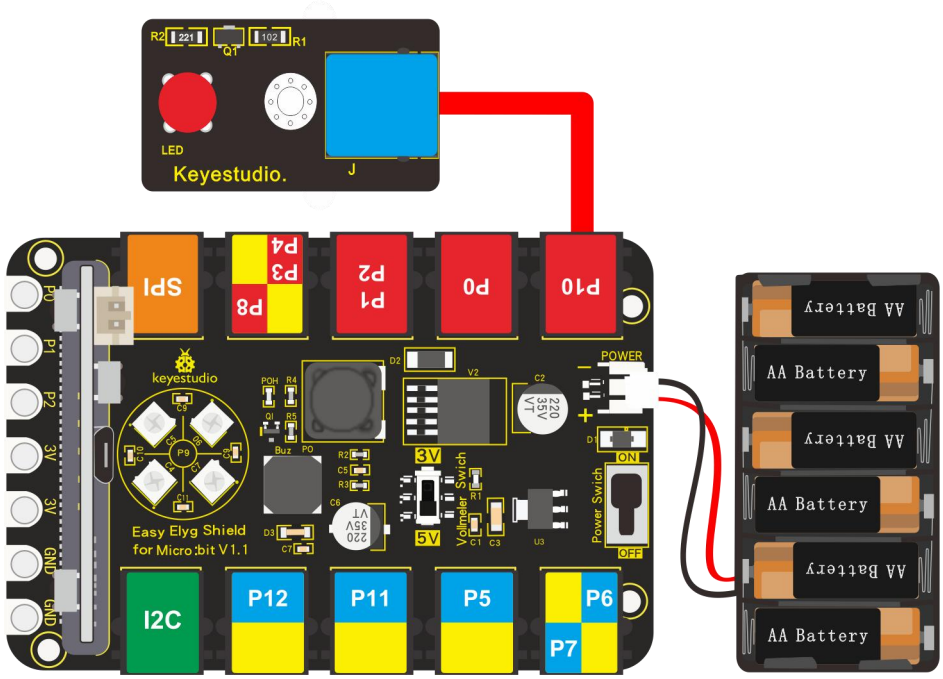
2. What You Need:

- Micro:bit Board*1EASY Plug Shield for micro bit V1.1*1
- Micro USB Cable*1
- EASY Plug Red LED Module*1

- RJ11 Cable*1
- 6-Slot AA Battery Holder*1
- 1.5V AA Battery*6

3. Wiring Up:

Insert micro:bit onto EASY Plug shield, connect red LED module to P10 of shield with a RJ11 cable, and plug in external power.



Note: Dial Voltmeter_Switch to 3V end

4. Test Code:

You could navigate https://makecode.micro:bit.org/reference to have access to more details.

Browse link https://makecode.micro:bit.org/ to edit your program. The following test code is as for your reference.

"on start" : command block only runs once to start program.
Turn off dot matrix on micro:bit
The program under the block "forever" runs cyclically.
When val<1024, run the program in the do block
Set val to val+1
Set analog value of P10 to val
Delay in 5ms
When val>0, run the program in the do block
Set val to val-1
Set the analog value of P10 to val.
Delay in 5ms

5. Test Result:

Wire up, dial Voltmeter_Switch to 3V end, plug in external power and dial Power_Switch to ON end and upload code to micro:bit.

You will find LED of module get brighter then darker, like human breath.

Project 13: Blink and Breath

1.Description:

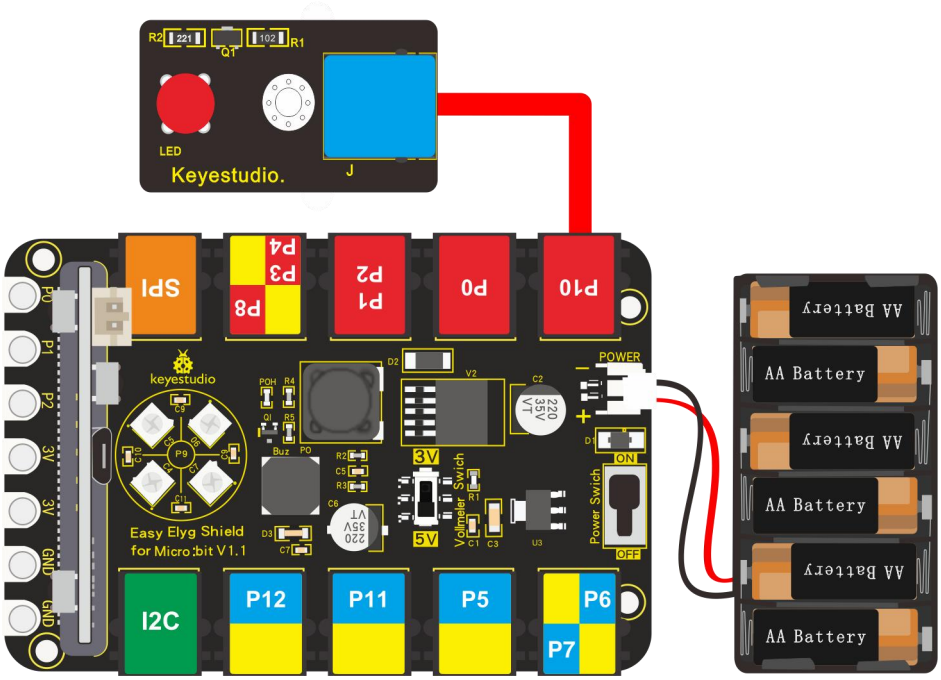
In this project, we will combine LED flash and breathing effect together.

2. What You Need:

- Micro:bit Board*1EASY Plug Shield for micro bit V1.1*1
- Micro USB Cable*1
- EASY Plug Red LED Module*1
- RJ11 Cable*1
- 6-Slot AA Battery Holder*1
- 1.5V AA Battery*6

3. Wiring Up:

Insert micro:bit onto EASY Plug shield，connect red LED module to P10 of shield with a RJ11 cable and connect external power.

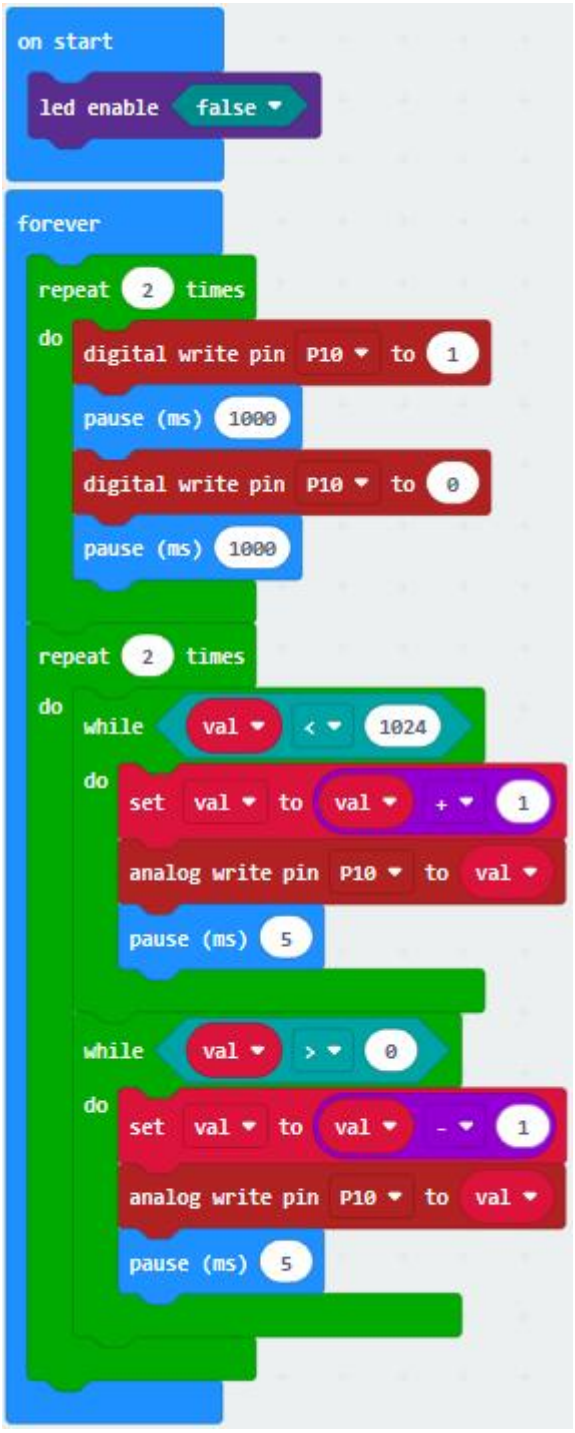


Note: Dial Voltmeter_Switch to 3V end

4.Test Code:

You could navigate https://makecode.micro:bit.org/reference to have access to more details.

Browse link https://makecode.micro:bit.org/ to edit your program. The following test code is as for your reference.


on start
led enable false
forever
repeat 2 times
do
digital write pin P10 to 1
pause (ms) 1000
digital write pin P10 to 0
pause (ms) 1000
repeat 2 times
do
while val < 1024
do
set val to val + 1
analog write pin P10 to val
pause (ms) 5
while val > 0
do
set val to val - 1
analog write pin P10 to val
pause (ms) 5

```
"on start": command block only runs once to start program.
Turn off  dot matrix on micro:bit
The program under the block  "forever"  runs cyclically.
Repeat the program in the do block twice
Set P10 to high level (1), turn on LED
Delay in 1000ms
Set P10 to low level (0), turn off LED
Delay in 1000ms
Repeat the program in the do block twice
When val<1024, run the program in the do block
Set val to val+1
Set the analog value of P10 to val
Delay in 5ms
```

5.Test Result:

Wire up, dial Voltmeter_Switch to 3V end, plug in power and dial Power_Switch to ON end. Upload program to micro:bit, LED flashes twice and shows breathing effect twice ceaselessly.

Project 14: Play Music

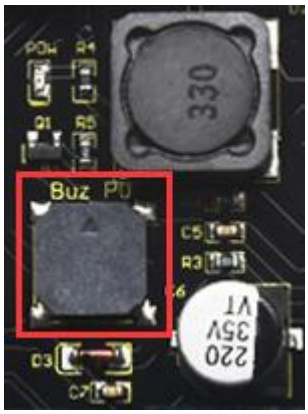
1.Description:

In this project, we will demonstrate how to play music with passive buzzer. Easy Plug shield comes with one. Let's get started. (Passive buzzer is connected to P0 on Easy Plug shield)

2.What You Need:

- Micro:bit Board*1EASY Plug Shield for micro bit V1.1*1
- Micro USB Cable*1
- 6-Slot AA Battery Holder*1
- 1.5V AA Battery*6

Passive Buzzer Module:



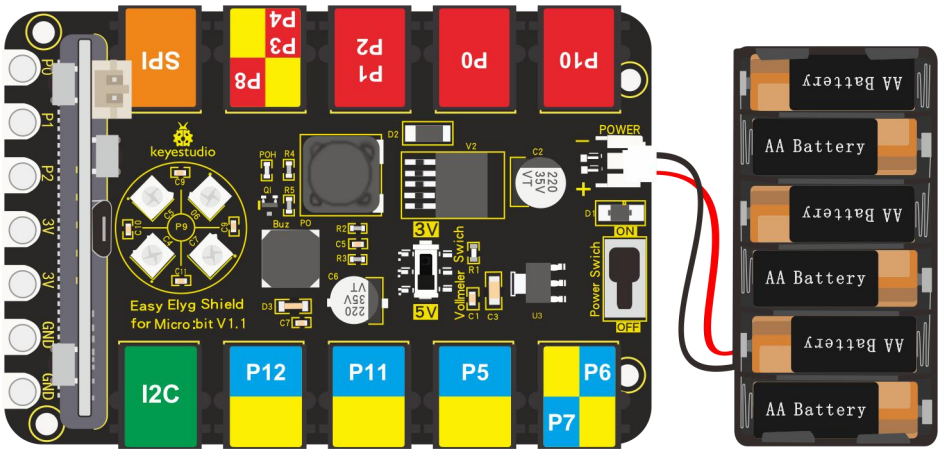
The buzzer includes active buzzer and passive buzzer. The difference between them a built-in vibration source, therefore, it will make a sound when power is plugged in.

We need 2K-5K square wave to drive passive buzzer because the buzzer on EASY Plug Shield doesn't come with this kind of source. Different frequencies produce different sounds. You can use the micro:bit to compose a simple, interesting and melodic song.

3. Specification:

Working voltage: 3.3-5V
Interface type: Digital

4. Wiring Up:



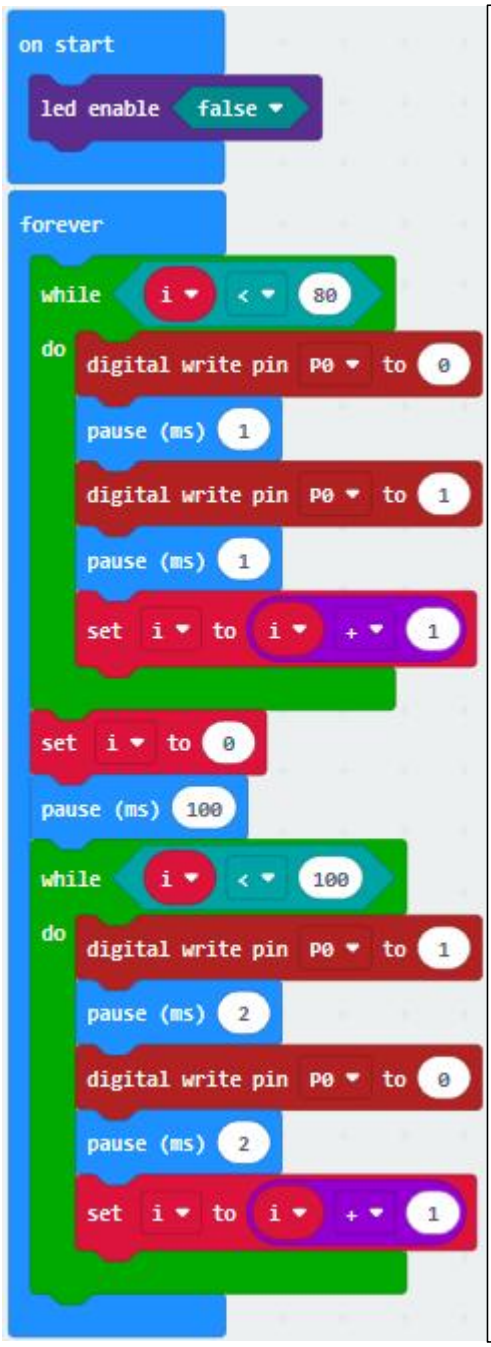
Note: Dial Voltmeter_Switch to 3V end.

5. Test Code:

You could navigate https://makecode.micro:bit.org/reference to have access to more details.

Browse link https://makecode.micro:bit.org/ to edit your program. The following test code is as for your reference.

Code 1:



"on start" : command block only runs once to start program.

Turn off dot matrix on micro:bit

The program under the block "forever" runs cyclically.

When i<80, run the program in the block

Set P0 to low level(0) to make passive buzzer silent

Delay in 1ms

Set P0 to high level(1) to make passive buzzer emit sound

Delay in 1ms

Set variable i to i+1

Set variable i to 0

Delay in 100ms

When i<100, run the program in the do block

Set P0 to high level(1) to make passive buzzer emit sound

Delay in 2ms

Set P0 to low level(0) to make passive buzzer silent

Delay in 2ms

Set variable i to i+1

Code 2:

"on start": command block only runs once to start program.
Turn off dot matrix on micro:bit
The program under the block "forever" runs cyclically.
Play tone High E for 2 beats
Play tone High E for 1 beat
Play tone high G for 2 beats
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 beats
Play tone high C for 2 beats
Play tone high D for 1 beat
Play tone high E for 2 beats
Play tone high E for 1/2 beat
Play tone high D for 1/2 beat
Play tone high D for 2 beats
Play tone high E for 2 beats
Play tone high F for 1 beat
Play tone high G for 2 beats
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 beats
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 D for 1/2 beat
Play tone high C for 1 /2 beat
Play tone high C for 1 beat
Play tone high D for 2 beats
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
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 D for 1 beat
Play tone high C for 1 beat
Play tone high D for 1 beat
Play tone high G for 1 beat
Play tone high E for 1 beat
Play tone high E for 2 beats
Play tone high F for 1 beat
Play tone high G for 2 beats
Play tone high F for 1 beat
Play tone high E for 1 beat
Play tone high F for 1 /2 beat
Play tone high E for 2 beats

Play tone high D for 1/2 beat
Play tone high C for 2 beats
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 beats

Note: Click 

to switch into JavaScript code, each frequency and beat of tone is shown below:


```
led.enable(false)
basic.forever(function () {
    music.playTone(659, music.beat(BeatFraction.Double))
    music.playTone(698, music.beat(BeatFraction.Whole))
    music.playTone(784, music.beat(BeatFraction.Double))
    music.playTone(698, music.beat(BeatFraction.Whole))
    music.playTone(659, music.beat(BeatFraction.Whole))
    music.playTone(587, music.beat(BeatFraction.Whole))
    music.playTone(523, music.beat(BeatFraction.Double))
    music.playTone(587, music.beat(BeatFraction.Whole))
    music.playTone(659, music.beat(BeatFraction.Double))
    music.playTone(659, music.beat(BeatFraction.Half))
    music.playTone(587, music.beat(BeatFraction.Half))
    music.playTone(587, music.beat(BeatFraction.Double))
    music.playTone(659, music.beat(BeatFraction.Double))
    music.playTone(698, music.beat(BeatFraction.Whole))
    music.playTone(784, music.beat(BeatFraction.Double))
    music.playTone(698, music.beat(BeatFraction.Whole))
    music.playTone(659, music.beat(BeatFraction.Whole))
    music.playTone(587, music.beat(BeatFraction.Whole))
    music.playTone(523, music.beat(BeatFraction.Double))
    music.playTone(587, music.beat(BeatFraction.Whole))
    music.playTone(659, music.beat(BeatFraction.Whole))
    music.playTone(587, music.beat(BeatFraction.Whole))
    music.playTone(587, music.beat(BeatFraction.Half))
```

6. Test Result:

Wiring up, dial Voltmeter_Switch to 3V end, plug in external power and dial Power_Switch to ON end and upload code 1 to micro:bit, you will hear the buzzer emit two kind of sounds; if download code 2 to micro:bit, the song "Ode-to- Joy" will be played.

Project 15: RGB

1.Description:

EASY Plug shield comes with 2812 2x2 full color RGB, we will finish three experiments with 2812 2x2 full color RGB

2.What You Need:

- Micro:bit Board*1
- EASY Plug Shield for micro bit V1.1*1
- Micro USB Cable*1
- 6-Slot AA Battery Holder*1
- 1.5V AA Battery*6

2812 2x2 full color RGB:

2812 2x2 full color RGB module is a smart external

control LED light source that integrates control circuit and lighting circuit.

Each LED has the same appearance as a 5050 LED bead, and each component is a pixel point.

The pixel point includes an intelligent digital interface data latch signal shaping and amplifying driving circuit, as well as a high-precision internal oscillator and a 12V high-voltage programmable constant current control part, which effectively ensures that the color of the pixel point light is highly uniform.

The data protocol adopts the single-line return-to-zero code communication mode. After power-on and reset the pixel point, the S pin receives the data transmitted from the controller. And the 24-bit data are extracted by the first pixel and then sent to the data latch inside the pixel point.

LED has advantages of low voltage drive, environmental protection and energy saving, high brightness, wide scattering angle, good consistency, ultra low power, long life and so on.

3. Specification:

Working voltage: DC 5V

Power: 0.1W

Light source: SMD 5050 RGB

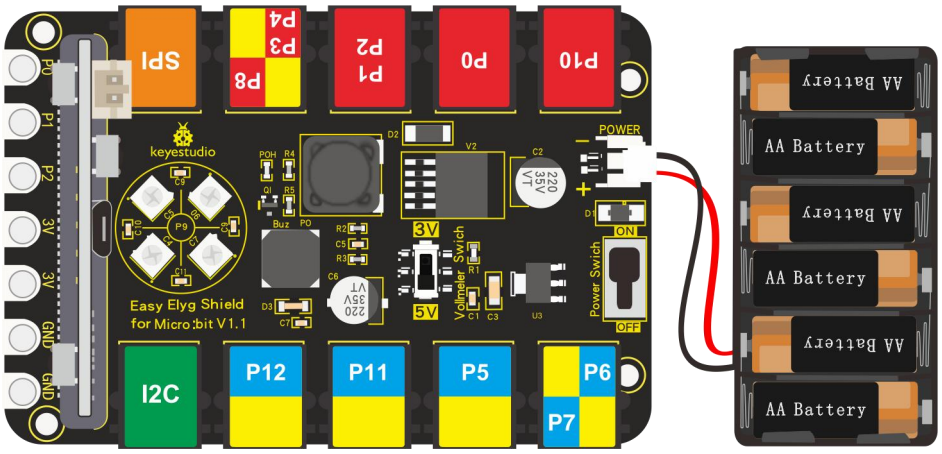
IC model: 4pcs/WS2811

Gray level: 256 levels

Beam angle: 180°

Luminous color: can be adjusted to white, red, yellow, blue, green, etc. by the controller

4.Wiring Up:



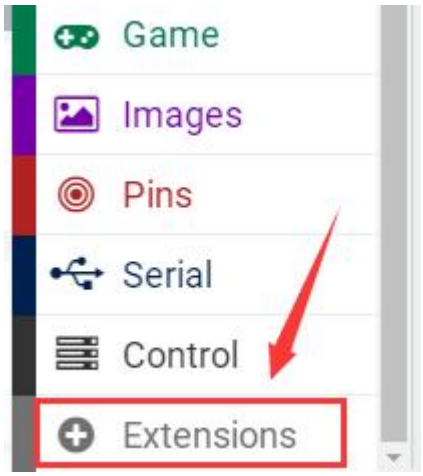
Note: Dial Voltmeter_Switch to 3V end

5.Test Code:

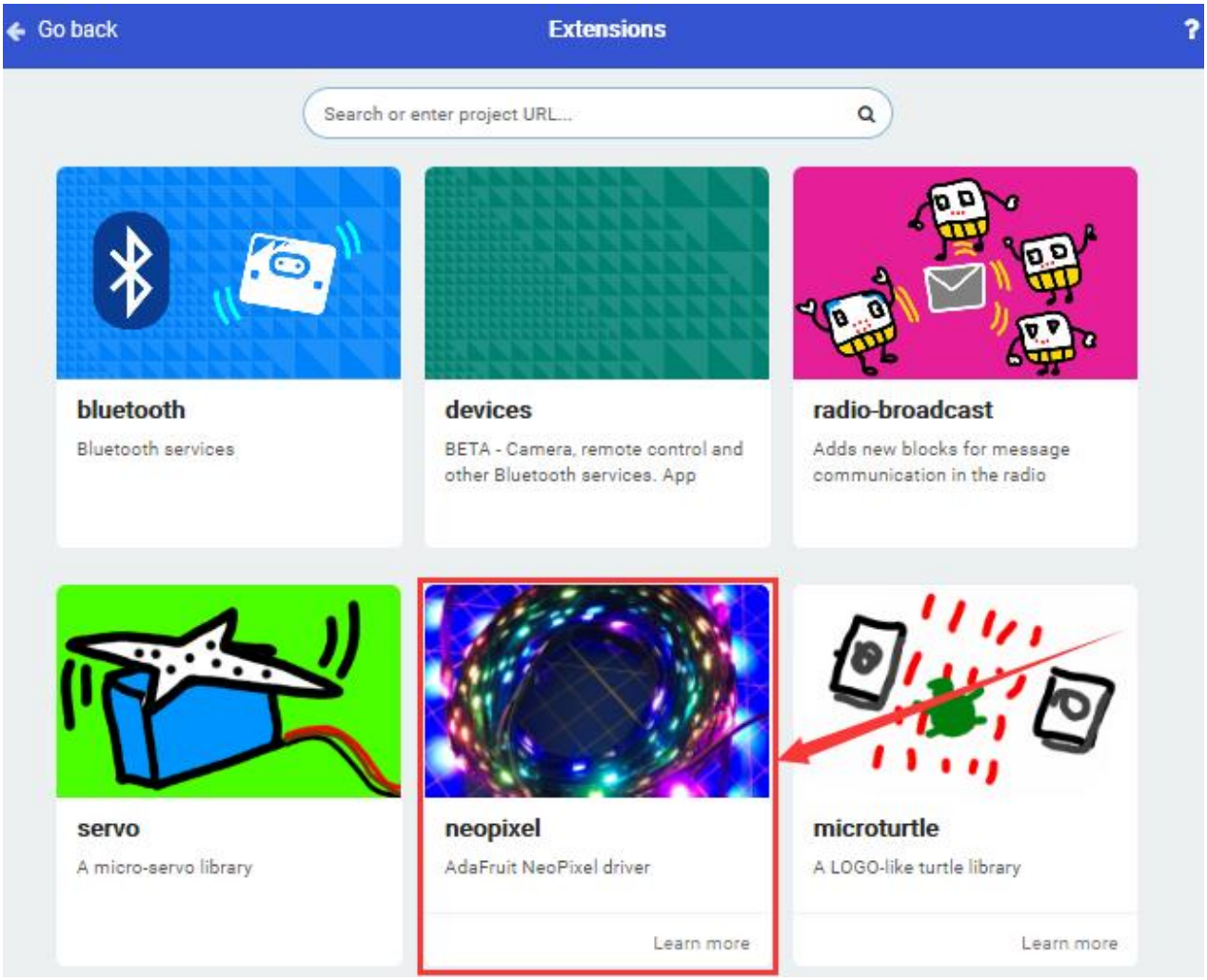
You could navigate https://makecode.micro:bit.org/reference to have access to more details.

Browse link https://makecode.micro:bit.org/ to edit your program. The following test code is as for your reference.

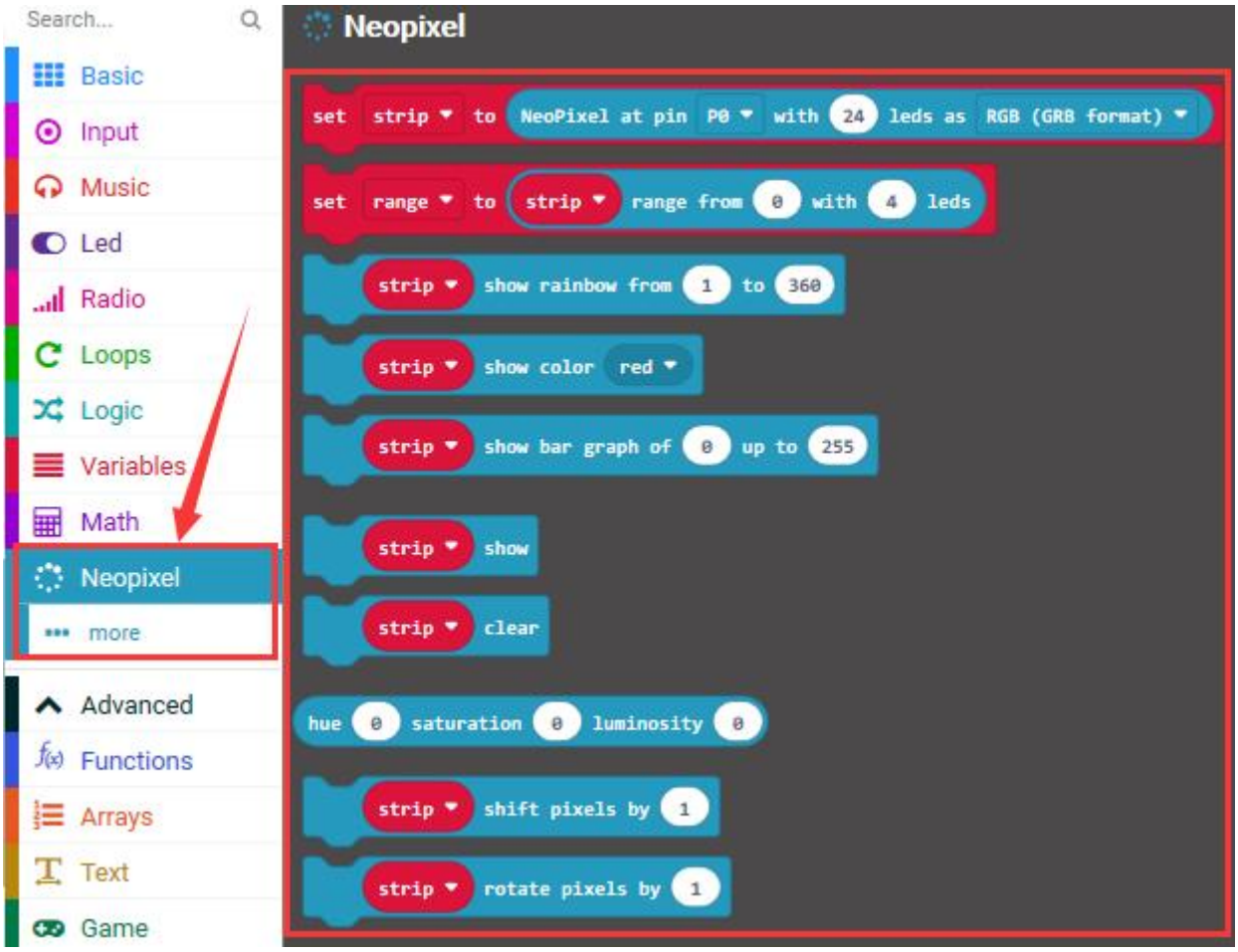
We need to set test code in library file, and add the library of "neopixe".



