SIYEENOVE

mShield expansion board for Microbit

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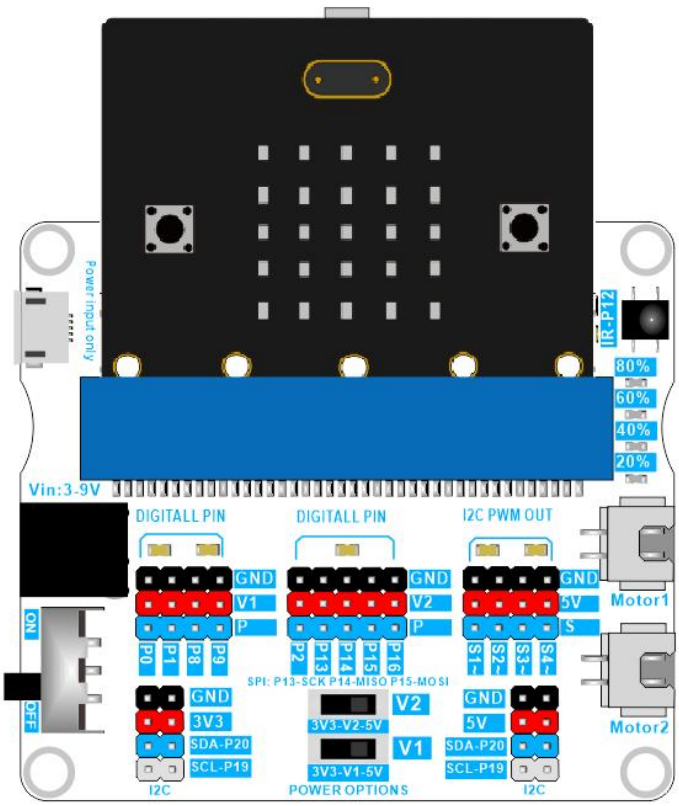
1. Overview

The mShield expansion board is an easy to use micro:bit shield, integrating powerful features such as dual motor drivers, infrared reception, battery level reading, four servo drivers, four PWM signal outputs, LED indicators, and optional 3V or 5V power output.

The board extends the commonly used pins of the micro:bit in the form of pin headers, allowing for the connection of additional sensors. It supports two types of multi-cell batteries and includes a micro USB port for external power banks, enhancing power adaptability and safety. To facilitate installation on other devices, the expansion board is equipped with four 4MM mounting holes, which are also compatible with universal building blocks, making it highly convenient for use in building block projects.

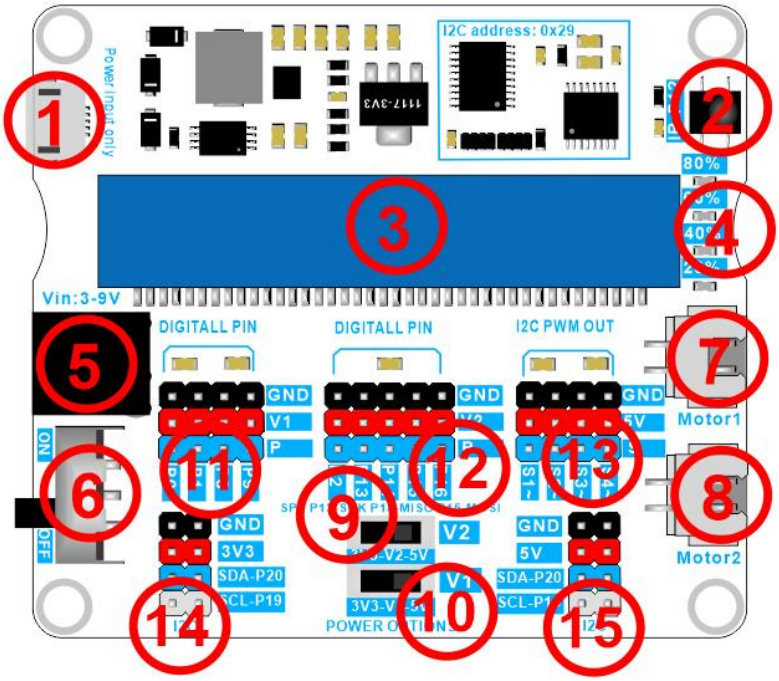


V2.0

2. Specification parameter

Shield	
Name	mShield expansion board for Microbit
SKU	M1E0002
USB connector	**Applicable motherboard**
Micro USB	Micro:bit
Pins	
Digital I/O Pins	9 (P0, P1, P2, P8, P9, P13, P14, P15, P16)
Analog read pins	3 (P0, P1, P2)
Analog write pins	9 (P0, P1, P2, P8, P9, P13, P14, P15, P16)
PWM pins	4 (S1~, S2~, S3~, S4~), period: 2ms.
Servo pins	4 (S1~, S2~, S3~, S4~)
Communication	
UART	Yes
I2C	Yes
SPI	Yes
IR receiver	Yes (NEC)
Power	
Input voltage (nominal)	3--9V
DC Current for 3.3V Pin	500 mA
DC Current for 5V Pin	2000 mA
Motors	
Connectors	Motor1, Motor2 (XH2.54 2P)
Output voltage	3--9V
Maximum drive current	1.2A
Recommended driving	1A
LEDs	
Number	4 (20%, 40%, 60%, 80%)
Dimensions	
Width	62 mm
Length	73 mm
Height	14mm
Weight	29.16 g

3. Interface specification



Number	Description
1	Micro USB port, only used for external power supply(5V)
2	Infrared receiver, using P12 pin
3	Micro:bit slot
4	LED Indicator, controlled by an internal I2C chip.
5	Power socket(DC005), accepts input voltage of 3-9V, can be connected to 3, 4, 5, or 6 AA batteries, or 1 or 2 lithium batteries, with reverse connection
6	Power socket switch
7、8	Motor interface, can connect to 3-9V DC motors, the motor voltage equals the power socket voltage. Controlled by an internal I2C chip
9、10	V1 and V2 pin header output voltage selection switch
11、12	Microbit IO expansion port
13	mShield internal expansion por, controlled by an internal I2C chip.
14	3.3V power I2C interface，P19(SCL), P20(SDA)。
15	5V power I2C interface, P19(SCL), P20(SDA)。

4. Getting Started with MakeCode

Microsoft's MakeCode editor is the perfect way to start coding with the BBC micro:bit. MakeCode is free and works across all platforms and browsers.

We recommend using Chrome or Edge browsers. WebUSB is a recent and developing web feature that allows you to access a micro:bit directly from a web page. It also lets you directly receive data into the MakeCode editor from the micro:bit. It works in Google Chrome and Microsoft Edge browsers.

WebUSB support for your micro:bit

If you're not using a current version of the