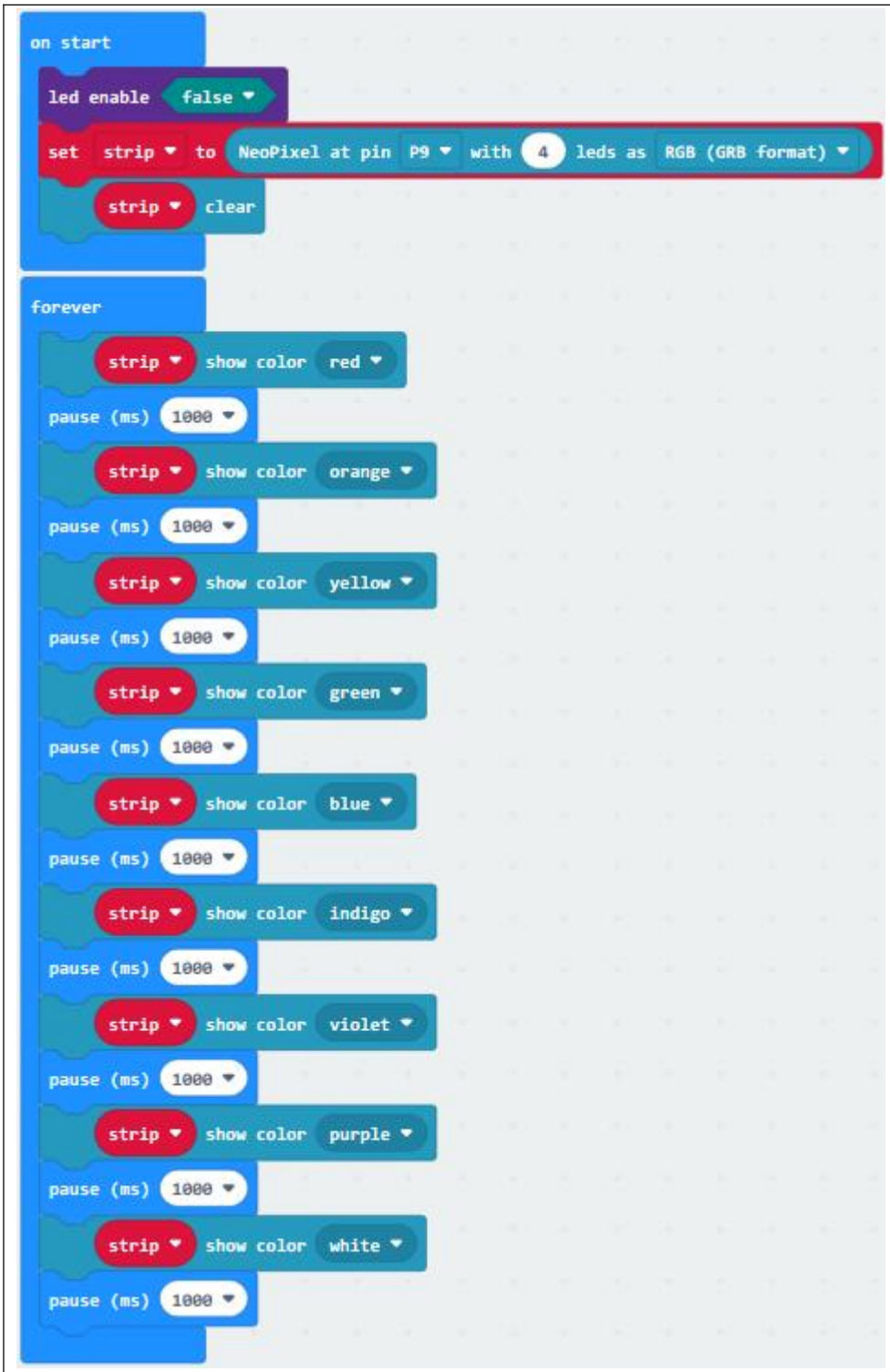
Click "Extensions" → "neopixel", click to download



You will view library "neopixel" in the editing blocks, as shown below:

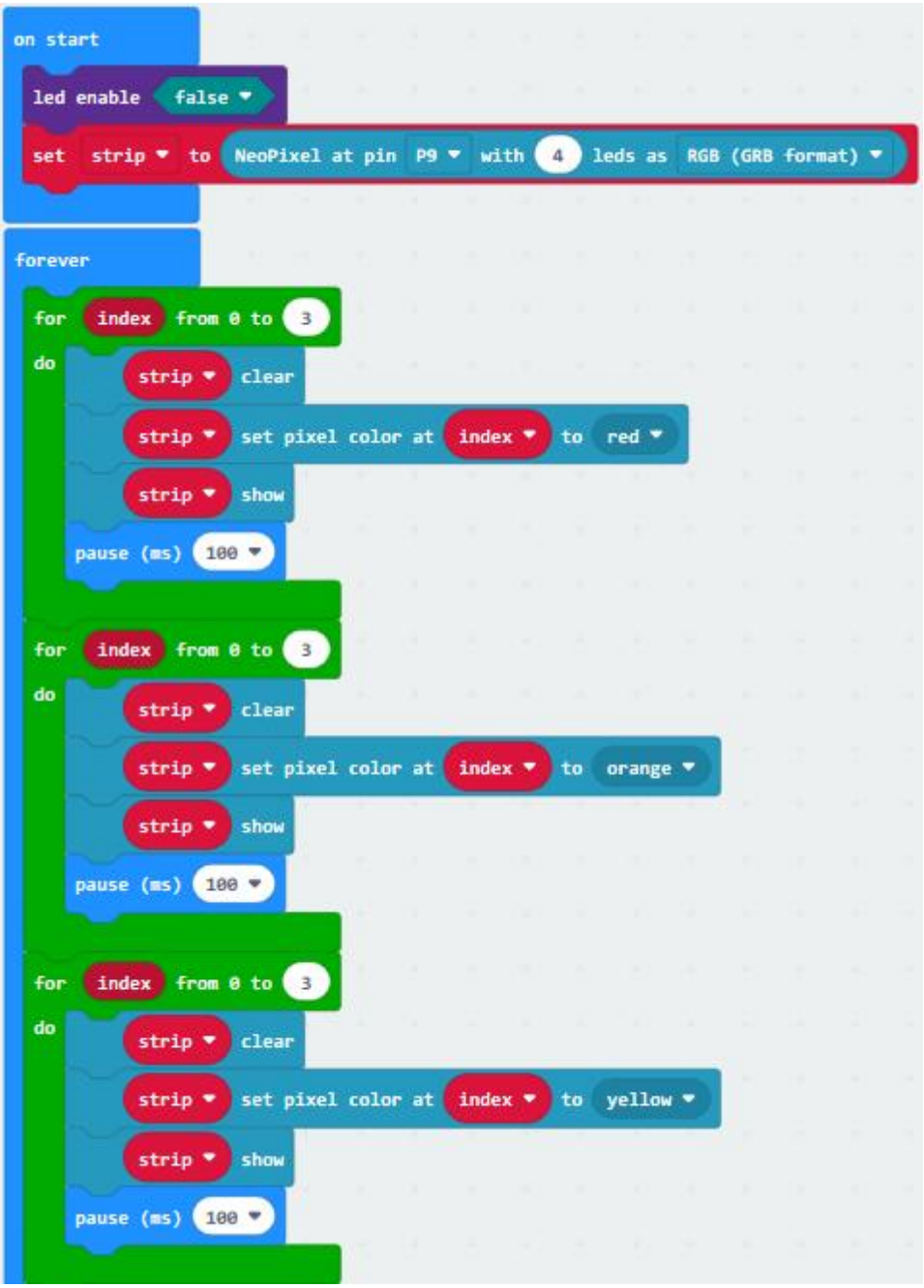

Search...
Basic
Input
Music
Led
Radio
Loops
Logic
Variables
Math
Neopixel
more
Advanced
Functions
Arrays
Text
Game
Neopixel
set strip to NeoPixel at pin P0 with 24 leds as RGB (GRB format)
set range to strip range from 0 with 4 leds
strip show rainbow from 1 to 360
strip show color red
strip show bar graph of 0 up to 255
strip show
strip clear
hue 0 saturation 0 luminosity 0
strip shift pixels by 1
strip rotate pixels by 1

Code 1:


on start
led enable false
set strip to NeoPixel at pin P9 with 4 leds as RGB (GRB format)
strip clear
forever
strip show color red
pause (ms) 1000
strip show color orange
pause (ms) 1000
strip show color yellow
pause (ms) 1000
strip show color green
pause (ms) 1000
strip show color blue
pause (ms) 1000
strip show color indigo
pause (ms) 1000
strip show color violet
pause (ms) 1000
strip show color purple
pause (ms) 1000
strip show color white
pause (ms) 1000

“on start”：command block only runs once to start program.
Turn off dot matrix on micro:bit
Set strip to NeoPixel at pin P9 with 4 leds as RGB
Turn off 4 pcs WS2812 RGB lights
The program under the block“forever”runs cyclically.
make all RGB show red color
make all RGB show red color
Delay in 1000ms
make all RGB show orange color
Delay in 1000ms
make all RGB show yellow color
Delay in 1000ms
make all RGB show green color
Delay in 1000ms
All of RGB show blue color
Delay in 1000ms
make all RGB show indigo color
Delay in 1000ms
make all RGB show violet color
Delay in 1000ms
make all RGB show purple color
Delay in 1000ms
make all RGB show white color
Delay in 1000ms

Code 2：


on start
led enable false
set strip to NeoPixel at pin P9 with 4 leds as RGB (GRB format)
forever
for index from 0 to 3
do
strip clear
strip set pixel color at index to red
strip show
pause (ms) 100
for index from 0 to 3
do
strip clear
strip set pixel color at index to orange
strip show
pause (ms) 100
for index from 0 to 3
do
strip clear
strip set pixel color at index to yellow
strip show
pause (ms) 100

“on start”：command block only runs once to start program.
Turn off dot matrix on micro:bit
Set strip to NeoPixel at pin P9 with 4 leds as RGB
The program under the block “forever” runs cyclically.
For index from 0 to 3，execute the program under do block
Turn off 4 pcs　WS2812 RGB lights
Set pixel color of 4 pcs WS2812 RGB lights to red color
Strip show
Delay in 100ms
For index from 0 to 3，execute the program under do block
Turn off 4 pcs WS2812 RGB lights
Set pixel color of 4 pcs WS2812 RGB lights to orange color
Strip show
Delay in 100ms
For index from 0 to 3，execute the program under do block
Turn off 4pcs WS2812 RGB lights
Set pixel color of 4 pcs WS2812 RGB lights to yellow color
Strip show
Delay in 100ms

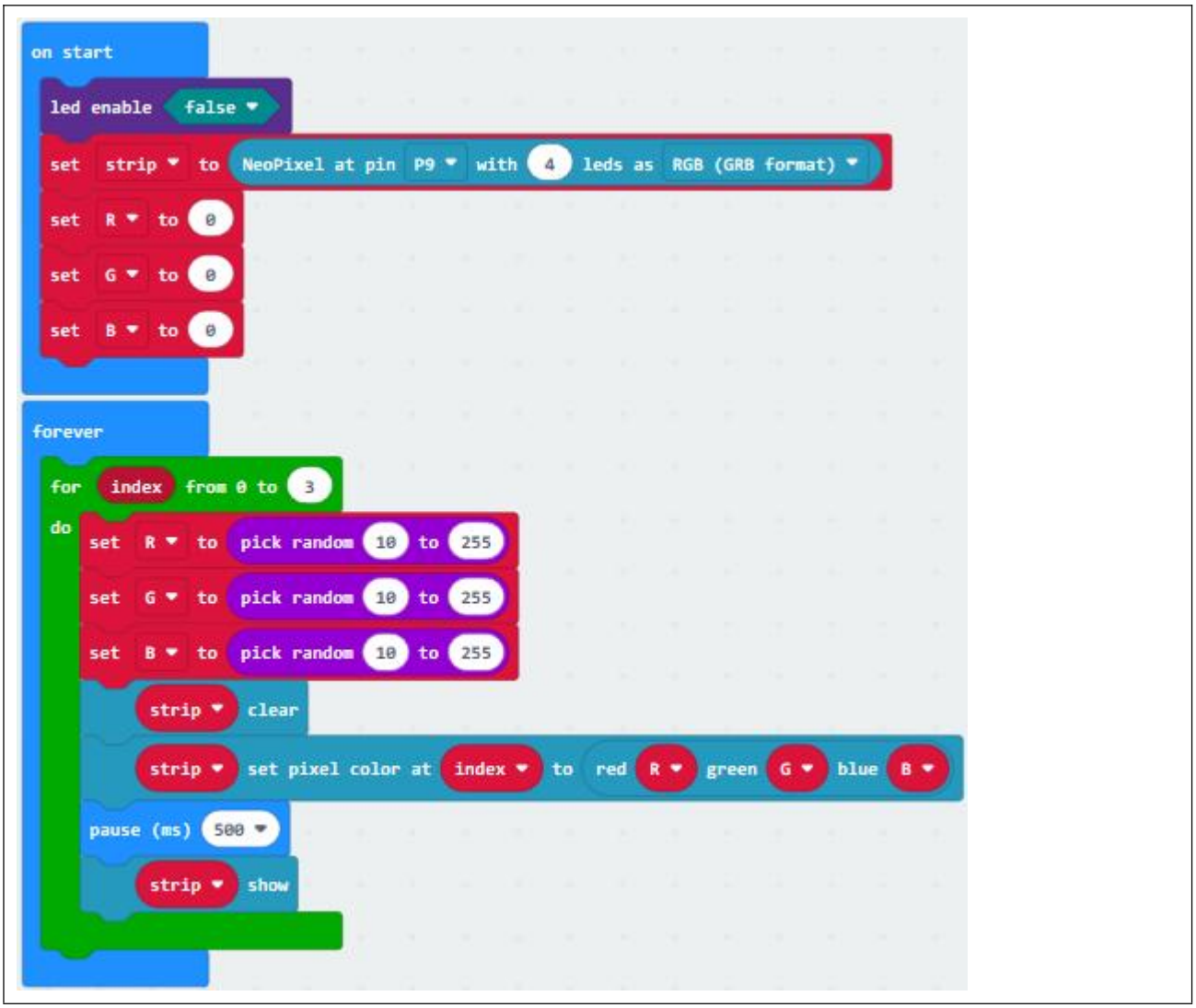

for index from 0 to 3
do
strip clear
strip set pixel color at index to green
strip show
pause (ms) 100
for index from 0 to 3
do
strip clear
strip set pixel color at index to blue
strip show
pause (ms) 100
for index from 0 to 3
do
strip clear
strip set pixel color at index to indigo
strip show
pause (ms) 100
for index from 0 to 3
do
strip clear
strip set pixel color at index to violet
strip show
pause (ms) 100
for index from 0 to 3
do
strip clear
strip set pixel color at index to purple
strip show
pause (ms) 100
for index from 0 to 3
do
strip clear
strip set pixel color at index to white
strip show
pause (ms) 100

For index from 0 to 3，execute the program under do block
Turn off 4pcs WS2812 RGB lights
Set pixel color of 4 pcs WS2812 RGB lights to green color
Strip show
Delay in 100ms
For index from 0 to 3，execute the program under do block
Turn off 4 pcs WS2812 RGB lights
Set pixel color of 4 pcs WS2812 RGB lights to blue color
Strip show
Delay in 100ms
For index from 0 to 3，execute the program under do block
Turn off 4 pcs WS2812 RGB
Set pixel color of 4 pcs WS2812 RGB lights to indigo color
Strip show
Delay in 100ms
For index from 0 to 3，execute the program under do block
Turn off 4 pcs WS2812 RGB lights
Set pixel color of 4 pcs WS2812 RGB lights to violet color
Strip show
Delay in 100ms
For index from 0 to 3，execute the program under do block
Turn off 4 pcs WS2812 RGB
Set pixel color of 4 pcs WS2812 RGB lights to violet color
Strip show
Strip refreshes to display
Delay in 100ms
For index from 0 to 3，execute the program under do block

Turn off 4 pcs WS2812 RGB
Turn off 4 pcs
Set pixel color of 4 pcs WS2812 RGB lights to white color

Strip show
Delay in 100ms

Code 3:


on start
led enable false
set strip to NeoPixel at pin P9 with 4 leds as RGB (GRB format)
set R to 0
set G to 0
set B to 0
forever
for index from 0 to 3
do
set R to pick random 10 to 255
set G to pick random 10 to 255
set B to pick random 10 to 255
strip clear
strip set pixel color at index to red R green G blue B
pause (ms) 500
strip show

```
"on start" : command block only runs once to start program.
Turn off micro:bit LED dot matrix
Set strip to NeoPixel at pin P9 with 4 leds as RGB
Set strip to initialization o
Set variable R to 0
Set variable G to 0
Set variable B to 0

The program under the block "forever" runs cyclically.
When value of variable index is in 0-3, execute the program in the do block
Set variable R to random number in 10~255
Set variable G to random number in 10~255
Set variable B to random number in 10~255
Turn off all RGB lights on the strip
Set pixel color of 4 pcs WS2812 RGB lights to RGB
Set 4pcs WS2812 RGB to
Delay in 500ms
strip refreshes to display
```

6.Test Result:

Wiring up, dial Voltmeter_Switch to 3V end, plug in external power and dial Power_Switch to ON end and download code 1 to micro:bit, WS2812RGB lights display different color.

Download code 2 to micro:bit, WS2812RGB show same color like flow light.

Download code 3 to micro:bit, each WS2812RGB shows random color like flow light.

Project 16: Button Control

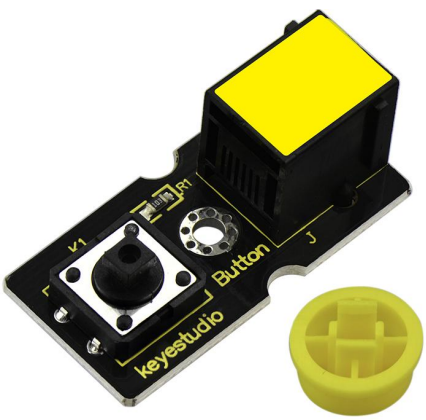
1.Description:

Button sensor is commonly used component.In this chapter, we will show you how to control LED with button sensor.

2. What You Need:

- Micro:bit Board*1
- EASY Plug Shield for micro bit V1.1*1
- Micro USB Cable*1
- EASY Plug Digital Push Module*1
- EASY Plug White LED Module*1
- RJ11 Cable*2
- 6-Slot AA Battery Holder*1
- 1.5V AA Battery*6

EASY Plug Button



The EASY Plug digital push module is a tidy little design that lets you control a DC power source using an everyday tactile

button.

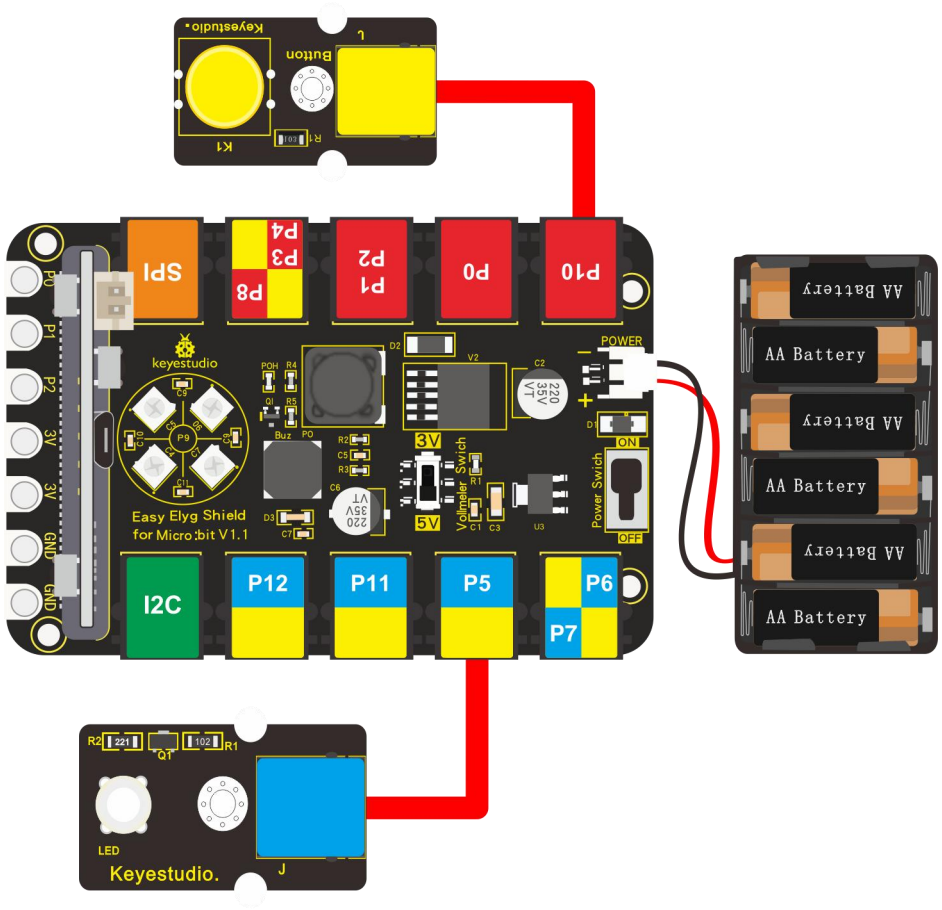
It can be connected to circuit. When it it pressed, the circuit is connected, when released, the circuit is cut.

3. Specification:

- Connector: Easy plug
- Supply Voltage: 3.3V to 5V
- Large button and high-quality top cap
- Sensor type: Digital
- Weight: 5.6g

4.Wiring Up:

Insert micro:bit onto EASY Plug shield, wire up digital push module and LED module to P10 and P5 port of shield and RJ11cables. Don’ t forget to connect battery holder.

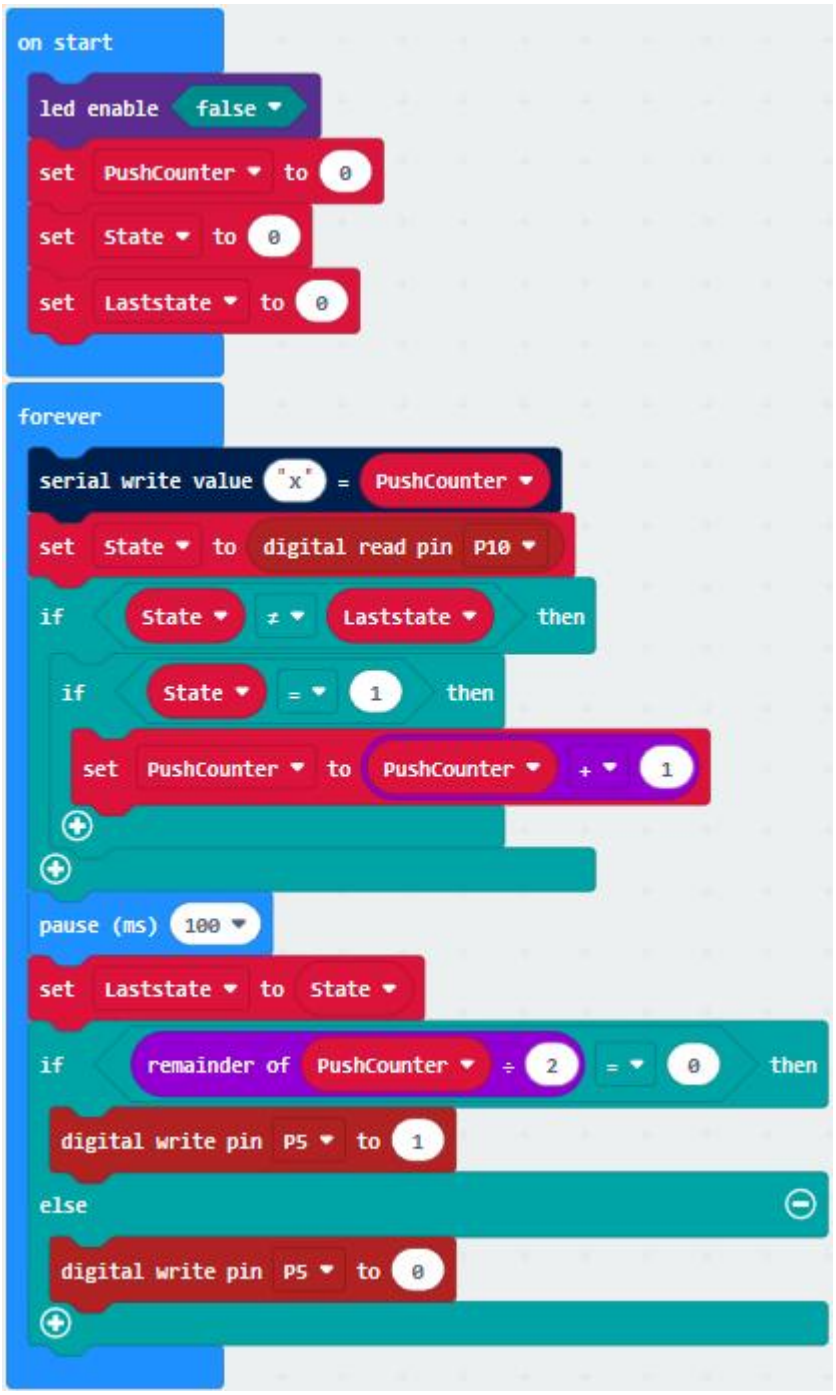


Note: Dial Voltmeter_Switch to 3V end

5.Test Code:

You could navigate https://makecode.micro:bit.org/reference to have access to more details.

Browse link https://makecode.micro:bit.org/ to edit your program. The following test code is as for your reference.


on start
led enable false
set PushCounter to 0
set State to 0
set Laststate to 0
forever
serial write value "x" = PushCounter
set State to digital read pin P10
if State ≠ Laststate then
if State = 1 then
set PushCounter to PushCounter + 1
pause (ms) 100
set Laststate to State
if remainder of PushCounter ÷ 2 = 0 then
digital write pin P5 to 1
else
digital write pin P5 to 0

"on start" : command block only runs once to start program.
Turn off dot matrix on micro:bit
Set variable PushCounter to 0
Set variable State to 0
Set variable Laststate to 0
The program under the block "forever" runs cyclically.
Serial writes "x" =the value of PushCounter
Set the digital signal read by P0 to state
If State≠Laststate, execute the program under then block
If State=1, execute the program under then block
Set PushCounter to PushCounter+1
Delay in 100ms
Set the value of State to varible4 Laststate
If the remainder of PushCounter divided by 2 is 0, execute the program under then block
Set P5 to high level(1), LED turns on
If the remainder of PushCounter divided by 2 is not 0, execute the program under else block
Set P5 to low level(1), LED turns off

6. Test Result:

Wiring up, dial Voltmeter_Switch to 3V end, plug in external power and dial Power_Switch to ON end and upload code to micro:bit.

Press button sensor, LED will be on; press button again, LED off.

Project 17: Tilt Control

1. Description:

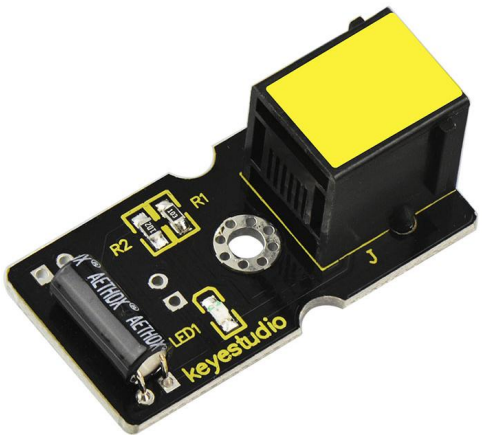
Tilt sensor (tilt ball switch) allows you to detect orientation or inclination. They are small, inexpensive, low-power and easy-to-use.

We will try to control LED with tilt sensor.

2.What You Need:

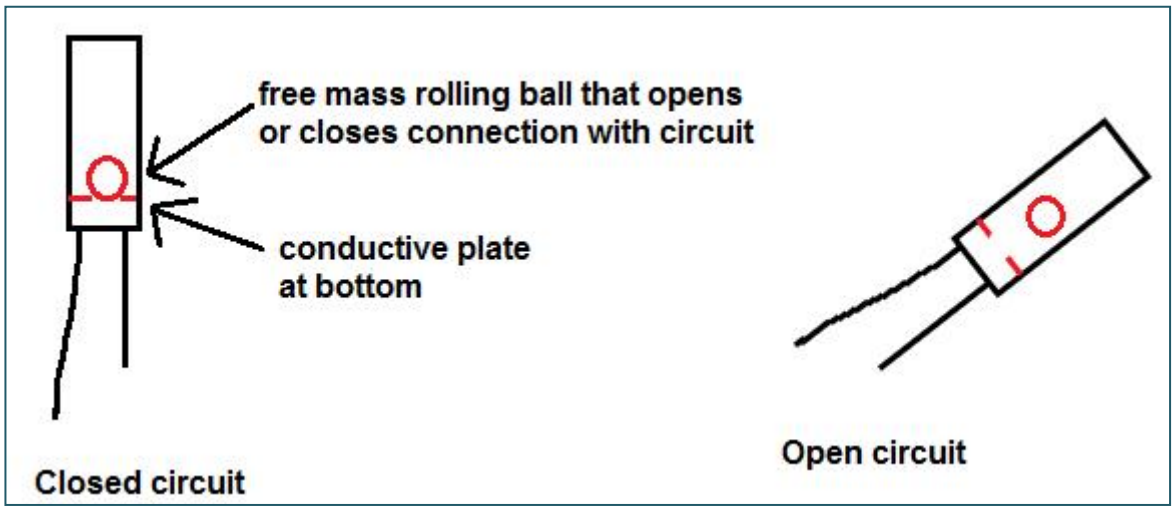
- Micro:bit Board*1
- EASY Plug Shield for micro bit V1.1*1
- Micro USB Cable*1
- EASY Plug Digital Tilt Sensor*1
- EASY plug Red LED Module*1
- RJ11 Cable*2
- 6-Slot AA Battery Holder*1
- 1.5V AA Battery*6

EASY Plug Digital Tilt Sensor:



This EASY Plug digital tilt sensor module mainly integrates a tilt sensor. The tilt sensor is a component that can detect the tilt of an object. It uses the ball in the switch to change different inclination angles to trigger the circuit. When the ball in the tilt switch runs from one end to the other due to the vibration of an external force, the tilt switch will be turned on, otherwise it will be turned off. The tilt sensor can be applied in orientation detection and alarm.

Schematic Diagram



4. Specification:

Connector: Easy plug

Supply Voltage: 3.3V to 5V

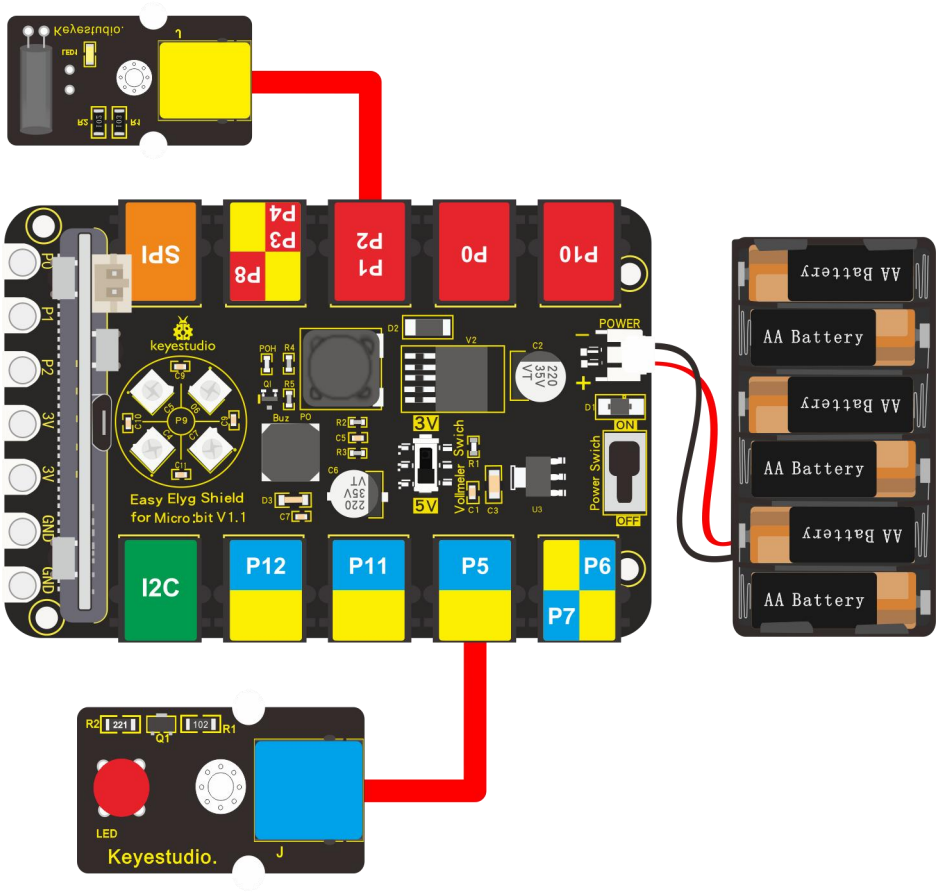
Sensor type: Digital

Dimensions: 39mm*20mm*18mm

Weight: 4.8g

4.Wiring Up:

Insert micro:bit onto EASY Plug shield, connect digital tilt sensor and LED module to P1 and P5 port of shield. And plug in power.

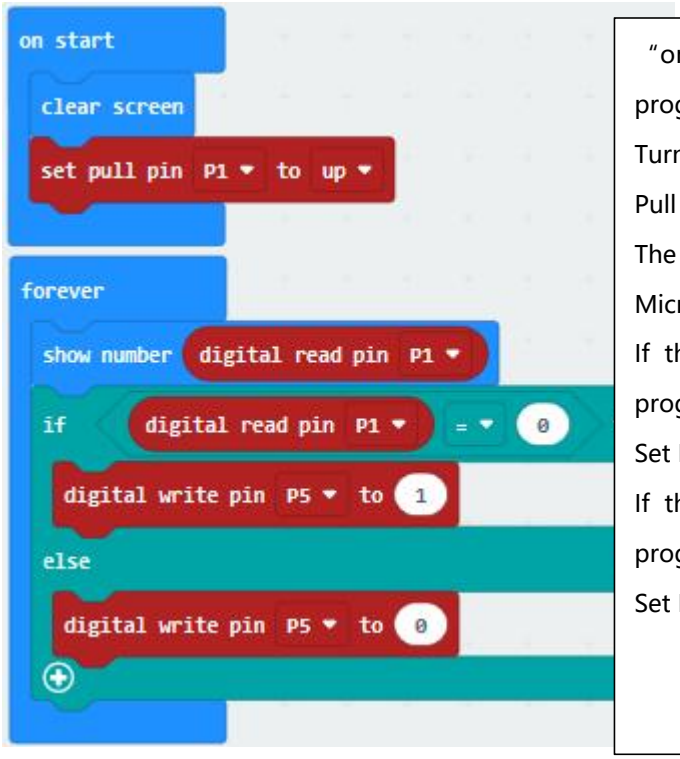


Note: Dial Voltmeter_Switch to 3V end

5.Test Code:

You could navigate https://makecode.micro:bit.org/reference to have access to more details.

Browse link https://makecode.micro:bit.org/ to edit your program. The following test code is as for your reference.



"on start" : command block only runs once to start program.

Turn off LED dot matrix

Pull up the voltage of P1

The program under the block "forever" runs cyclically.

Micro:bit shows the digital signal read by tilt sensor

If the digital signals read by P1 is 0, execute the program under then block

Set P5 to high level(1), LED turns on

If the digital signals read by P1 is 1, execute the program under else block

Set P5 to low level(0), LED turns off

6.Test Result:

Wiring up, dial Voltmeter_Switch to 3V end, plug in external power and dial Power_Switch to ON end and upload code to micro:bit.

When tilt sensor is inclined to the right, micro:bit shows 0, and LED is on; when inclined to the left, micro:bit displays 1 and LED is off.

Project 18: Relay Module

1.Description:

Generally, we drive electronic devices with 220V alternating current and connect a switch in 220V circuit.

We design the Easy Plug relay module with NO and NC end to constrain from the risk of electricity leakage.

In this experiment, we will show you how to control relay module.

This module integrates a high-quality relay, basically an electrically controlled mechanical switch.

It can be controlled through the digital IO port, such as lamps, motors and other high current or high voltage devices.

2.What You Need:

- Micro:bit Board*1
- EASY Plug Shield for micro bit V1.1*1
- Micro USB Cable*1
- EASY plug Relay Module*1
- RJ11 Cable*1
- 6-Slot AA Battery Holder*1
- 1.5V AA Battery*6

EASY Plug Relay Module:

It is one of the most important controlled elements, which is widely used to control the lighting, communications, remote sensing, electrical and other equipment.

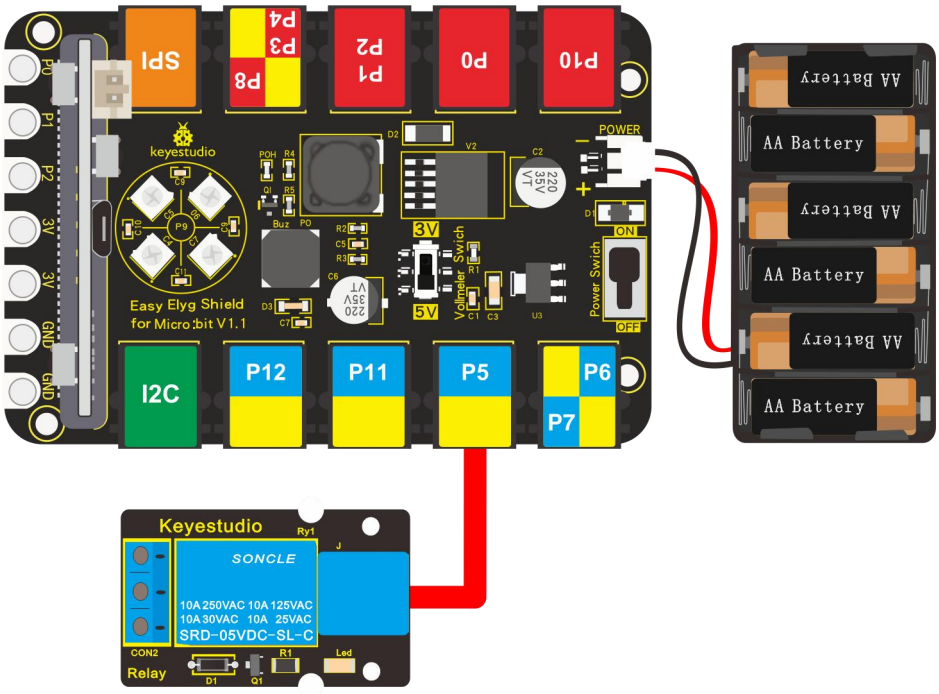
When S end is set high level, relay is driven, that is NO is connected, NC off; when S end is low level, relay is closed, that is NO is disconnected and NC is connected.

5. Specification:

- 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

6. Wiring Up:

Insert micro:bit onto EASY Plug shield, connect relay module to P5 of shield with a JR11 cable, plug in power.



Note: Dial Voltmeter_Switch to 5V end

5.Test Code:

You could navigate https://makecode.micro:bit.org/reference to have access to more details.

Browse link https://makecode.micro:bit.org/ to edit your program. The following test code is as for your reference.

"on start" : command block only runs once to start program.
Turn off dot matrix on micro:bit
The program under the block "forever" runs cyclically.
Set P5 to high level(1), relay module is connected
Delay in 1000ms
Set P5 to low level(0),relay module is disconnected

Delay in 1000ms

6.Test Result:

Wiring up, dial Voltmeter_Switch to 5V end, plug in external power and dial Power_Switch to ON end and upload code to micro:bit.

The relay module is connected and disconnected ceaselessly, with interval of 1s.

Project 19: Crash Sensor

1.Description:

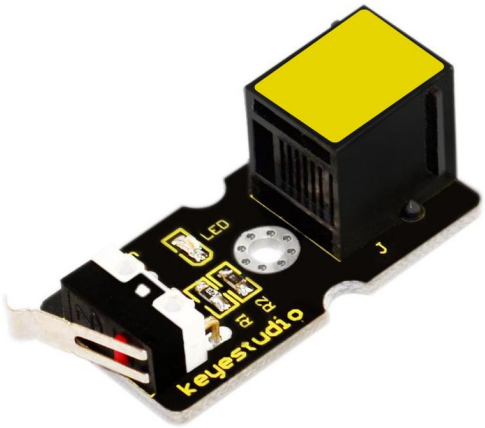
We detect collision with crash sensor. When the metal switch is touched, sensor will output low level signals; when the metal switch is not touched, high level will be remained.

We will control LED with collision sensor

2. What You Need:

- Micro:bit Board*1
- EASY Plug Shield for micro bit V1.1*1
- Micro USB Cable*1
- EASY Plug Crash Sensor*1
- EASY Plug White LED Module*1
- RJ11 Cable*2
- 6-Slot AA Battery Holder*1
- 1.5V AA Battery*6

EASY Plug Crash Sensor:



Crash sensor, an electronic switch, is a digital switch input module.

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.

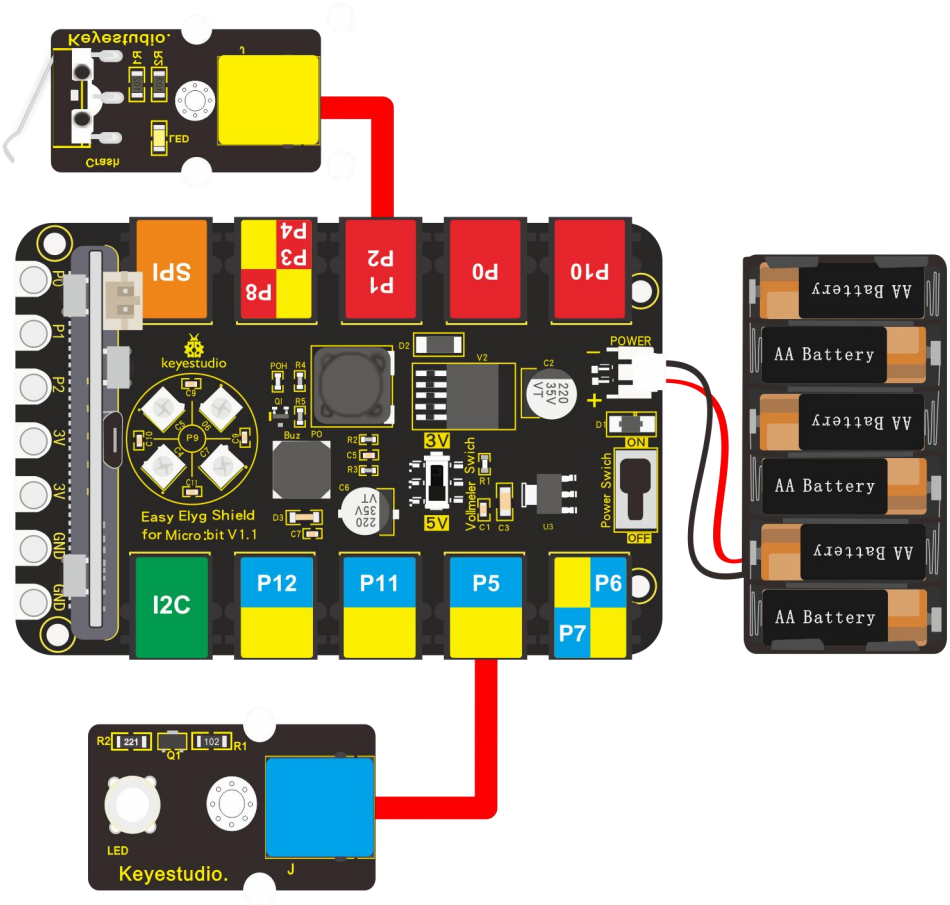
5.Connector: Easy plug

6.On-board status indicator LED

7.M3 mounting hole, convenient for fixation on other devices.

3. Wiring Up:

Insert micro:bit onto EASY Plug shield. Connect crash sensor and LED module to P1 and P5 port of shield. Plug in external power.

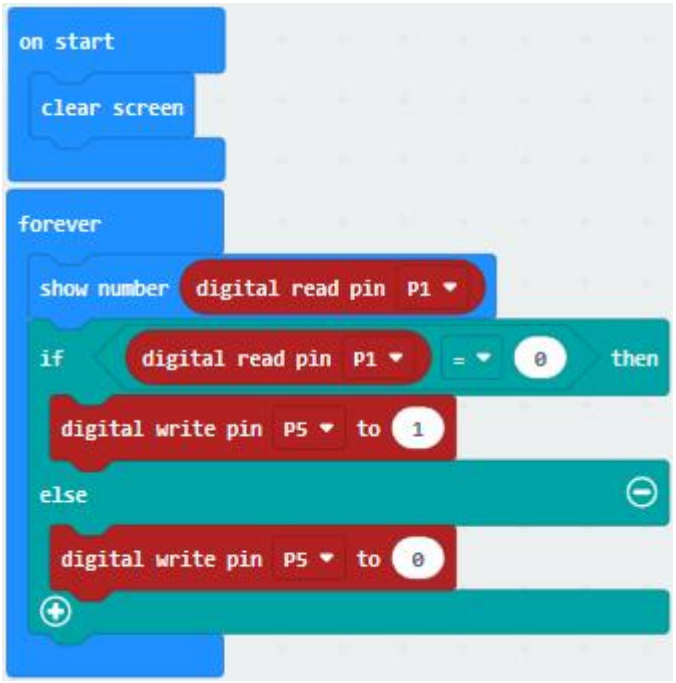


Note: Dial Voltmeter_Switch to 3V end

4. Test Code:

You could navigate https://makecode.micro:bit.org/reference to have access to more details.

Browse link https://makecode.micro:bit.org/ to edit your program. The following test code is as for your reference.



"on start" : command block only runs once to start program.
Clear screen
The program under the block "forever" runs cyclically.
Micro:bit shows the digital signal (1/0)read by crash sensor
Micro:bit will show the digital signal read by
If the digital signal read by P1 is 0(crash), execute the program under then block
Set P5 to high level(1), LED turns on
When the digital signal read by P1 is 1, no crash, execute the program under else block
Set P5 to low level(0), LED turns off

5. Test Result:

Wiring up, dial Voltmeter_Switch to 3V end, plug in external power and dial Power_Switch to ON end and upload code to micro:bit.

When the metal switch of crash sensor is pressed, micro:bit will display low level(0) and LED will be on; on the contrary, micro:bit will show high level(1), LED will be off.

Project 20: Follow Black Line

1.Description:

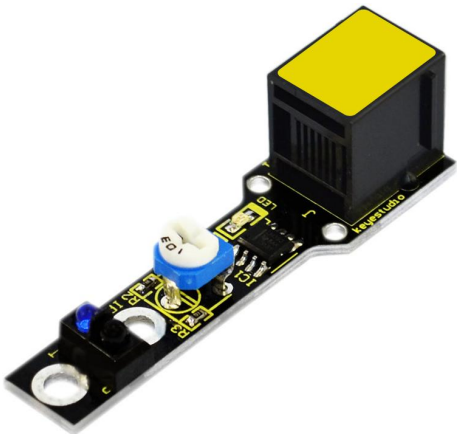
We will make smart robot follow the black lines to drive. Does it sound unbelievable?

Combine line tracking sensor with micro:bit, then we could achieve what we want.

2.What You Need:

- Micro:bit Board*1EASY Plug Shield for micro bit V1.1*1
- Micro USB Cable*1
- EASY Plug Line Tracking Sensor*1
- RJ11 Cable*1
- 6-Slot AA Battery Holder*1
- 1.5V AA Battery*6

EASY Plug Line Tracking Sensor:



As an IR sensor, the line tracking sensor can detect black and white lines.

It has a TCRT5000 photoelectric sensor. Infrared reflectivity of color is different , which is applied to convert strong and

weak echoed signal into current signal. The signal end will output high level when no object or black line is detected; otherwise, the low level will be output. As a result, we could determine color by high or low level from signal end.

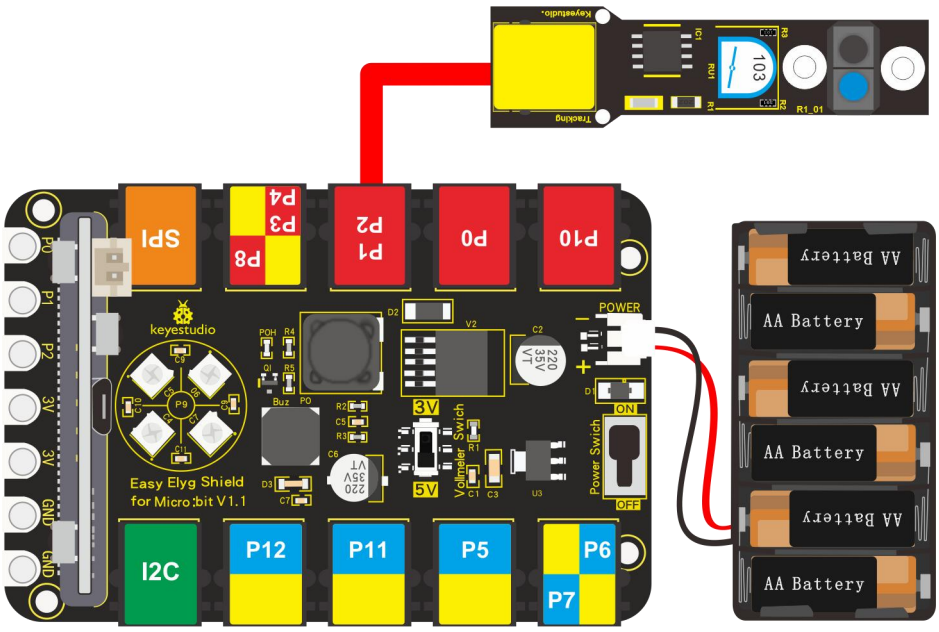
Note: rotate the potentiometer to keep LED in on-and-off state that stands for high sensitivity.

3. Specification:

- Power supply: +5V
- Operating current: <10mA
- Operating temperature range: 0℃ ~ + 50℃
- Output interface: Easy plug
- Output Level: TTL (Black for HIGH output, White for LOW output)
- Detection Height: 0-3 cm

5. Wiring Up:

Insert micro:bit onto EASY Plug shield, connect line tracking sensor to P1 port of shield, and plug in power.



Note: Dial Voltmeter_Switch to 3V end

5.Test Code:

You could navigate https://makecode.micro:bit.org/reference to have access to more details.

Browse link https://makecode.micro:bit.org/ to edit your program. The following test code is as for your reference.

"on start" : command block only runs once to start program.
Turn off LED dot matrix
The program under the block "forever" runs cyclically.

Micro: bit shows the digital signal read by line tracking sensor(1/0)

Delay in 500ms

6.Test Result:

Wiring up, dial Voltmeter_Switch to 3V end, plug in external power and dial Power_Switch to ON end and upload code to micro:bit.

The signal end will output high level when no object or black line is detected; otherwise, the low level will be output. As a result, we could determine color by high or low level from signal end.

Project 21: Magnetic Detection

1.Description:

Hall magnetic sensor has the characteristic of high sensitivity, quick-response, high reliability and high performance.

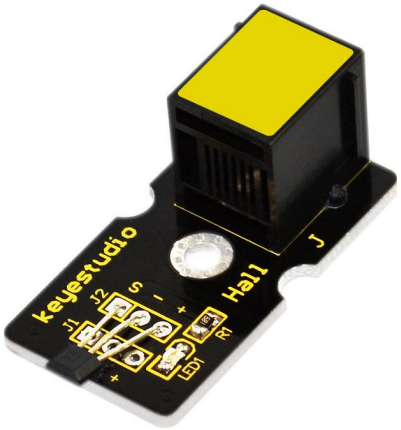
We will teach you how to control the on-and-off state of LED and detect if there is magnetic field with hall magnetic sensor.

2. What You Need:

- Micro:bit Board*1EASY Plug Shield for micro bit V1.1*1
- Micro USB Cable*1
- EASY Plug Hall Magnetic Sensor*1
- EASY Plug Blue LED Module*1
- RJ11 Cable*2
- 6-Slot AA Battery Holder*1

- 1.5V AA Battery*6

EASY Plug Hall Magnetic Sensor:



Applied to detect magnetic field and output digital signals, this Hall magnetic sensor adopts A3144E component. It can detect if there exists magnetic field rather than how strong it is.

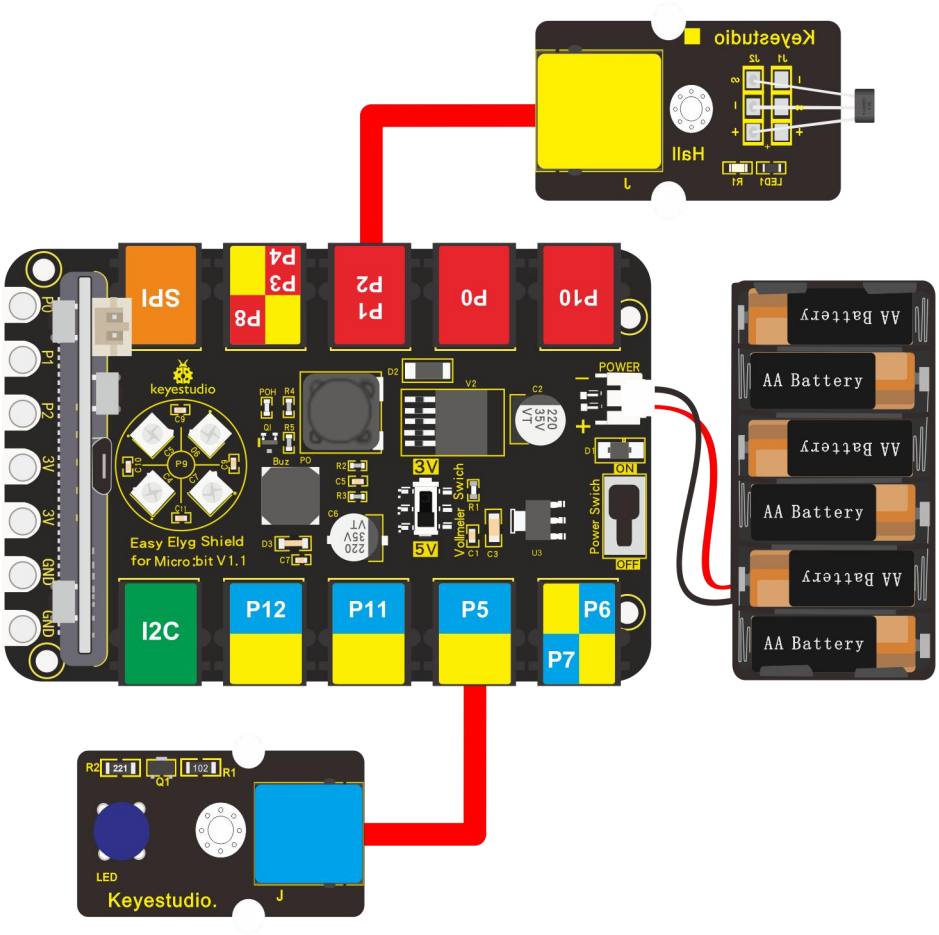
3. Specification:

- Power supply: +5V
- Sensing magnetic materials
- Detection range: up to 75px
- Output: Digital High/Low
- Detection range and magnetic field strength are proportional

4. Wiring Up:

Insert micro:bit onto EASY Plug shield, connect hall magnetic sensor and blue LED module to P1 and P5 port of shield with 2 RJ11 cables.

And plug in power.

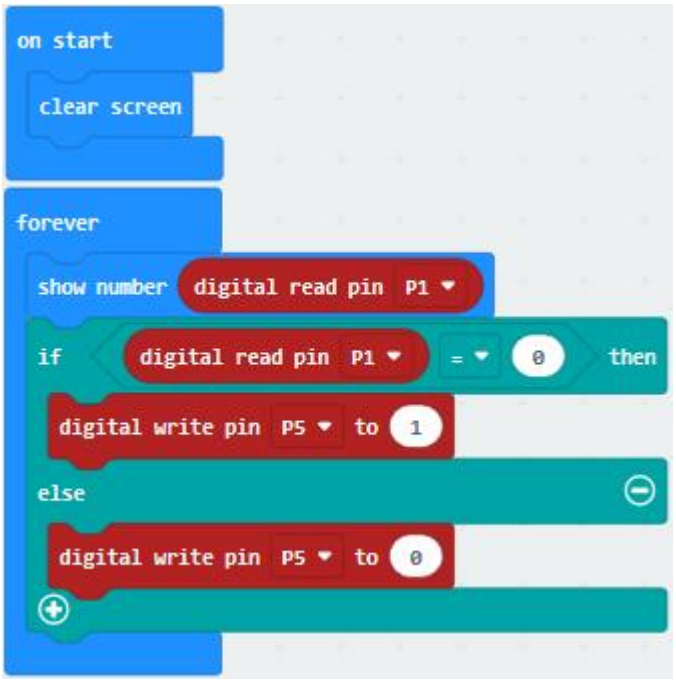


Note: Dial Voltmeter_Switch to 3V end

5.Test Code:

You could navigate https://makecode.micro:bit.org/reference to have access to more details.

Browse link https://makecode.micro:bit.org/ to edit your program. The following test code is as for your reference.



"on start" : command block only runs once to start program.

Turn off LED dot matrix

The program under the block "forever" runs cyclically.

Micro:bit shows the digital signals read by hall magnetic sensor.

If the digital signal is 0, there exists magnetic field, execute the program under then block.

Set P5 to high level(1), LED turns on

If the digital signal is 1, there is no magnetic field, execute the program under else block.

Set P5 to low level(0), LED turns off

6.Test Result:

Wiring up, dial Voltmeter_Switch to 3V end, plug in external power and dial Power_Switch to ON end and upload code to micro:bit.

Place a magnetic bead nearby the hall magnetic sensor, micro:bit will display 0(low level) and LED will be on if sensor detects the magnetic field; conversely, 1 will appear on micro:bit and LED will be off.

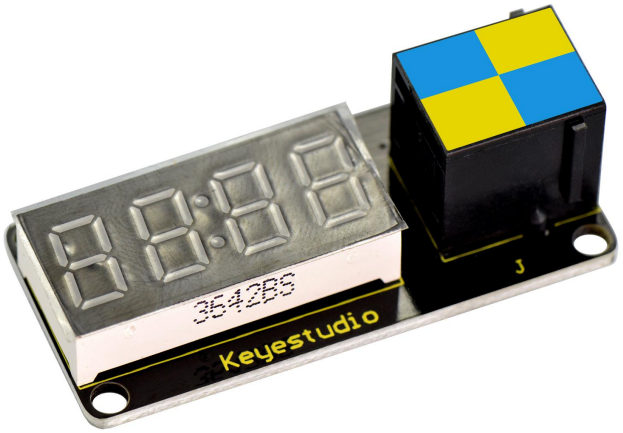
Project 22: 4-digit LED Display

1.Description:

In this lesson, we will teach you how to display numbers on EASY Plug 4-digit LED module.

2. What You Need:

- Micro:bit Board*1EASY Plug Shield for micro bit V1.1*1
- Micro USB Cable*1
- EASY plug 4-digit 8-segment Display Module*1
- RJ11 Cable*1
- 6-Slot AA Battery Holder*1
- 1.5V AA Battery*6



EASY plug 4-digit LED display

This is a 4-digit 0.36 ' ' Common Anode LED display

module, a 12-pin display module with score points.

The driver chip used in the matrices is TM1637, using only two signal cables to make the microcontroller control the 4-digit LED display.

The four pins of LED display are GND、VCC、DIO、CLK. (GND is ground, VCC is for power supply, DIO is data IO pin, CLK is clock signal pin.)

The module pins are extended into Registered jack, so you can easily connect it to EASY Plug control board using a RJ11 cable.

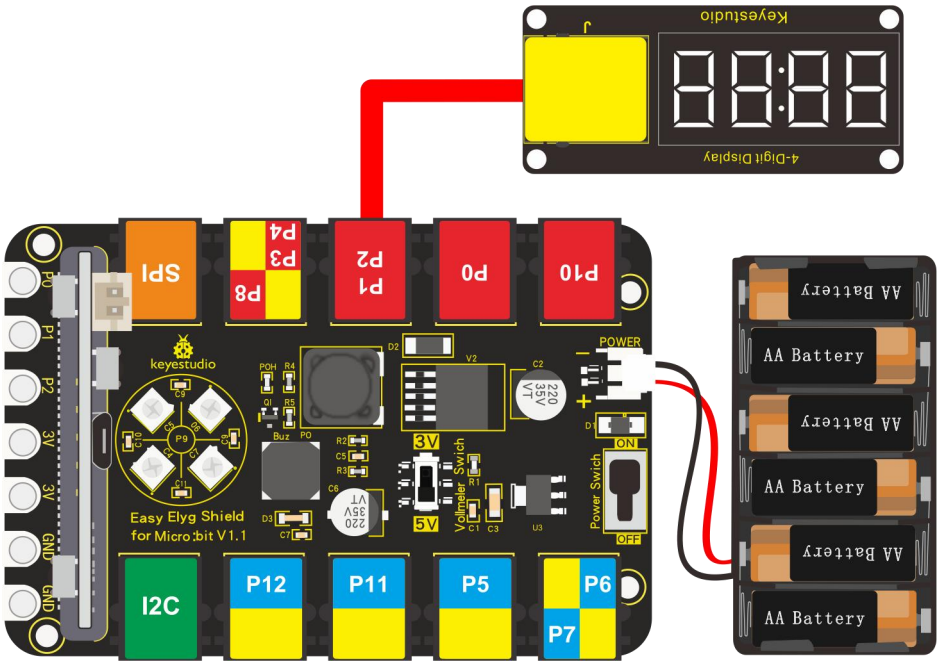
This module should be used together with EASY plug control board.

3. Specification:

- Specification:
- Working voltage: DC 5V
- Operating temperature
- range: -40～+85℃
- Size: 49.6*23 MM
- Environmental protection attributes: ROHS

4. Wiring Up:

Insert micro:bit onto EASY Plug shield, connect 4-digit tube module to P1-P2 port of shield.



Note: Dial Voltmeter_Switch to 3V end

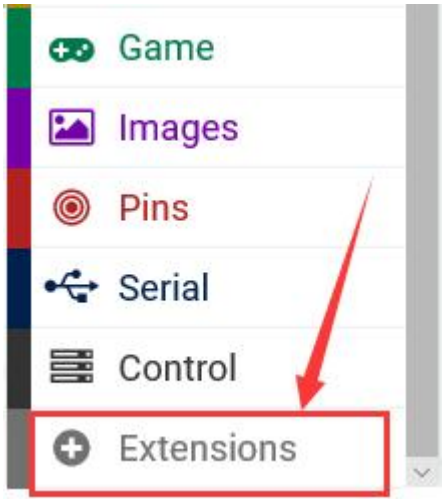
5.Test Code:

You could navigate https://makecode.micro:bit.org/reference to have access to more details.

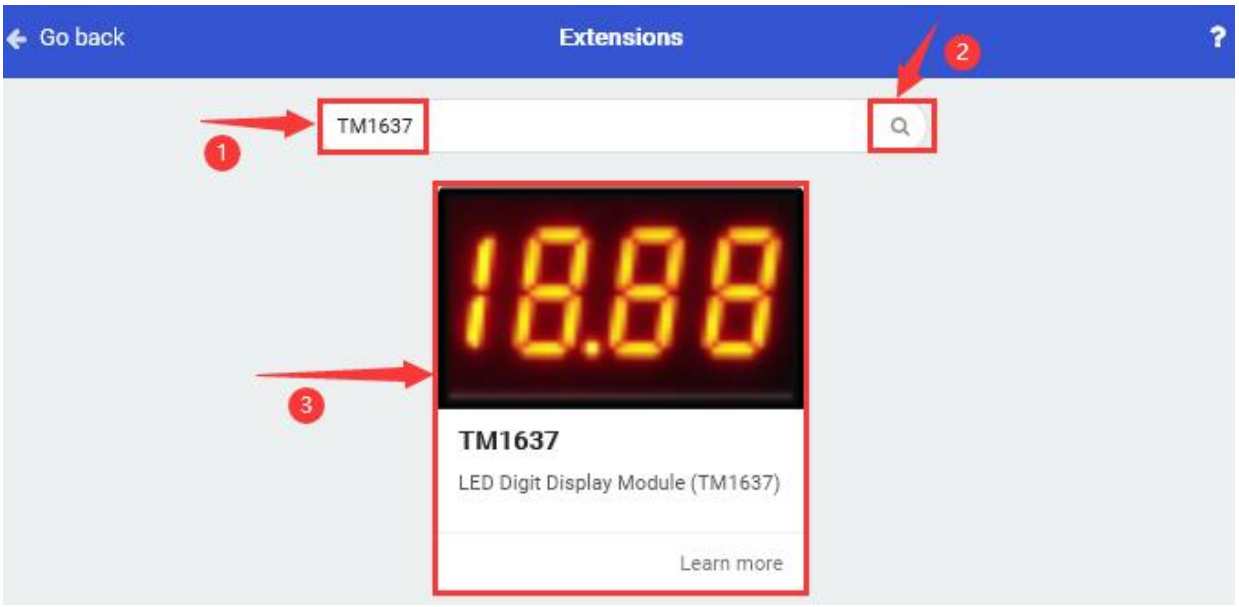
Browse link https://makecode.micro:bit.org/ to edit your program. The following test code is as for your reference.

Add the library of 4-digit tube module, as shown below:

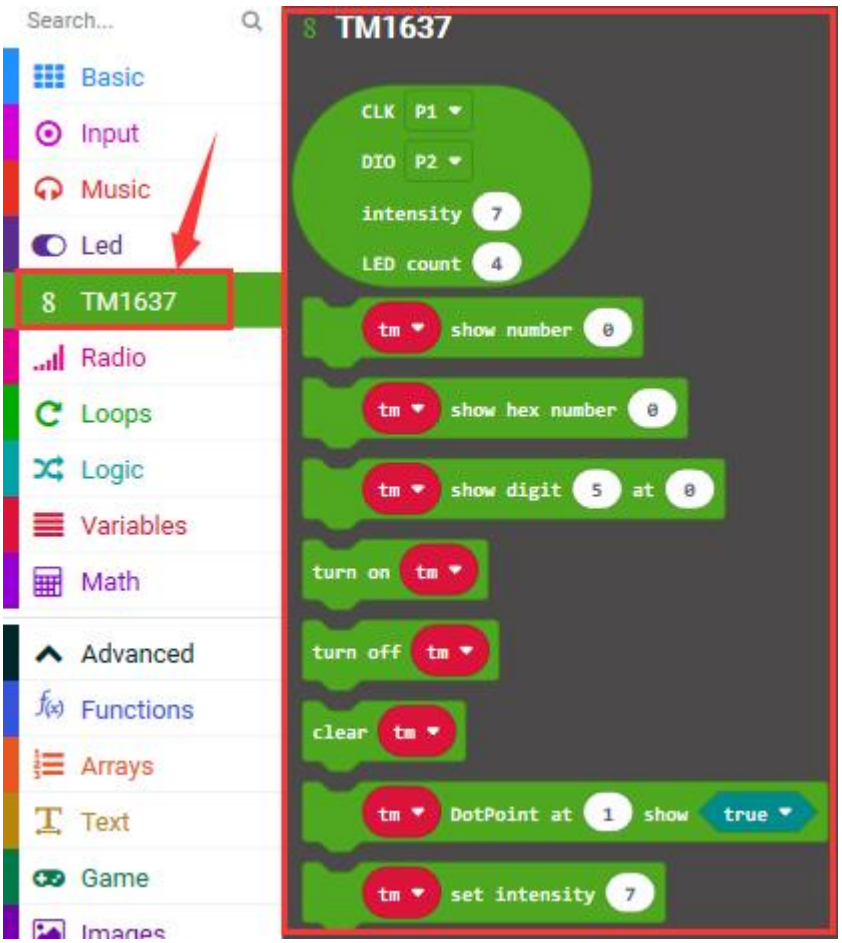
Click "Extensions"

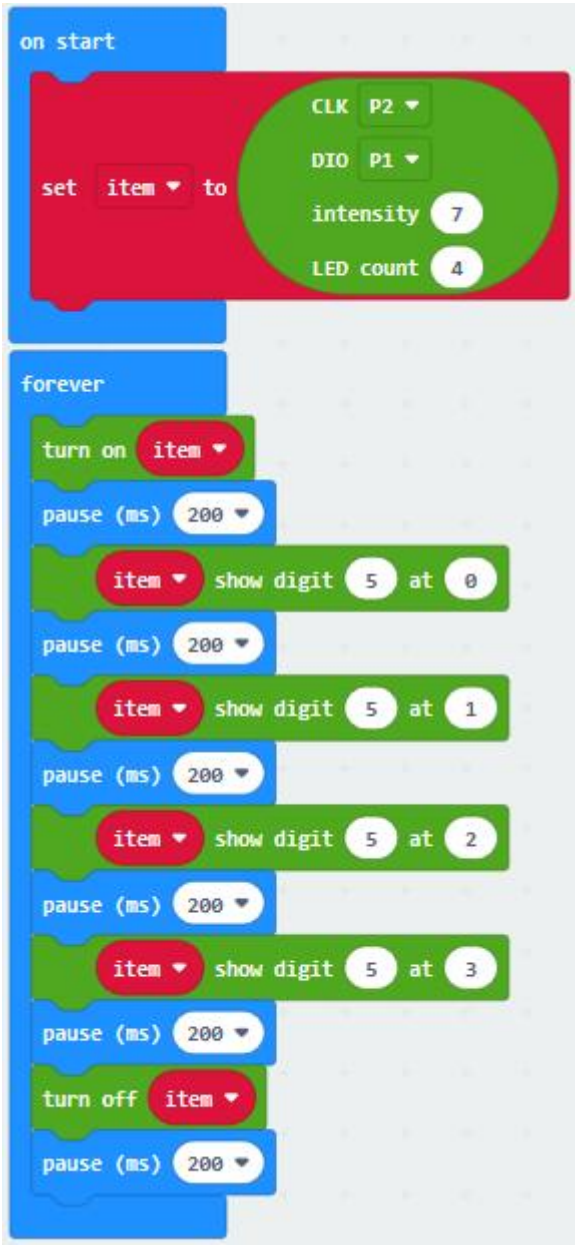


Input “TM1637” and search，as shown below, click to download



After installing the library of 4-digit tube display module, you could view it in the editing blocks.


Search...
Basic
Input
Music
Led
TM1637
Radio
Loops
Logic
Variables
Math
Advanced
Functions
Arrays
Text
Game
Images
TM1637
CLK P1
DIO P2
intensity 7
LED count 4
tm show number 0
tm show hex number 0
tm show digit 5 at 0
turn on tm
turn off tm
clear tm
tm DotPoint at 1 show true
tm set intensity 7



"on start" : command block only runs once to start program.
Set item to CLK P2 DIO P1 intensity 7 LED count 4
The program under the block "forever" runs cyclically.
Open 4-digit tube
Delay in 200ms
Show 5 at the zero bit on 4-digit tube module.
Delay in 200ms
Show 5 at the first bit on 4-digit tube module.
Delay in 200ms
Display 5 at the second bit on 4-digit tube module.
Delay in 200ms
Display 5 at the third bit on 4-digit tube module.

Delay in 200ms

6. Test Result:

Wiring up, dial Voltmeter_Switch to 3V end, plug in external power and dial Power_Switch to ON end and upload code to micro:bit.

The 4-digit tube module shows "5" from 0 bit to the third bit(From left to right are 0, 1, 2, and 3 bits). then the number "5555" flashes.

Project 23: Light Interrupter

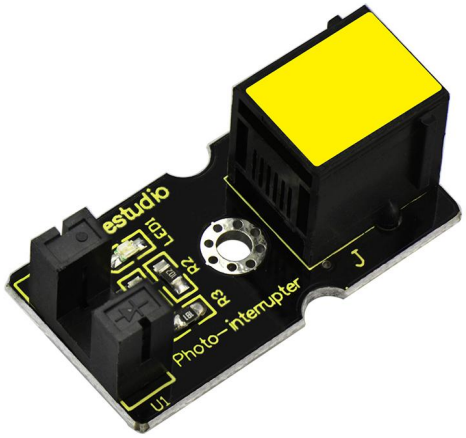
1.Description:

In our daily life, we often need to count and take measurement.
We could achieve goal by the combination of photo interrupter and microcontroller. We connect photo interrupter to shield so as to control LED.

2. What You Need:

- Micro:bit Board*1EASY Plug Shield for micro bit V1.1*1
- Micro USB Cable*1
- EASY Plug Light Interrupter*1
- EASY Plug Red LED Module*1
- RJ11 Cable*2
- 6-Slot AA Battery Holder*1
- 1.5V AA Battery*6

EASY Plug Light Interrupter:



This is a high performance EASY Plug photo interrupter module.

The upright part on the module combines an infrared light emitting diode and shielded infrared detector.

By emitting a beam of infrared light from one end to another end, the sensor can detect an object when it passes through the beam.

Useful for many applications such as optical limit switches, pellet dispensing, general object detection, etc.

6. Specification:

Support quick response; highly sensitive

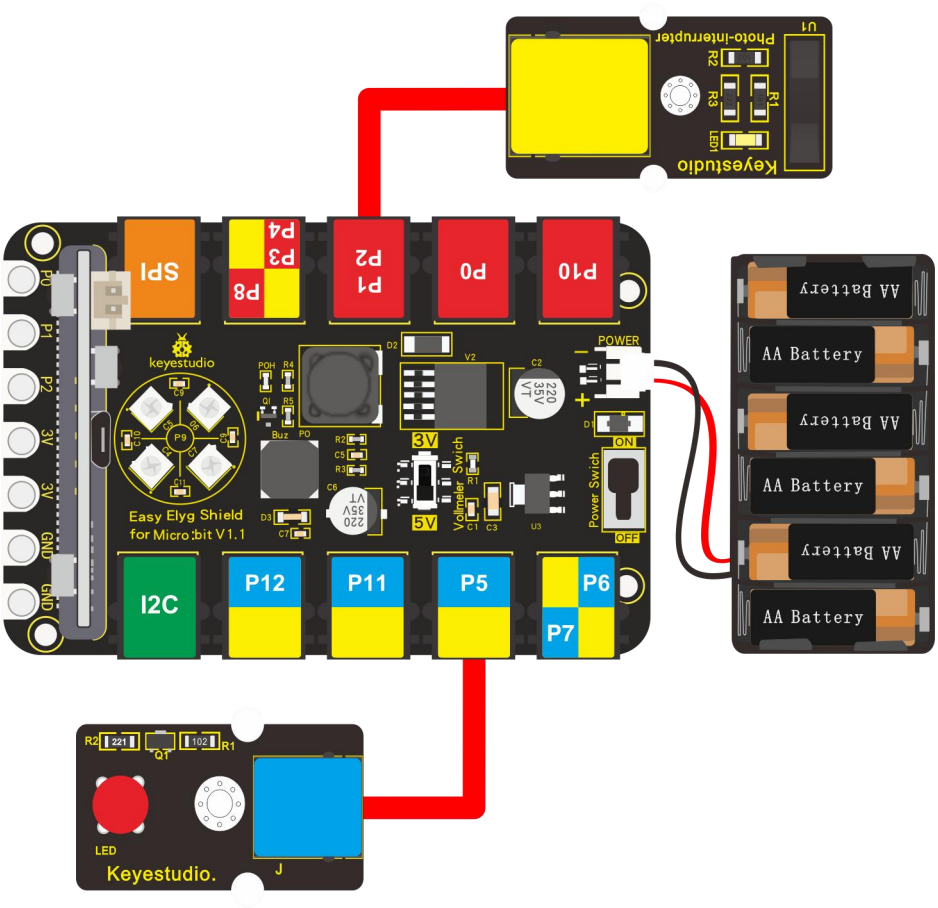
Interface: Easy plug

Supply Voltage: 3.3V to 5V

4.Wiring Up:

Insert micro:bit onto EASY Plug shield, connect light interrupter

module and LED module to P1 and P5 port of shield.

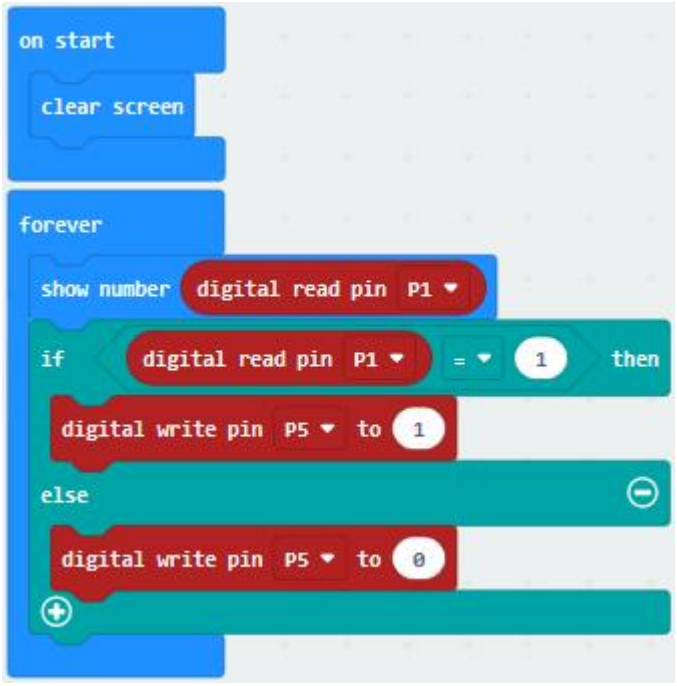


Note: Dial Voltmeter_Switch to 3V end

5. Test Code:

You could navigate https://makecode.micro:bit.org/reference to have access to more details.

Browse link https://makecode.micro:bit.org/ to edit your program. The following test code is as for your reference.



6.Test Result:

Wiring up, dial Voltmeter_Switch to 3V end, plug in external power and dial Power_Switch to ON end and upload code to micro:bit.

Micro:bit will display high level(1) and LED will be on if there is object goes through U slot of light interrupter; if not, LED will be off.

Project 24: EASY Plug Reed Switch Module

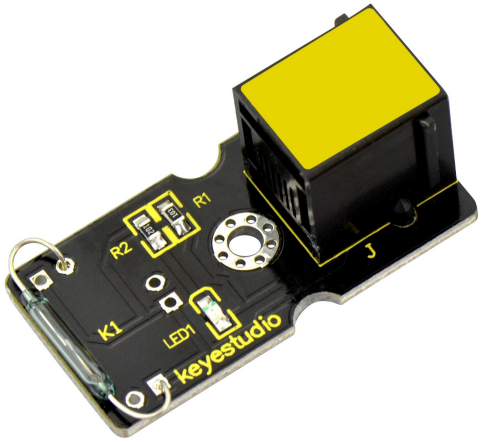
1.Description:

In this project, we will detect magnetic field with reed switch, shied and micro:bit. We’ ve take advantage of hall magnetic sensor to detect magnetic field in project 20. What’ s the difference between hall magnetic sensor and reed switch module? Let’ s get started.

2.What You Need:

- Micro:bit Board*1EASY Plug Shield for micro bit V1.1*1
- Micro USB Cable*1
- EASY plug Magnetic Switch *1
- EASY plug Red LED Module*1
- RJ11 Cable*2
- 6-Slot AA Battery Holder*1
- 1.5V AA Battery*6

EASY Plug Reed Switch Module:



This is a small device called a reed

switch on the module.

When the device is exposed to a magnetic field, the two ferrous materials inside the switch pull together and the switch closes.

When the magnetic field is removed, the reeds separate and the switch opens. This makes for a great non-contact switch.

You can mount reed switch on the door for alarming purpose or as switches.

This sensor needs to be used together with EASY plug control board.

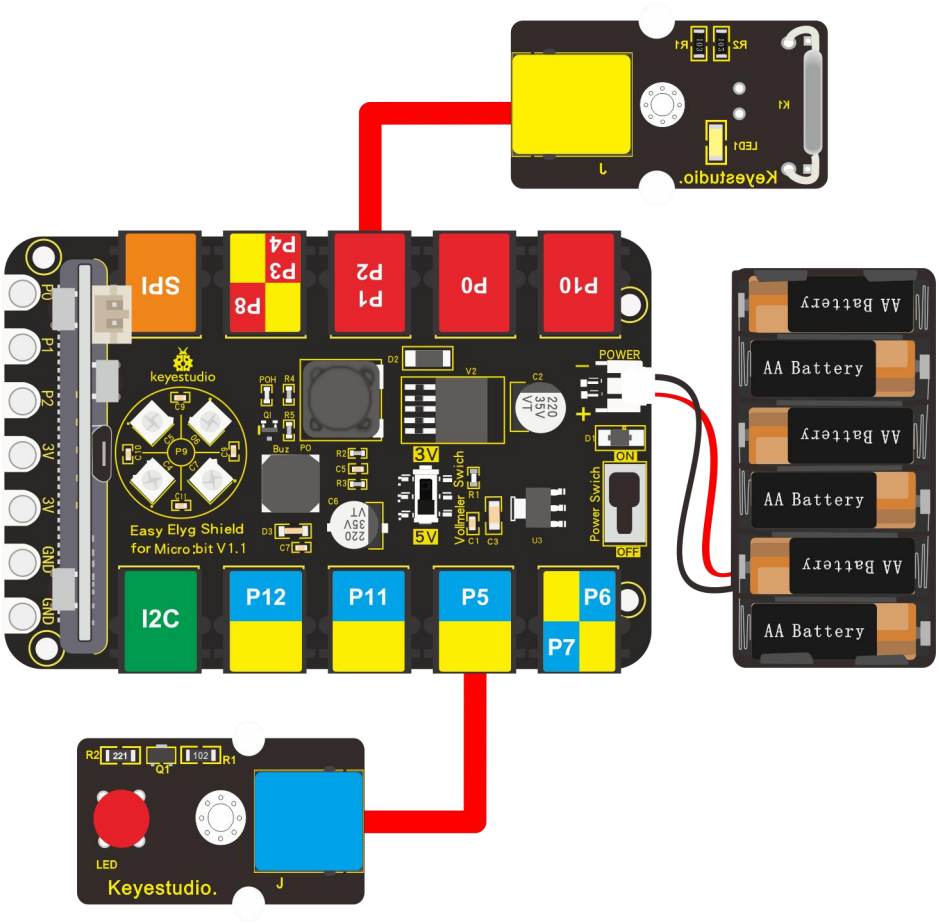
The reed switch is applied widely in home appliance, automobile, communication, industrial, health care and security, as well as other electronic devices like door magnet, reed relay and level gauge.

3. Specification:

- Interface: Easy plug
- Working voltage: DC 3.3V-5V
- Working current: ≥20mA
- Working temperature: －10℃ to＋50℃
- Detection distance: ≤10mm

4.Wiring Up:

Insert micro:bit onto EASY Plug shield, connect reed switch and LED module to P1 and P5 port of shield.

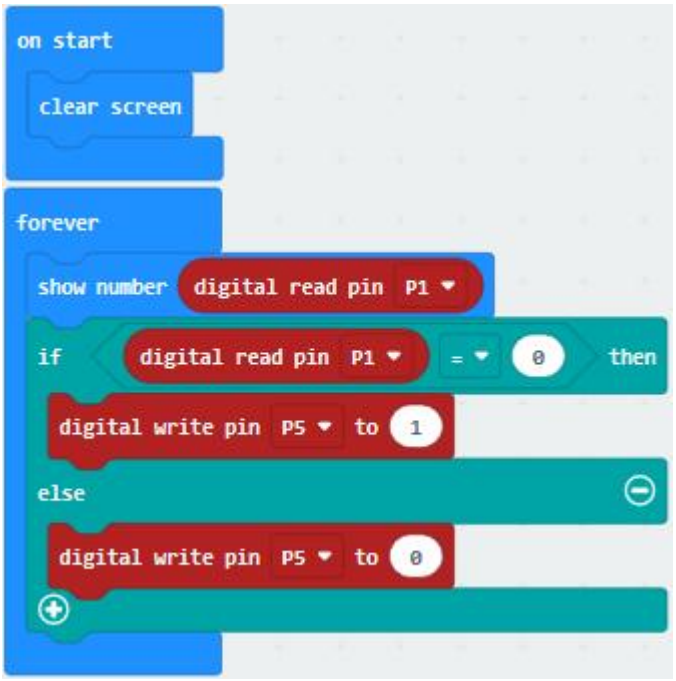


Note: Dial Voltmeter_Switch to 3V end

5.Test Code:

You could navigate https://makecode.micro:bit.org/reference to have access to more details.

Browse link https://makecode.micro:bit.org/ to edit your program. The following test code is as for your reference.



“on start”: command block only runs once to start program.

Turn off LED dot matrix

The program under the block “forever” runs cyclically.

Micro:bit shows the digital signal(1/0)

If digital signal read by P1=0, there is magnetic field, execute the program under then block

Set P5 to high level(1), turn on LED

If digital signal read by P1=1, no magnetic field, execute the program under else block

Set P2 to low level(0), turn off LED

6. Test Result:

Wiring up, dial Voltmeter_Switch to 3V end, plug in external power and dial Power_Switch to ON end, download code to micro:bit. When the reed switch module detects magnetic field, micro:bit will show low level(0) and LED will be on; on the contrary, high level(1) will be displayed and LED will be off.

Project 25: Hear Footstep

1.Description:

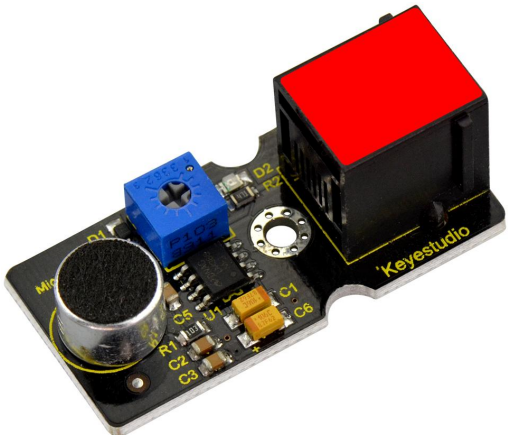
In this project, we will connect sound sensor to shield and read analog value by detecting sound with micro:bit. The louder the sound is, the larger the analog value is.

2. What You Need:

- Micro:bit main board*1
- EASY Plug Shield for micro bit V1.1*1
- Micro USB Cable*1
- EASY plug analog sound sensor*1
- EASY plug White LED Module*1

- RJ11 Cable*2
- 6-Slot AA Battery Holder*1
- 1.5V AA Battery*6

EASY plug Analog Sound Sensor:



The sound sensor mainly adopts a high-sensitivity microphone element and LM386 chip. High-sensitivity microphone components are used to detect external sounds. The LM386 chip can amplify the sound detected by the high-sensitivity microphone, and the maximum multiple is 200 times.

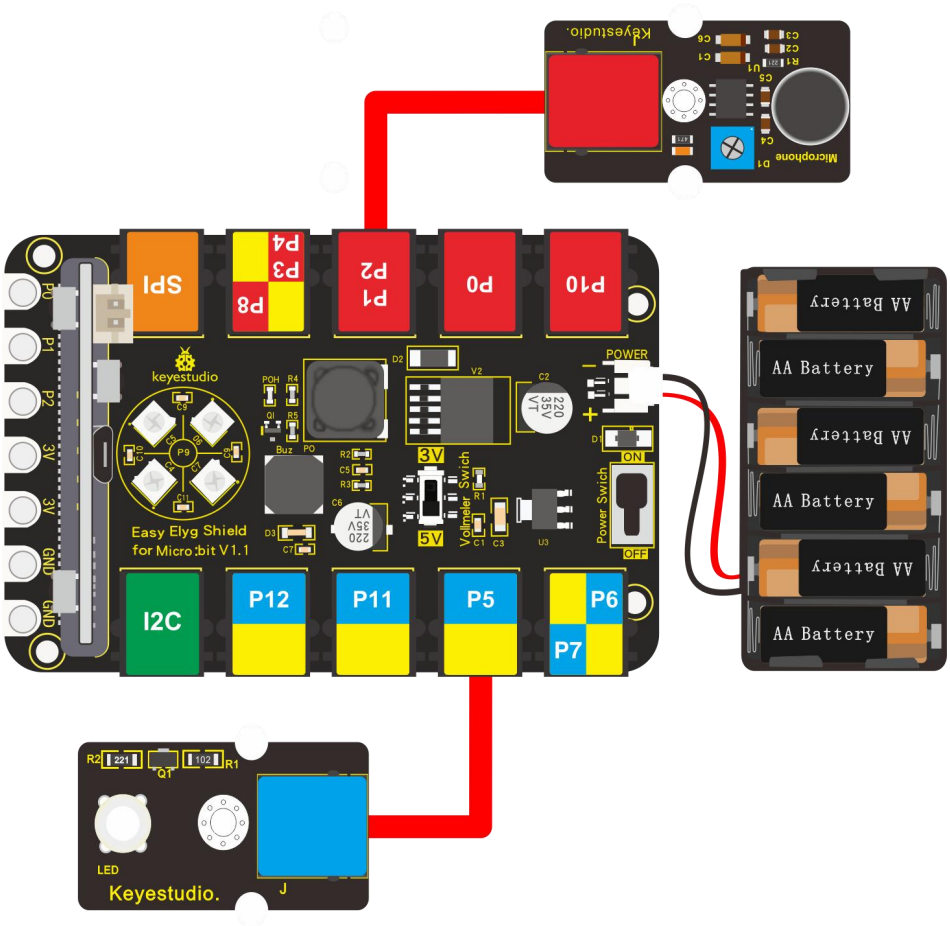
When in use, we can adjust the multiple of the sound by rotating the potentiometer on the sensor. Rotating potentiometer clockwise, the sound will be up to the maximum. This benefits us to make sound-activated robot, switch, alarm and so on.

3. Specification:

Supply Voltage: 3.3V to 5V
Interface: Easy plug

4. Wiring Up:

Insert micro:bit onto EASY Plug shield, respectively connect sound sensor and white LED to P1 and P5 of shield, and plug in power.



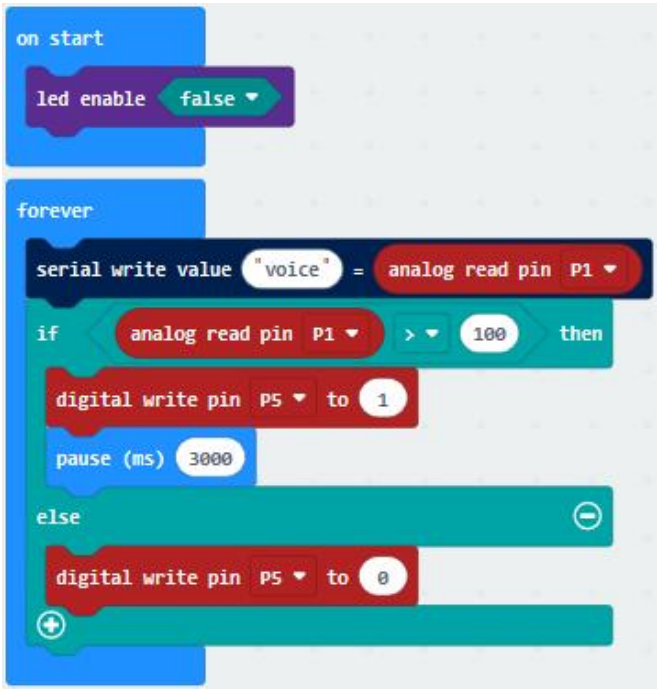
Note: Dial Voltmeter_Switch to 5V end.

5. Test Code:

You could navigate https://makecode.micro:bit.org/reference to have access to more details.

Browse link https://makecode.micro:bit.org/ to edit your program. The following test code is as for your reference.

(Note: sound analog value could be adjusted)



"on start" : command block only runs once to start program.
Turn off LED dot matrix
The program under the block "forever" runs cyclically.
Serial writes voice=analog sound signals read by sound sensor
If analog signals read by P1 >100, execute the program under then block
Set P5 to high level (1) to turn on LED
Delay in 3000ms
If analog signals read by P1 <100, execute the program under else block
Set P5 to low level (0) to turn off LED

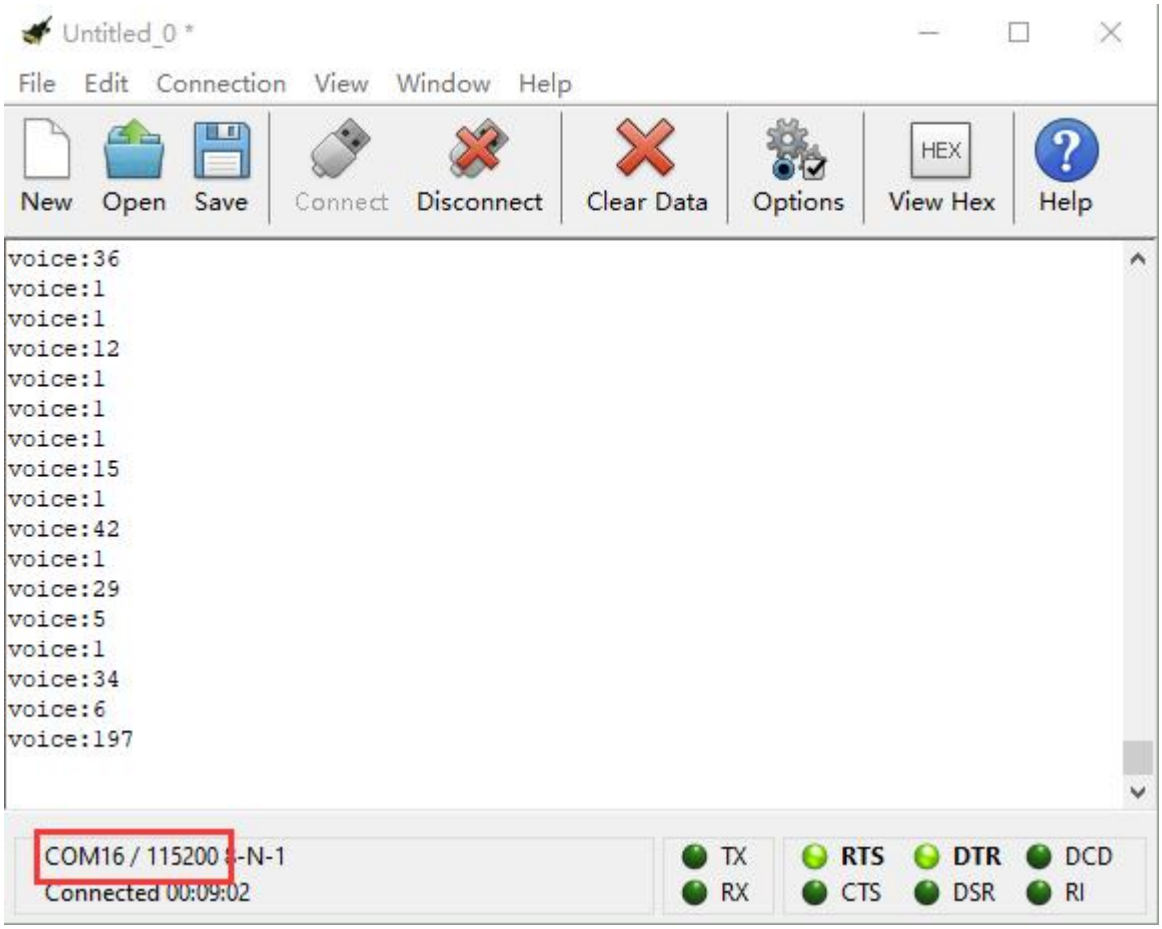
6. Test Result:

Wiring up, dial Voltmeter_Switch to 5V end, plug in external power and dial Power_Switch to ON end and upload code to micro:bit.

Open CoolTerm, click Options and select SerialPort, set COM port and baud rate, set baud rate to 115200. Tap OK and Connect.

CoolTerm monitor will display the result, as shown below:

When the sound analog value is greater than 100, LED will be on, otherwise, LED will be off.



Project 26: Rotary Potentiometer

1.Description:

When doing experiments, we often use a 10K adjustable

potentiometer. Rotating it can change analog value and you could check value on CoolTerm monitor. At same time,the brightness of LED connected to P10 gradually alters.

2. What You Need:

- Micro:bit main board*1
- EASY Plug Shield for micro bit V1.1*1
- Micro USB Cable*1
- EASY plug Rotary Potentiometer*1
- EASY plug Red LED Module*1
- RJ11 Cable*2
- 6-Slot AA Battery Holder*1
- 1.5V AA Battery*6

3. EASY Plug Rotary Potentiometer:

This EASY Plug rotary potentiometer is counted as a changeable resistor. In fact, it will change the resistance of changeable resistor when rotating potentiometer. We set the circuit, convert the change

of resistance into the change of voltage.

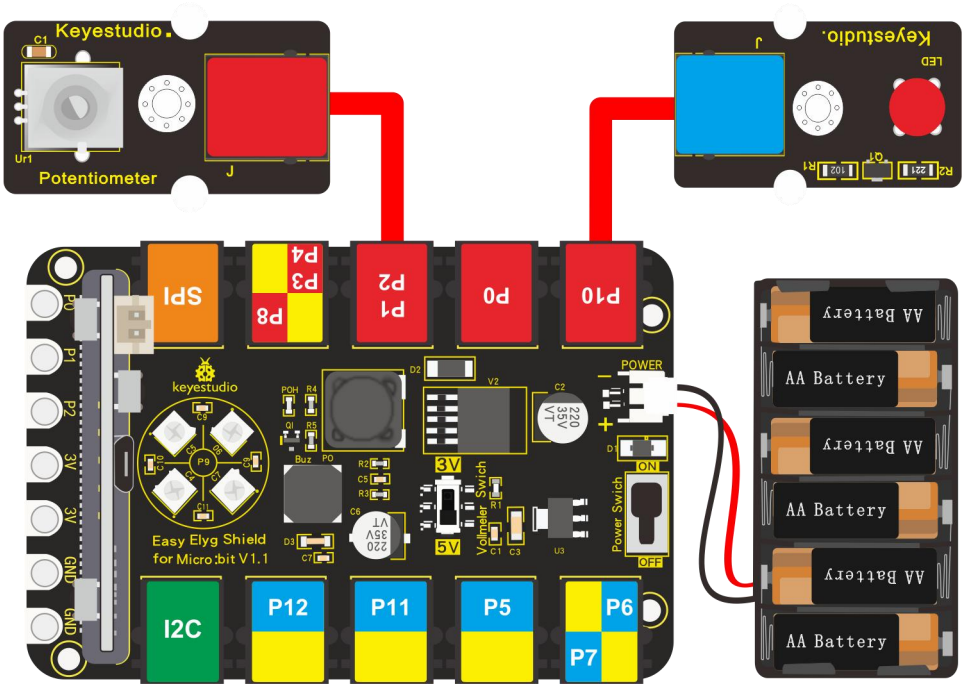
4. Specification:

Supply Voltage: 3.3V to 5V

Interface: EASY Plug

5. Wiring Up:

Insert micro:bit onto EASY Plug shield, connect analog potentiometer and red LED module to P1 and P10 port of shield. And plug in power.

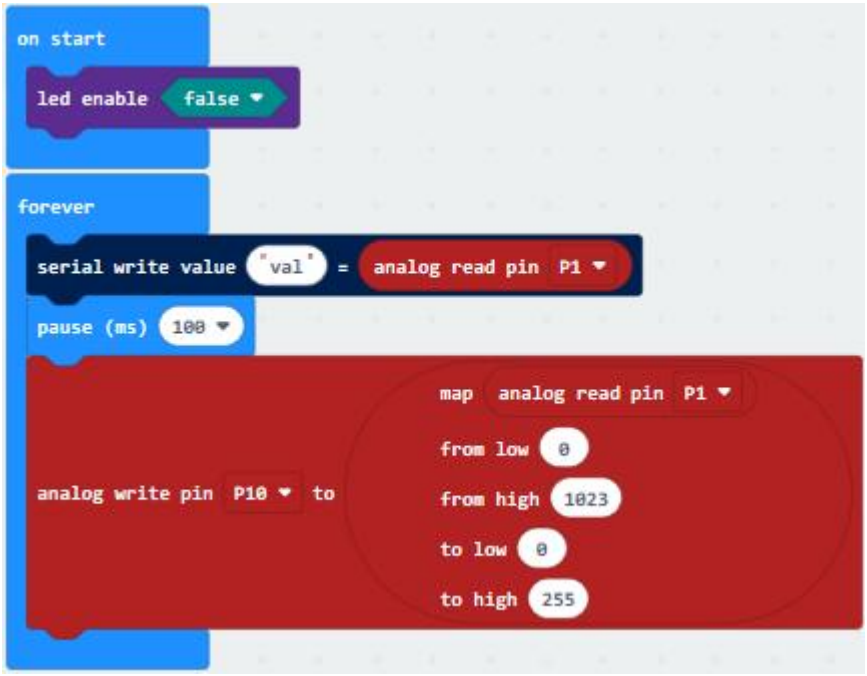


Note: Dial Voltmeter_Switch to 3V end.

6. Test Code：

You could navigate https://makecode.micro:bit.org/reference to have access to more details.

Browse link https://makecode.micro:bit.org/ to edit your program. The following test code is as for your reference.



"on start" : command block only runs once to start program.

Turn off micro:bit

The program under the block "forever" runs cyclically.

Serial writes the analog signal of adjustable potentiometer

Delay in 100ms

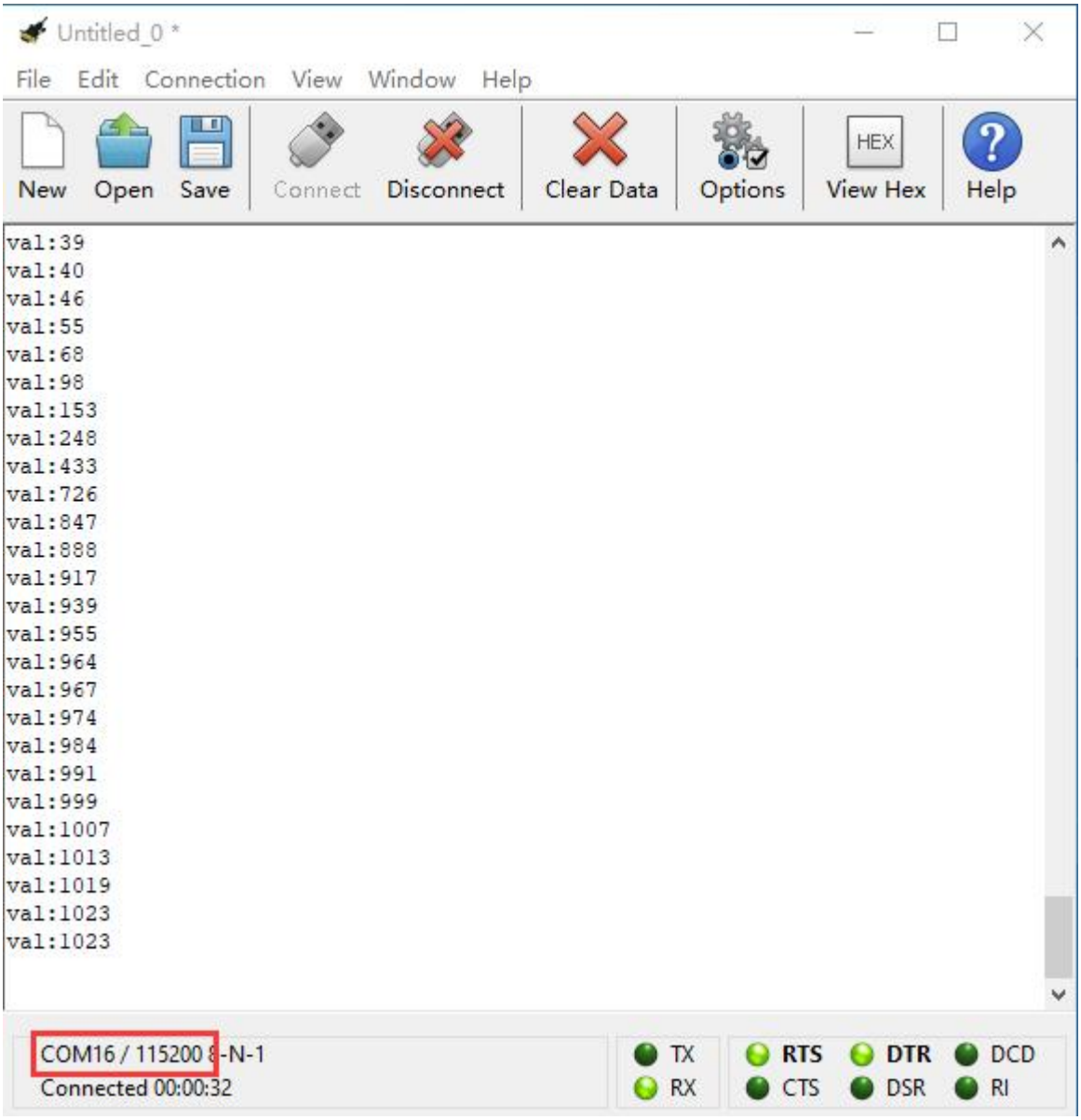
Map the analog signal (0-1023) of potentiometer to analog value (0-255) of LED connected P10

7. Test Result:

Wiring up, dial Voltmeter_Switch to 5V end, plug in external power and dial Power_Switch to ON end and upload code to micro:bit.

Open CoolTerm, click Options and select SerialPort, set COM port and baud rate, set baud rate to 115200. Tap OK and Connect.

CoolTerm monitor shows the detected value, rotate the potentiometer to adjust analog value. As the analog value rises, LED gradually gets bright; when the value reduces, LED gets dimmer.



Project 27: Alcohol Content in the Air

1.Description:

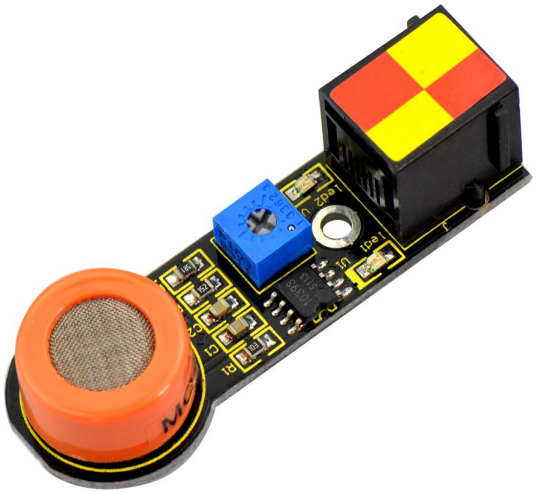
In this program, we will conduct you how to detect alcohol content.

2. What You Need:

- Micro:bit Board*1EASY Plug Shield for micro bit V1.1*1
- Micro USB Cable*1

- EASY plug Analog Alcohol Sensor*1
- RJ11 Cable*1
- 6-Slot AA Battery Holder*1
- 1.5V AA Battery*6

EASY Plug Analog Alcohol Sensor:



This analog gas sensor - MQ3 is suitable for detecting alcohol. It can be used in a Breath analyzer. Also it has high sensitivity to alcohol and low sensitivity to gas. You could adjust the sensitivity by rotating the potentiometer of sensor.

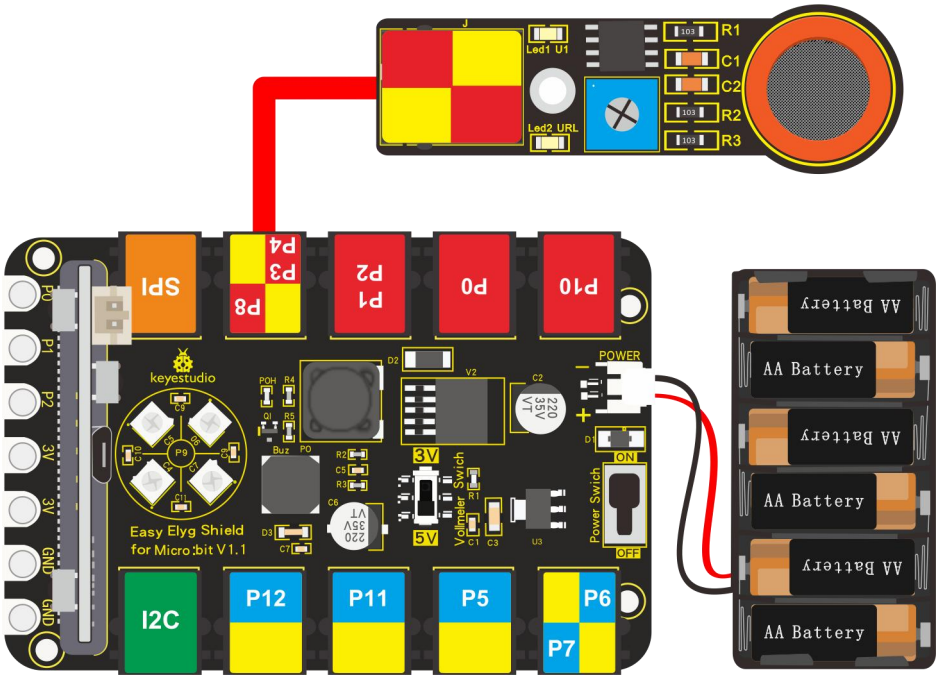
The high the alcohol content is, the larger the analog value at A0.

3. Specification:

- Power supply: 5V
- Interface type: EASY Plug
- Simple drive circuit
- Stable and long service life
- Quick response and High sensitivity

4. Wiring Up:

Insert micro:bit onto EASY Plug shield, connect alcohol sensor to P4 of shield and plug in external power.

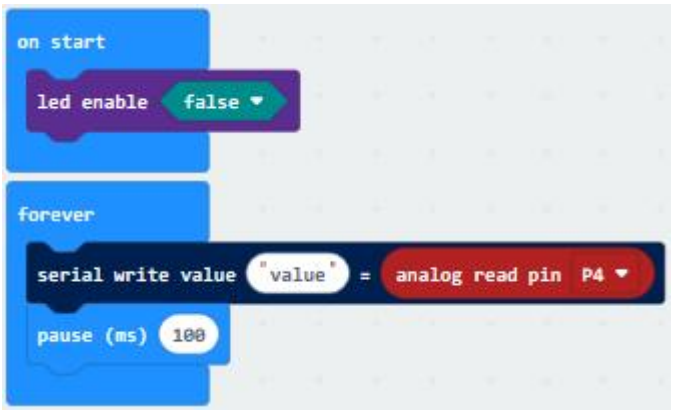


Dial Voltmeter_Switch to 5V end.

3. Test Code:

You could navigate https://makecode.micro:bit.org/reference to have access to more details.

Browse link https://makecode.micro:bit.org/ to edit your program. The following test code is as for your reference.



"on start" : command block only runs once to start program.

Turn off dot matrix on micro:bit

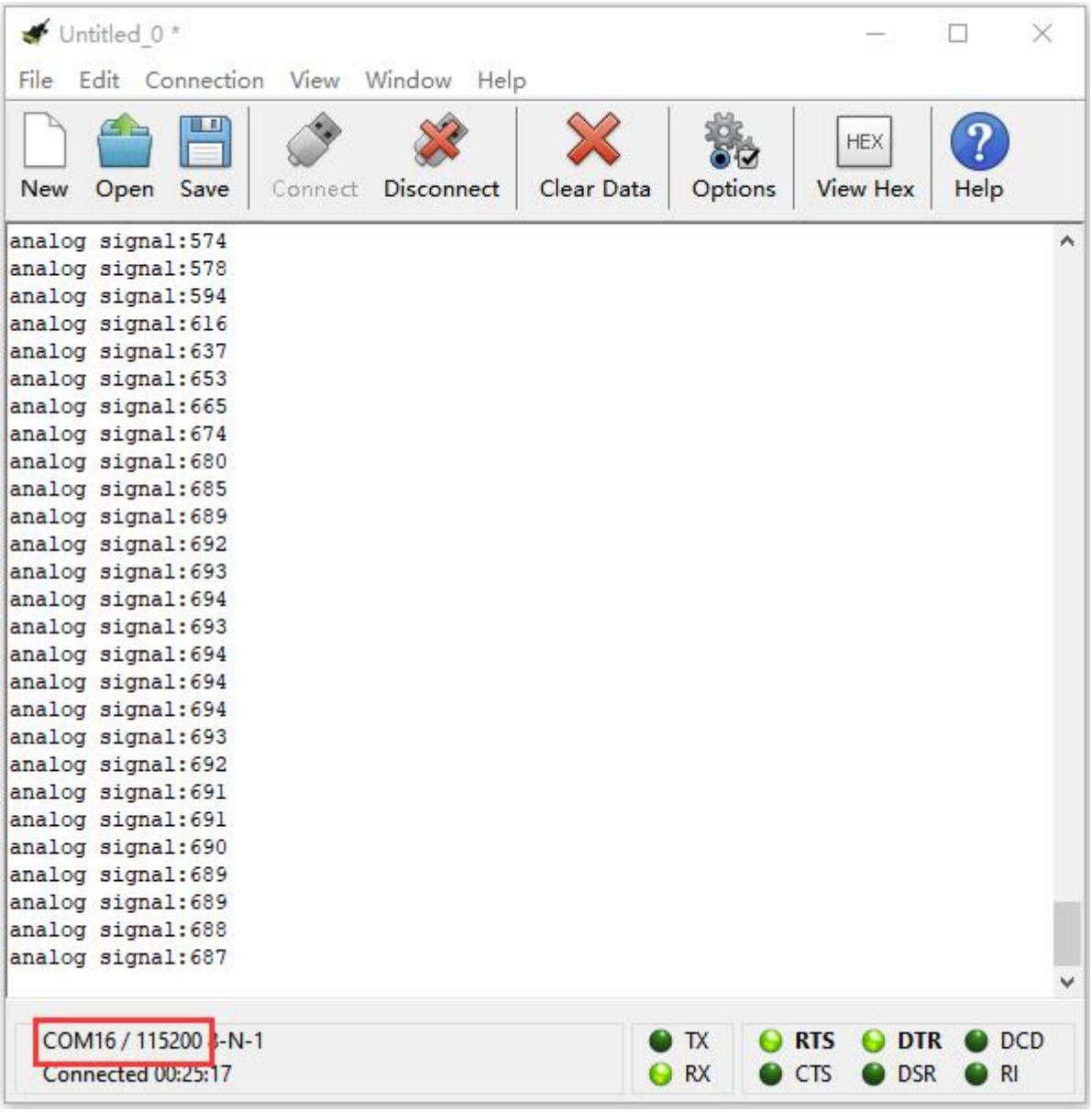
The program under the block "forever" runs cyclically.
Serial writes analog signals read by alcohol sensor
Delay in 100ms

6.Test Result:

Wiring up, dial Voltmeter_Switch to 5V end, plug in external power and dial Power_Switch to ON end and upload code to micro:bit.(LED2 of sensor shows green color, and you could adjust potentiometer to keep LED on module in off-and-on state(the sensitivity is highest)

Open CoolTerm, click Options and select SerialPort, set COM port and baud rate, set baud rate to 115200. Tap OK and Connect.

Make alcohol gas close to alcohol sensor, CoolTerm serial monitor indicates that the analog value gets larger and larger and LED1 is on; on the contrary, the analog value gets smaller, LED1 will be off.



Project 28: Ambient Temperature Detection

1.Description:

We will detect the current temperature with EASY plug LM35 linear temperature sensor and display the results on CoolTerm monitor and dot matrix.

2. What You Need:

- Micro:bit Board*1
- EASY Plug Shield for micro bit V1.1*1
- Micro USB Cable*1
- EASY plug LM35 Temperature Sensor*1
- RJ11 Cable*1
- 6-Slot AA Battery Holder*1
- 1.5V AA Battery*6

EASY Plug LM35 Linear Temperature Sensor:

Based on semiconductor LM35 temperature sensor, LM35 linear temperature Sensor can be used to detect ambient temperature.

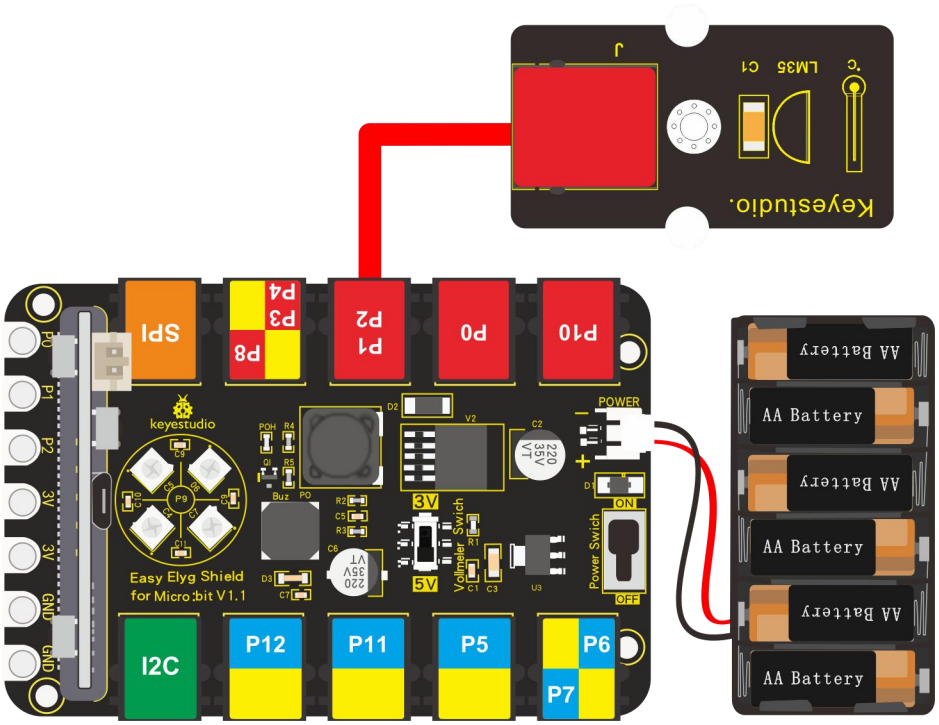
It can detect temperature between 0°~100°. Sensitivity is 10mV per degree Celsius. The output voltage is proportional to the temperature.

7. Specification:

Sensitivity: 10mV per degree Celsius
Functional Range: 0℃ to 100℃

8. Wiring Up:

Insert micro:bit onto EASY Plug shield, connect LM35 temperature sensor to P1 of EASY Plug shield with a RJ11 cable, and plug in external power.

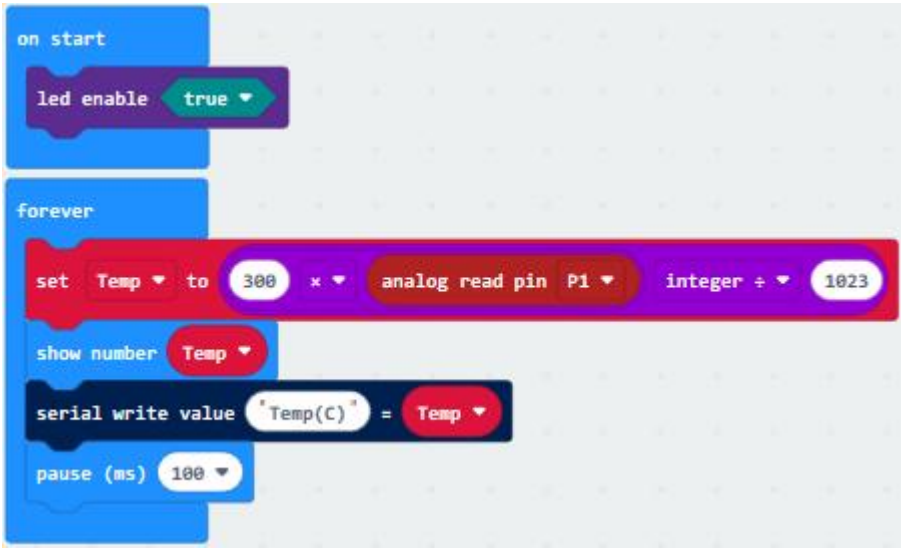


Note: Dial Voltmeter_Switch to 3V end.

5.Test Code:

You could navigate https://makecode.micro:bit.org/reference to have access to more details.

Browse link https://makecode.micro:bit.org/ to edit your program. The following test code is as for your reference.



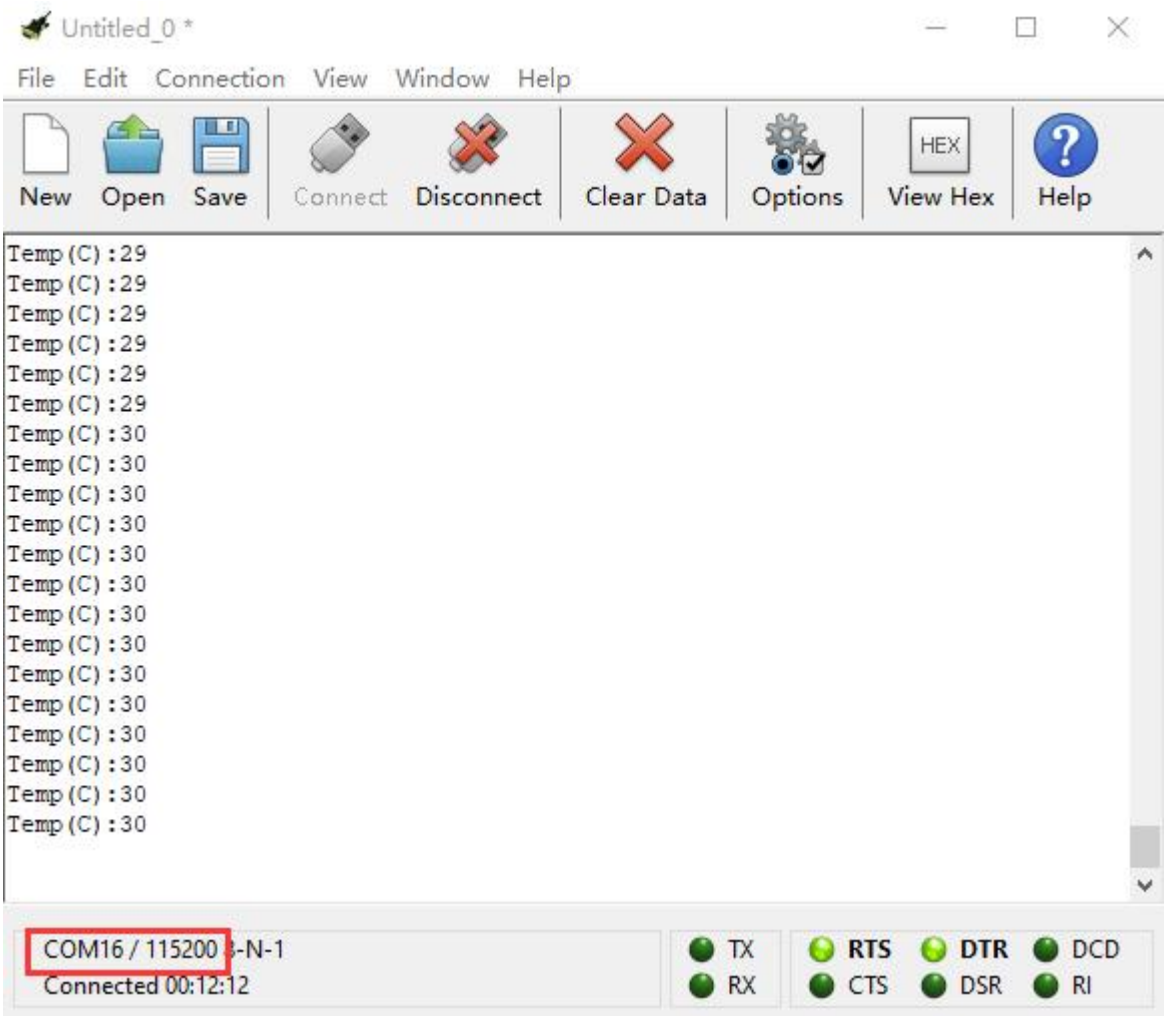
"on start" : command block only runs once to start program.
open LED dot matrix on micro:bit
The program under the block "forever" runs cyclically.
Set temp to 300*analog read pin P1 integer÷1023
Display temperature value on micro:bit
Serial writes temperature value
Delay in 100ms

6.Test Result:

Wiring up, dial Voltmeter_Switch to 3V end, plug in external power and dial Power_Switch to ON end and upload code to micro:bit.

Open CoolTerm, click Options and select SerialPort, set COM port and baud rate, set baud rate to 115200. Tap OK and Connect.

Micro:bit and CoolTerm monitor will display the current temperature, as shown below:



Project 29: Water Level Alarm

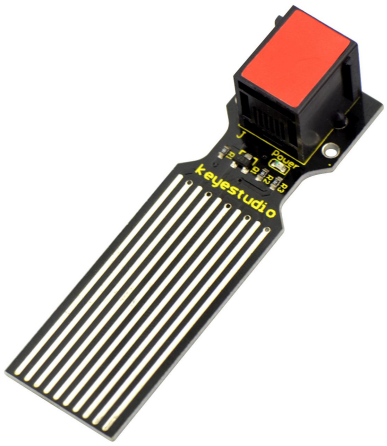
1.Description:

In this lesson, we will do an experiment with a water level sensor and a passive buzzer. Measure the water level in the cup, if water level rises up, LED will flash and passive buzzer will emit sound.

2. What You Need:

- Micro:bit Board*1EASY Plug Shield for micro bit V1.1*1
- Micro USB Cable*1
- EASY plug Water Level Sensor*1
- EASY plug Red LED Module*1
- RJ11 Cable*2
- 6-Slot AA Battery Holder*1
- 1.5V AA Battery*6

EASY Plug Water Level Sensor:



The water level sensor is easy- to-use, portable and cost-effective, designed to identify and detect water level and water drop.

This sensor measures the volume of water drop and water quantity through an array of traces of exposed parallel wires.

Characteristic:

Conversion of water volume and simulated water volume;

Strong flexibility, can output analog value;

Low power consumption, high sensitivity;

Can be directly connected to microprocessors or other logic circuits, suitable for Arduino controllers, STC microcontrollers, AVR microcontrollers and other development boards and controllers;

Production process: FR4 double-sided tin plating;

Shape design: non-slip half-moon groove.

3. Specification:

Working voltage: DC 5V;

Working current: 20mA;

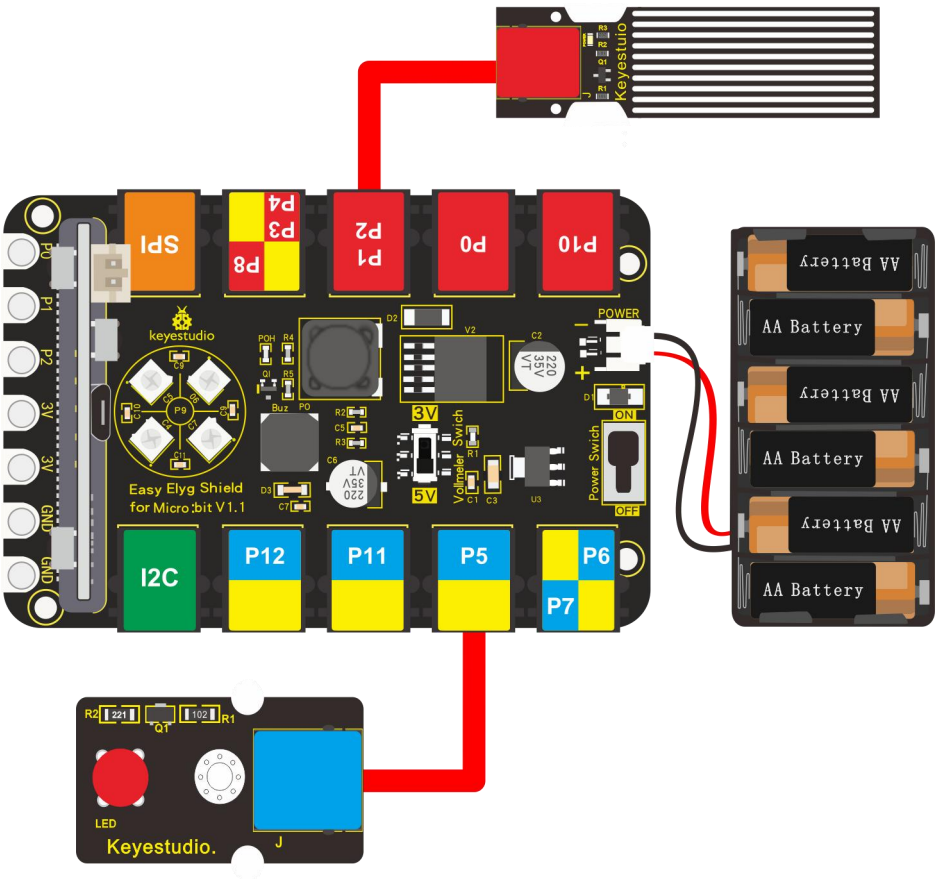
Sensor type: analog signal;

Working temperature: 10℃ -30℃;

Working humidity: 10%-90% non-condensing

4. Wiring Up:

Insert micro:bit onto EASY Plug shield, connect water level sensor and LED module to P1 and P5 port of shield with two RJ11 cables.



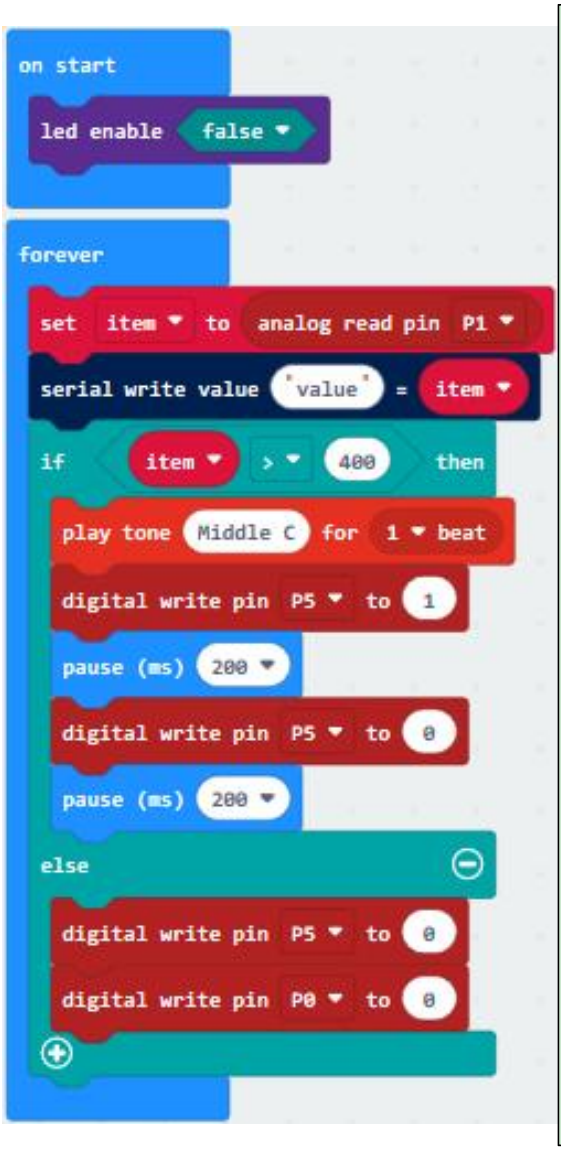
Note: Dial Voltmeter_Switch to 3V end.

5.Test Code:

You could navigate https://makecode.micro:bit.org/reference to have access to more details.

Browse link https://makecode.micro:bit.org/ to edit your program. The following test code is as for your reference.

(Note: the analog value can be adjusted)



"on start": command block only runs once to start program.
Turn off dot matrix on micro:bit
The program under the block "forever" runs cyclically.
Set the analog signals read by water level sensor to variable item
Serial writes value=analog signals read by water level sensor
If the analog signals read by P1>400, execute the program under then block
Play tone high C for 1 beat to make passive buzzer emit sound

Set P5 to high level (1) to make LED light on
Delay in 200ms
Set P5 to low level(0). LED turns off
Delay in 200ms

When the analog signals read by P1≤400, execute the program under else program

Set P5 to low level(0), turn off LED

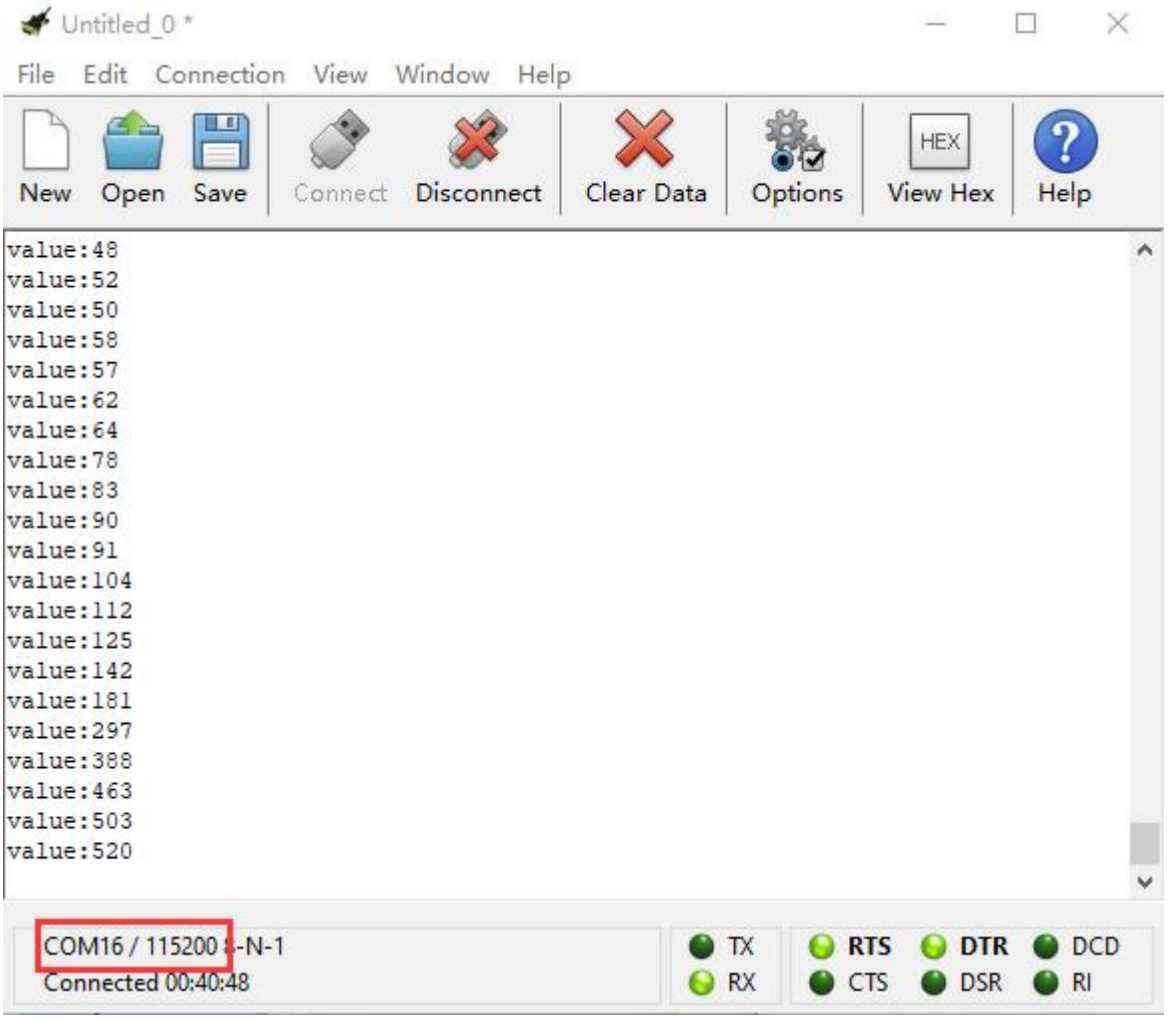
Set P0 to low level (0), turn off buzzer

6. Test Result:

Wiring up, dial Voltmeter_Switch to 3V end, plug in external power and dial Power_Switch to ON end and upload code to micro:bit.

Open CoolTerm, click Options and select SerialPort, set COM port and baud rate, set baud rate to 115200. Tap OK and Connect.

The deeper the water level sensor is immersed, the analog value gets larger and larger; on the contrary, the analog value will plummet. When the analog value is greater than 400, passive buzzer will sound and LED will flash; if not, LED will be off and buzzer won't emit sound.



Project 30: 1602 LCD Display

1.Description:

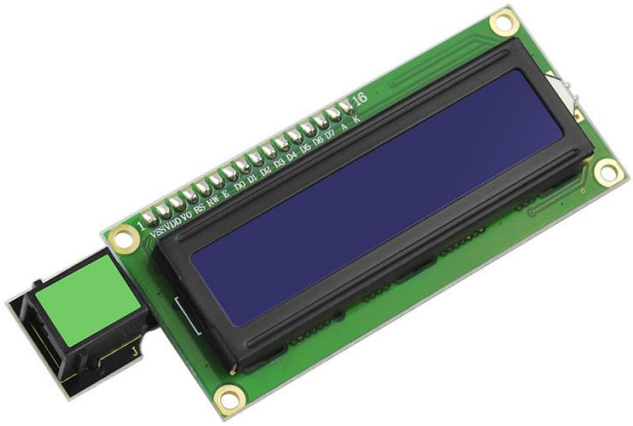
1602 I2C can be used as display, in this project, we will connect it to shield and teach you how to make it display “keyestudio” and numbers.

2. What You Need:

- Micro:bit*1
- EASY Plug Shield for micro bit V1.1*1
- Micro USB Cable*1
- EASY plug LCD 1602 I2C Module*1
- RJ11 Cable*1
- 6-Slot AA Battery Holder*1
- 1.5V AA Battery*6

5. EASY Plug LCD 1602 I2C Module:

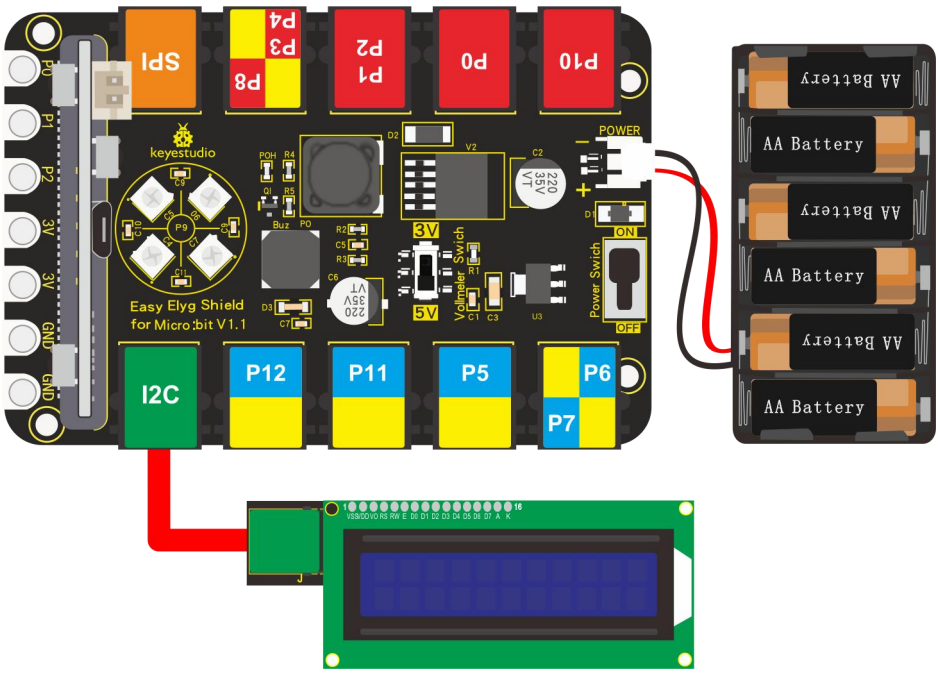
This module is a LCD 16x2 display, useful for creating standalone projects.



- 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

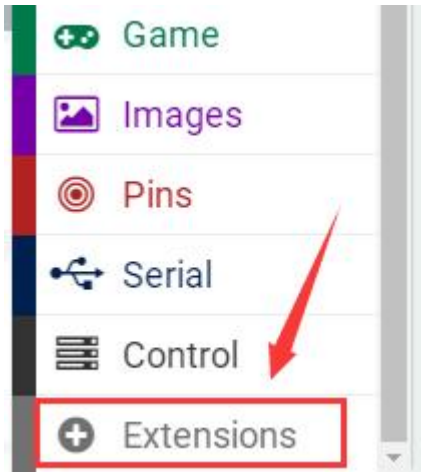
4. Wiring Up:

Insert micro:bit onto EASY Plug shield, connect LCD 1602 I2C to I2C port of shield with a RJ11 cable, and plug in power.



5. Test Code:

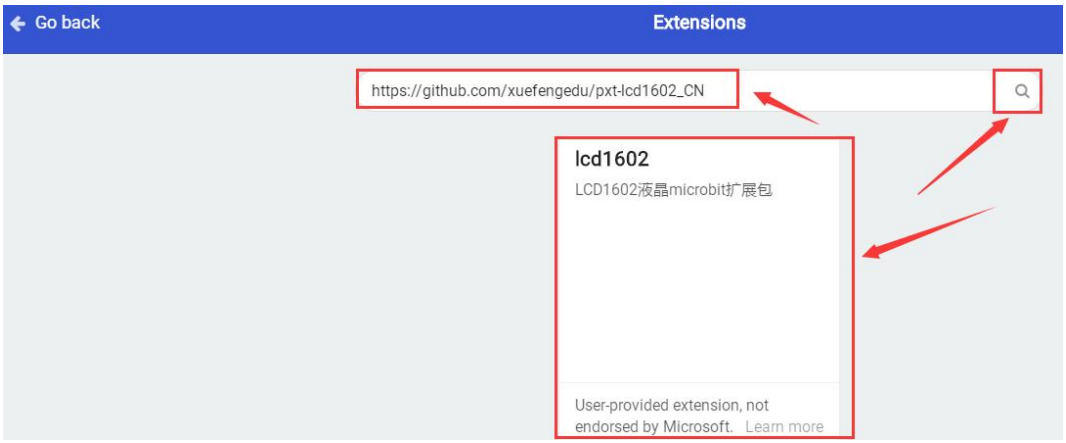
Enter link: https://makecode.micro:bit.org/ to edit program, and set test code with library, as shown below:



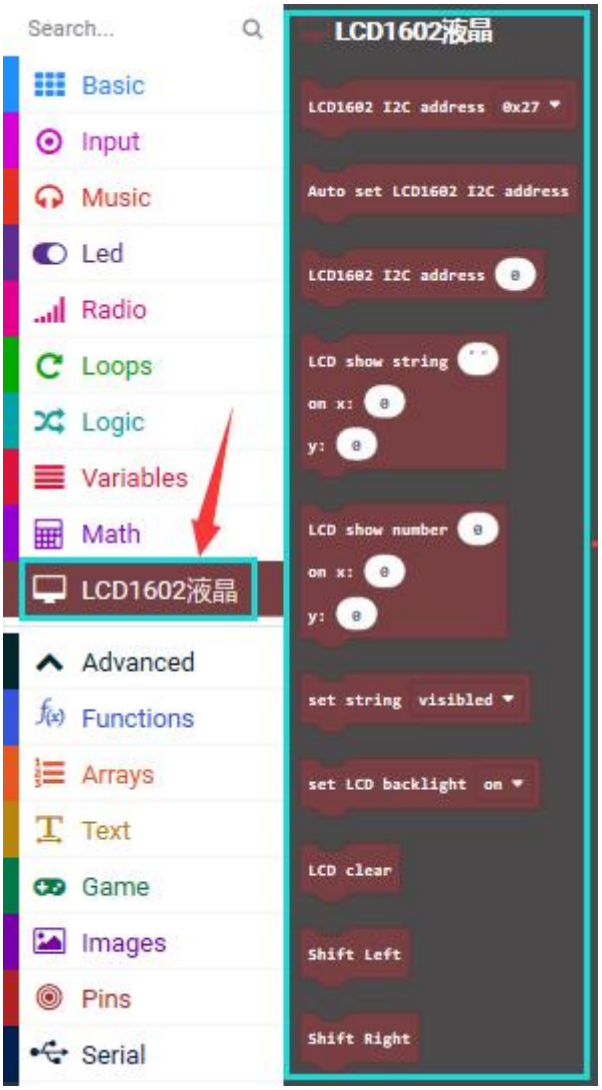
Download library:

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

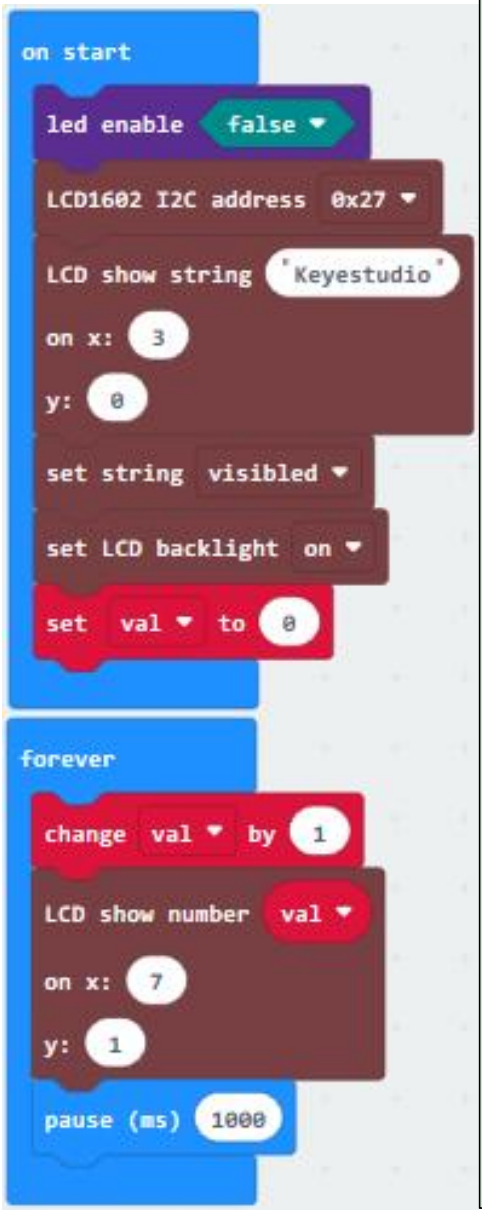
Copy this link in the search box to search:



Tap "lcd1602" to download, then LCD 1602 module will be added in the editing blocks, as shown below:



Test Code:



"on start" : command block only runs once to start program.

Turn off LED dot matrix

Set I2C address of LCD1602 to 0x27

Display Keyestudio at the first row and the fourth column on LCD module

Set backlight of LCD on

Set val to 0

The program under the block "forever" runs cyclically.

Change val by 1

Start displaying val at x:7 y:1

Delay in 1000ms

6.Test Result:

Wiring up, dial Voltmeter_Switch to 5V end, plug in external power and dial Power_Switch to ON end and upload code to micro:bit.

You will see "Keyestudio" at first row and numbers at the second row.

(Note: Press the reset button if there is random code on 1602 LCD module)

Project 31: Vapor in the Air

1.Description:

We could use vapor sensor to detect the vapor content in the air. The analog value will be displayed on 1602 LCD and CoolTerm serial monitor.

2.What You Need:

- Micro:bit Board*1
- EASY Plug Shield for micro bit V1.1*1
- Micro USB Cable*1
- EASY Plug Vapor Sensor*1
- EASY Plug LCD 1602 I2C Module*1
- RJ11 Cable*2
- 6-Slot AA Battery Holder*1
- 1.5V AA Battery*6

EASY Plug Vapor Sensor:

Vapor sensor is an analog sensor and can be made as a simple rainwater detector and liquid level switch. When humidity on the

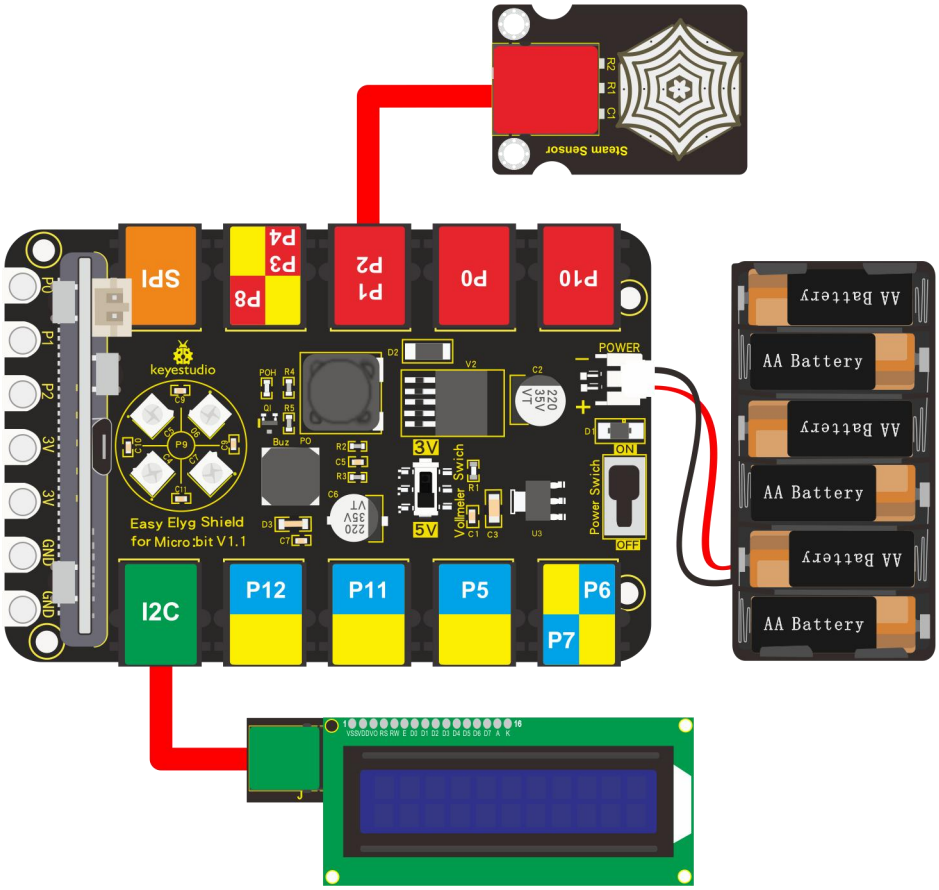
face of this sensor rises, the output voltage will increase.

6. Specification:

- Working Voltage: 3.3V-5V
- Working Current: <20mA
- Working Temperature: - 10℃ ~ + 70℃
- Interface Type: EASY plug

4.Wiring Up:

Insert micro:bit onto EASY Plug shield, connect vapor sensor and 1602LCD to P1 and I2C port of shield.



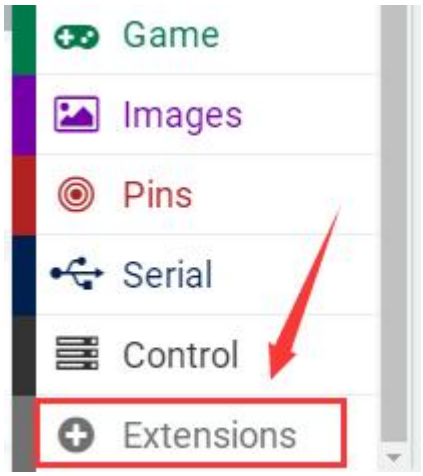
Note: Dial Voltmeter_Switch to 5V end.

5.Test Code:

You could navigate https://makecode.micro:bit.org/reference to have access to more details.

Browse link https://makecode.micro:bit.org/ to edit your program. The following test code is as for your reference.

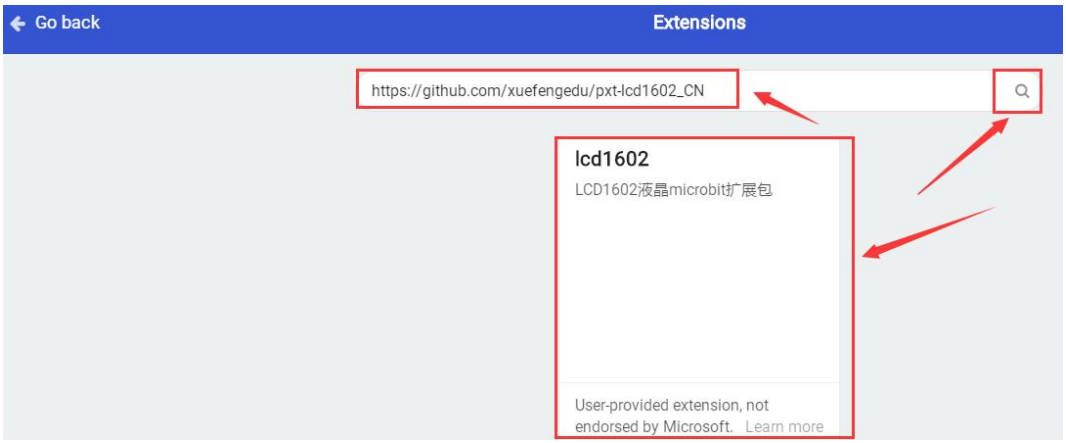
The below example code is as for your reference, you need to add the library of LCD 1602 module



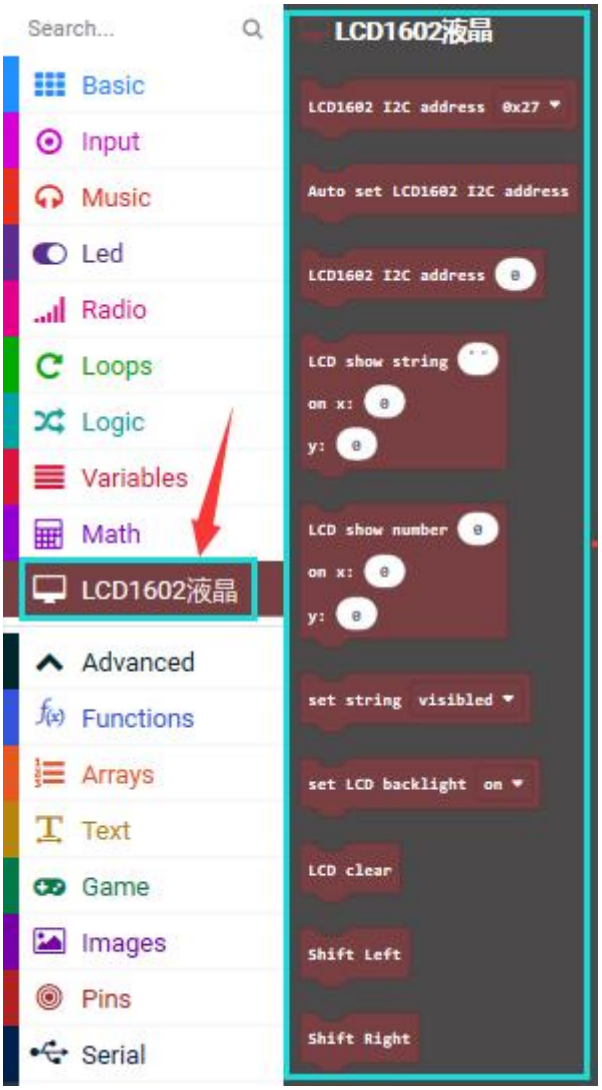
Download library:

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

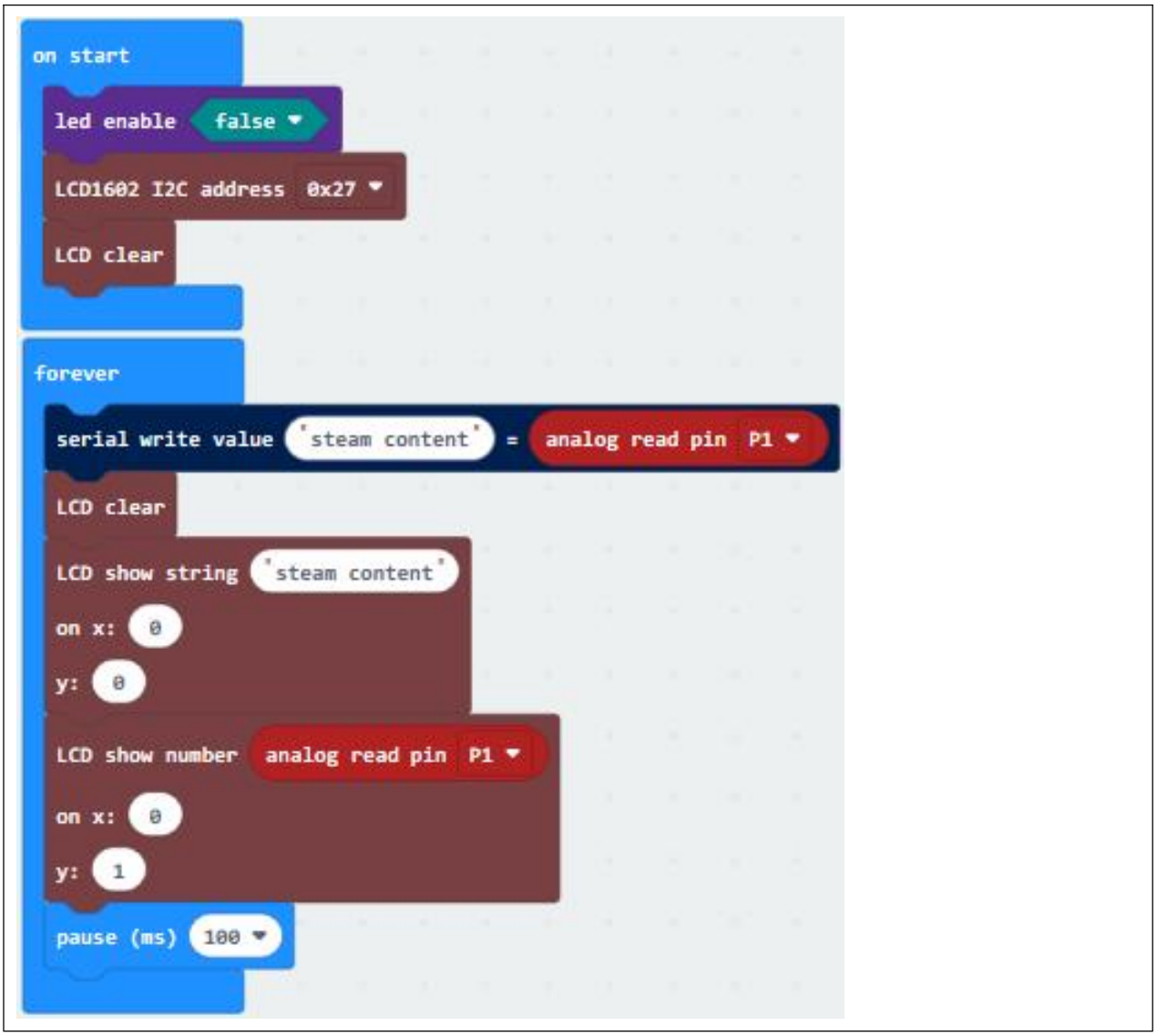
Copy this link in the search box to search.



Click "lcd1602" to download, then LCD 1602 module will be added in editing blocks



6. Test Code:


on start
led enable false
LCD1602 I2C address 0x27
LCD clear
forever
serial write value 'steam content' = analog read pin P1
LCD clear
LCD show string 'steam content'
on x: 0
y: 0
LCD show number analog read pin P1
on x: 0
y: 1
pause (ms) 100

"on start": command block only runs once to start program.

Turn off LED dot matrix

Set I2C address of LCD1602 to 0x27

Clear LCD screen

The program under the block "forever" runs cyclically.

Serial writes value=analog signals read by steam sensor

Clear LCD screen

Show the character string at the first row and the first column on LCE module

Steam content

Show the analog signals read by P1 at the second row and the first column on LCE module

Delay in 100ms

6.Test Result:

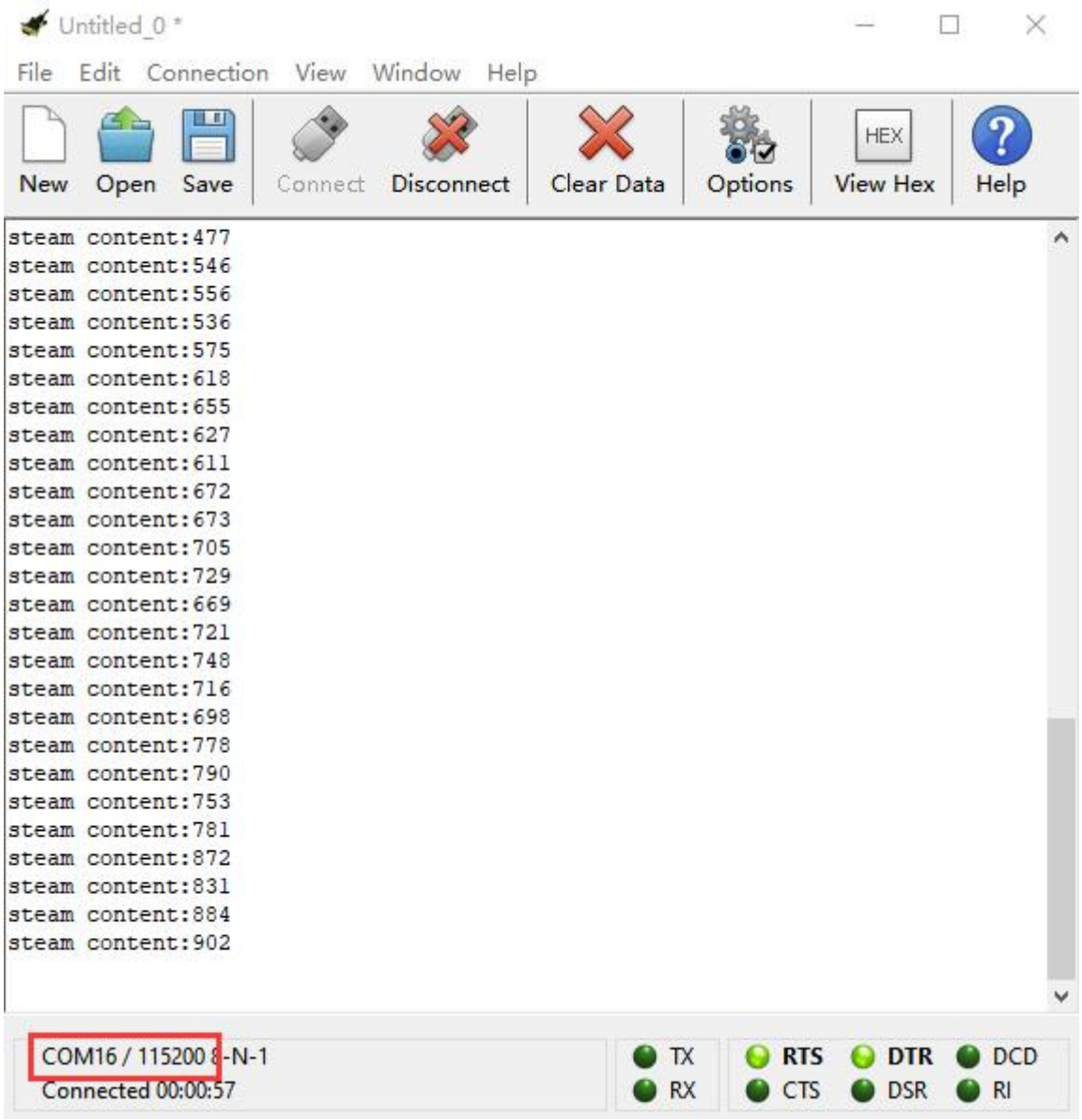
Wiring up, dial Voltmeter_Switch to 5V end, plug in external power and dial Power_Switch to ON end and upload code to micro:bit.

Open CoolTerm, click Options and select SerialPort, set COM port and baud rate, set baud rate to 115200. Tap OK and Connect.

CoolTerm monitor and 1602 LCD module display the analog signals read by steam sensor, the higher the vapor content is, the larger the analog value, as shown below:

（Note: Press the reset button if there is random code on 1602 LCD module)

CoolTerm monitor shows the analog signals read by vapor sensor, the higher the vapor content, the larger the analog value is, as shown below:



Project 32: Pressure Detection

1.Description:

We’ ve learned different sensors with specific characteristics, like sound sensor, gas sensor and so on. In this experiment, we will measure the pressure with thin-film pressure sensor and micro:bit.

2. What You Need:

- Micro:bit Board*1
- EASY Plug Shield for micro bit V1.1*1
- Micro USB Cable*1
- EASY Plug thin-film pressure sensor*1
- RJ11 Cable*1
- 6-Slot AA Battery Holder*1
- 1.5V AA Battery*6

EASY Plug Thin-film Pressure Sensor

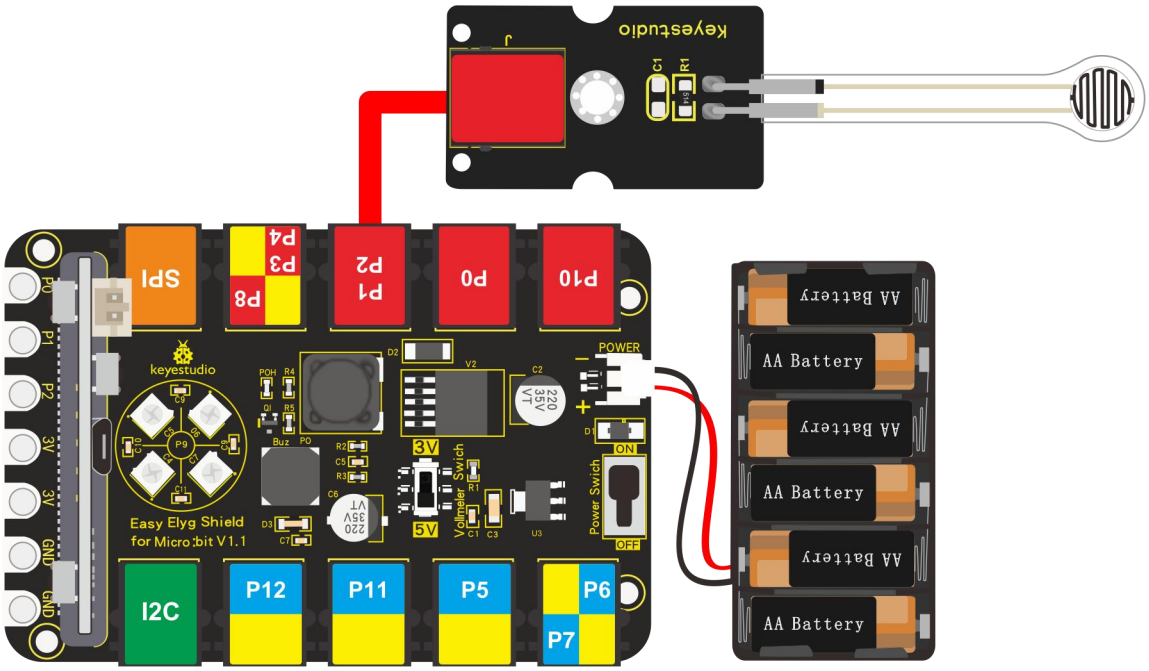
This EASY plug pressure sensor adopts the flexible Nano pressure-sensitive material with an ultra-thin film pad. It has the functions of water-proof and pressure detection. The force sensors are ultra-thin and flexible printed circuits, which can be easily integrated into force measurement applications.

Specification:

- 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℃

4.Wiring Up：

Insert micro:bit onto EASY Plug shield, connect thin-film pressure sensor to P1 port of shield.

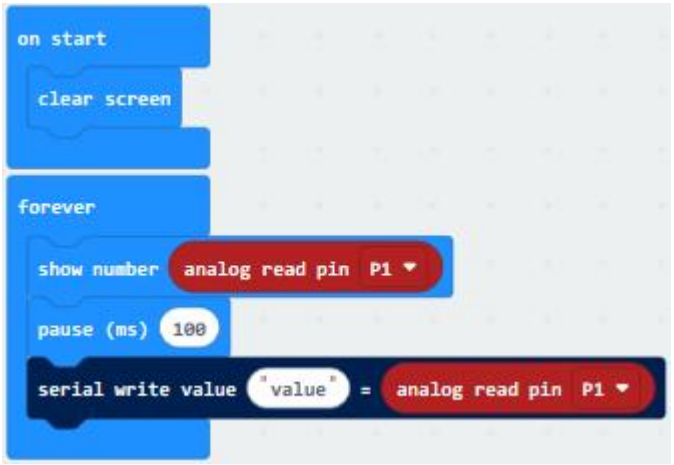


Note：Dial Voltmeter_Switch to 3 V end.

5.Test Code:

You could navigate https://makecode.micro:bit.org/reference to have access to more details.

Browse link https://makecode.micro:bit.org/ to edit your program. The following test code is as for your reference.



"on start": command block only runs once to start program.

Turn off LED dot matrix

The program under the block "forever" runs cyclically.

Micro:bit shows the analog signals read by by thin-film pressure sensor

Delay in 100ms

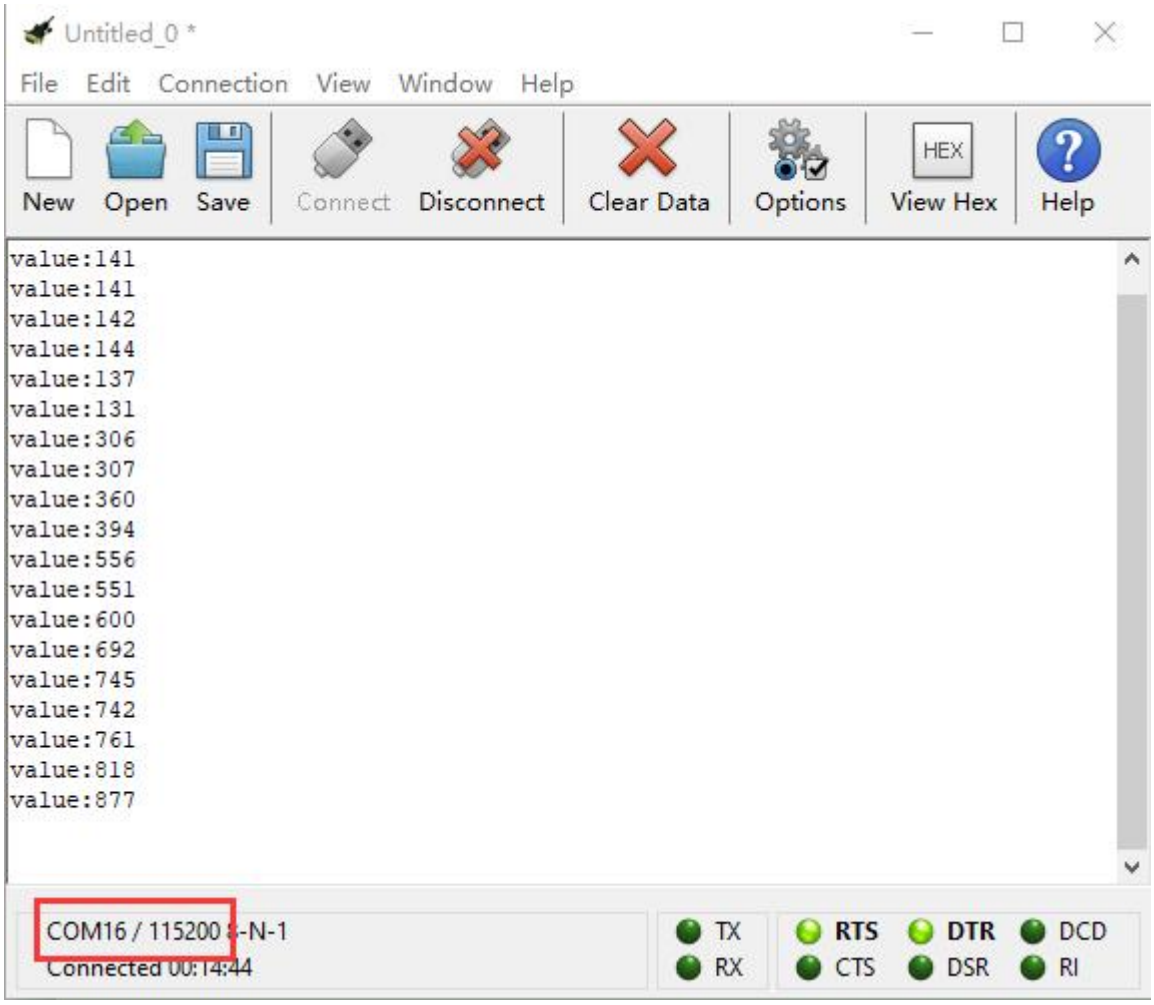
Serial writes value=analog signals read by thin-film pressure sensor

6.Test Result:

Wiring up, dial Voltmeter_Switch to 3V end, plug in external power and dial Power_Switch to ON end and upload code to micro:bit.

Open CoolTerm, click Options and select SerialPort, set COM port and baud rate, set baud rate to 115200. Tap OK and Connect.

Read the analog value of P1 end when the thin film is not pressed; when pressed, the bigger the pressure on thin film is, the larger the analog value is, as shown below:


Untitled_0 *
File Edit Connection View Window Help
New Open Save Connect Disconnect Clear Data Options HEX View Hex Help
value:141
value:141
value:142
value:144
value:137
value:131
value:306
value:307
value:360
value:394
value:556
value:551
value:600
value:692
value:745
value:742
value:761
value:818
value:877
COM16 / 115200 8-N-1
Connected 00:14:44
TX
RX
RTS
CTS
DTR
DSR
DCD
RI

Project 33: Make a thermo-hygrometer

1.Description:

This DHT11 Temperature and Humidity Sensor is a composite sensor which contains a calibrated digital signal output of the temperature and humidity.

Its technology ensures high reliability and excellent long-term stability.

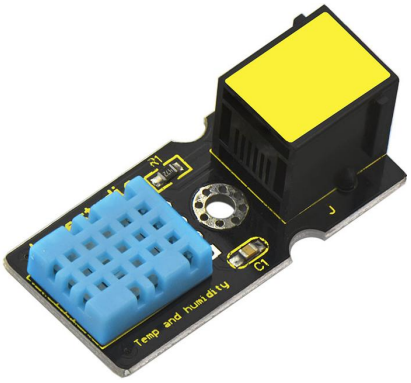
In this experiment, we connect DHT11 temperature and humidity sensor to P1 of micro:bit. We could calculate the current temperature and humidity value with specific formula to read the data.

And CoolTerm and 1602 LCD module will display temperature and humidity value too.

2. What You Need:

- Micro:bit Board*1EASY Plug Shield for micro bit V1.1*1
- Micro USB Cable*1
- EASY plug DHT11 Temperature and Humidity Sensor*1
- EASY plug 1602 LCD Module*1
- RJ11 Cable*2
- 6-Slot AA Battery Holder*1
- 1.5V AA Battery*6

EASY Plug DHT11 Temperature and Humidity Sensor:



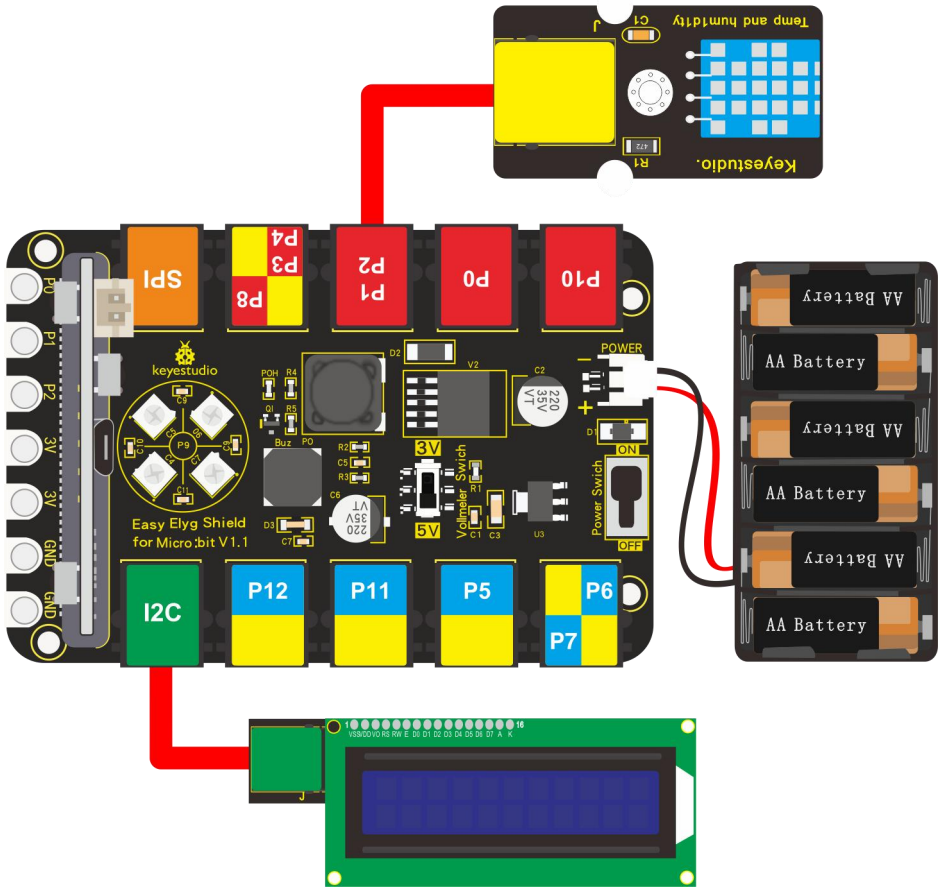
DHT11 temperature and humidity sensor, super low cost, adopts a capacitive humidity sensor and a thermistor to measure data and output a pre-calibrated digital signal.It has characteristics with high response, anti-interference ability, reliability and long-term stability.

7. Specification:

- Power supply voltage: DC5V;
- Relative humidity and temperature measurement;
- Suitable for humidity reading 20%-90%, accuracy: 5%;
- Suitable for temperature readings of 0-50℃, accuracy: ±2℃
- Interface: EASY plug
- Low cost

4.Wiring Up:

Insert micro:bit onto EASY Plug shield, connect DHT11temperature and humidity sensor and 1602 I2C to P1 and I2C port of shield.



Dial Voltmeter_Switch to 5V end.

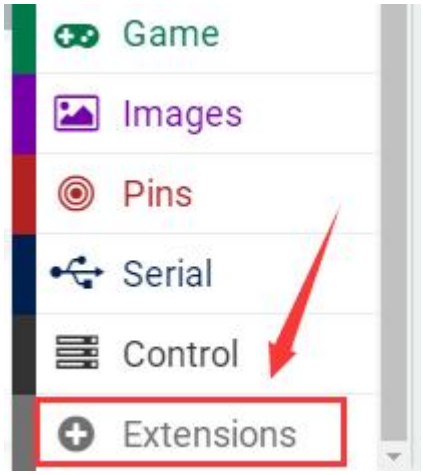
5.Test Code:

You could navigate https://makecode.micro:bit.org/reference to have access to more details.

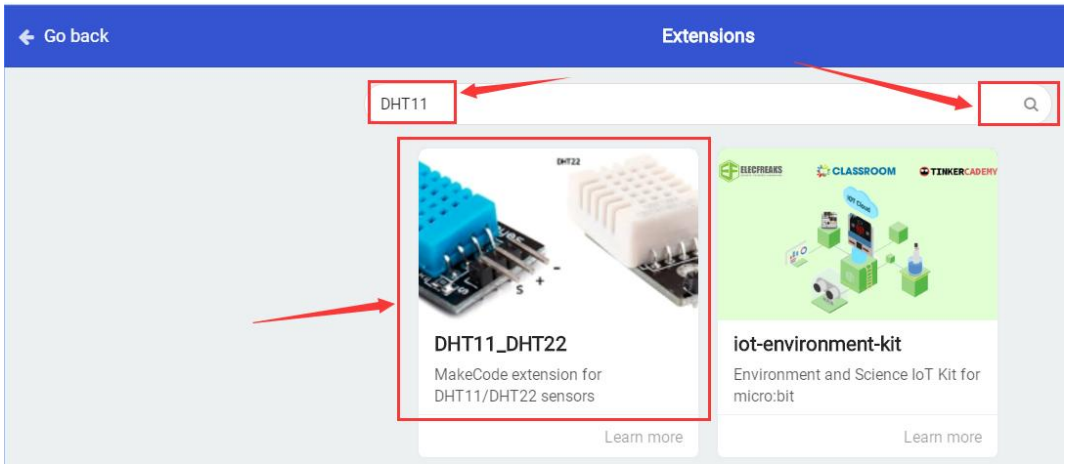
Browse link https://makecode.micro:bit.org/ to edit your program. The

following test code is as for your reference.

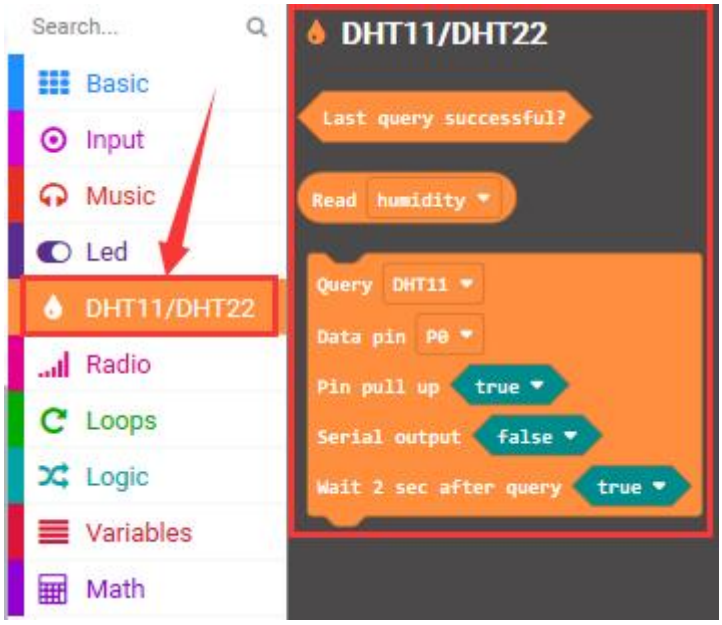
We need to add the library of DHT11 temperature and humidity sensor.



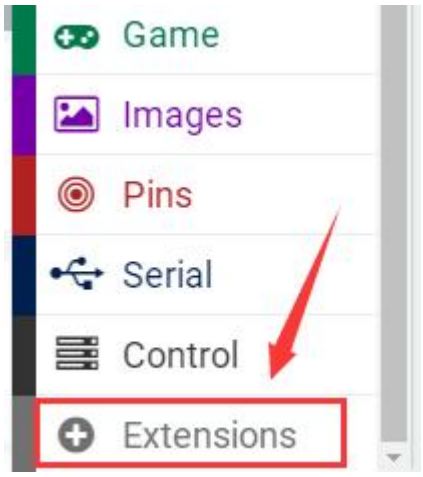
Search “DHT11”, as shown below, select and click “DHT11_DHT22” to install library



After the successful installation, the DHT11 module will be added into the editing module, as shown below:



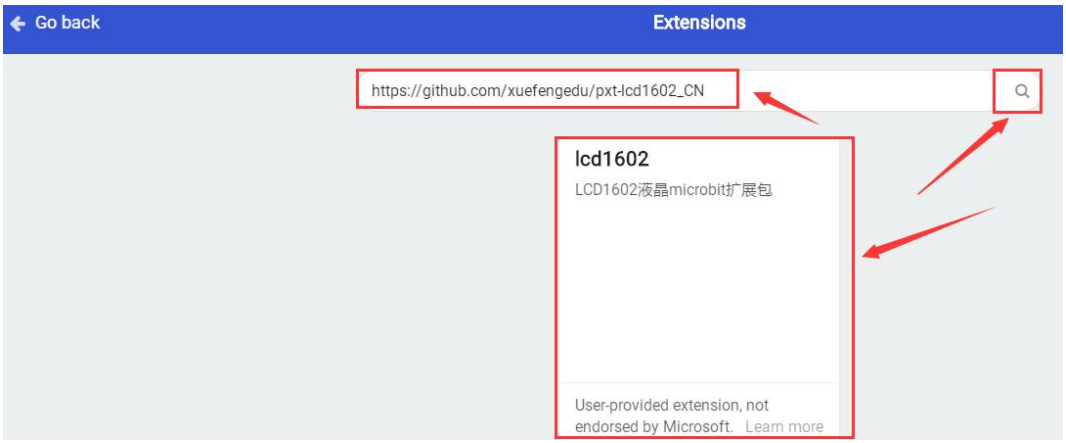
Then we add the library of 1602 I2C LCD module in same way.



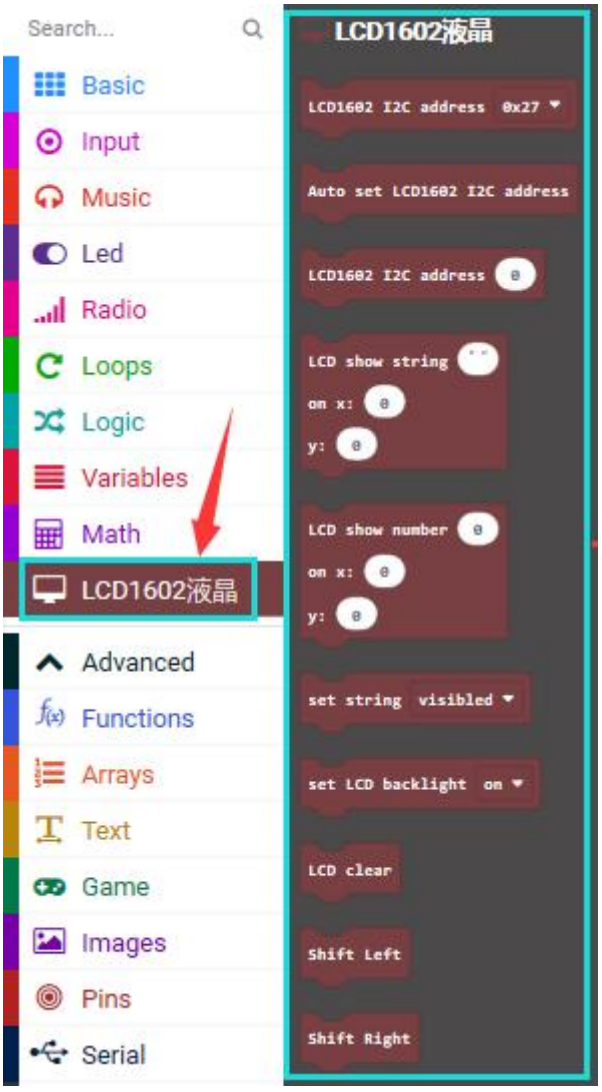
Download library:

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

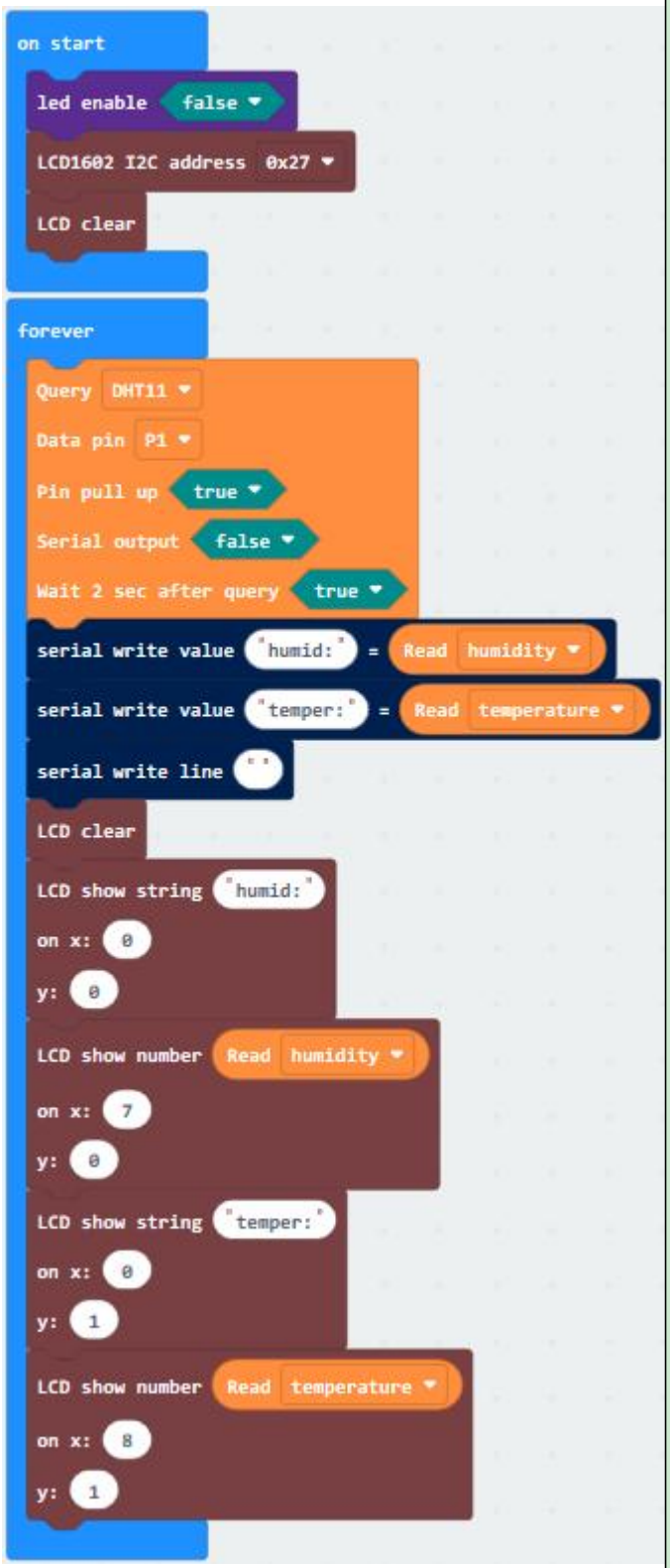
Copy this link in the search box to search, as shown below:



Click "lcd1602" to download, LCD 1602 module will be added.



Test Code:



"on start": command block only runs once to start program.

urn off LED dot matrix

Set I2C address of LCD1602 to 0x27

Clear LCD screen

The program under the block "forever" runs cyclically.

Search data from P1 of DHT11 sensor

Serial writes "humid:" =the humidity read by P0

Serial writes "temperature:" =the temperature read by P0

Clear LCD screen

Show character string at the first row and column

Display the humidity read by P1 at the first row and the eighth column

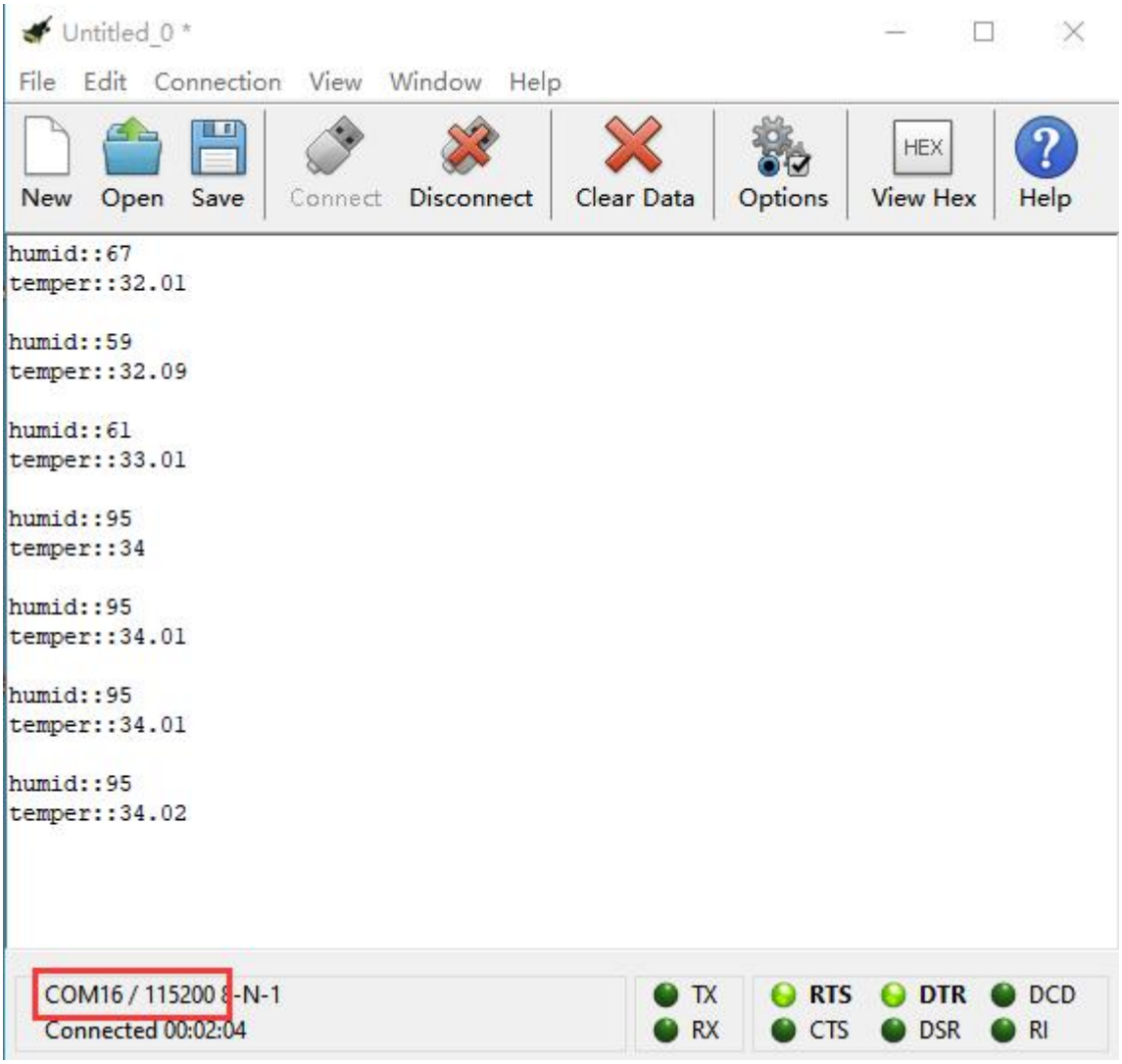
Display temper at the second row and the first column

Show the temperature read by P1 at the second row and the ninth column

6.Test Result:

Wiring up, dial Voltmeter_Switch to 5V end, plug in external power and dial Power_Switch to ON end and upload code to micro:bit.
Open CoolTerm, click Options and select SerialPort, set COM port and baud rate, set baud rate to 115200. Tap OK and Connect.

CoolTerm serial monitor and 1602 LCD module show the detected temperature and humidity, as shown below:
(Note: You could press reset button if there is random code on 1602 LCD module)



8. Resource

https://fs.keyestudio.com/KS4020-4021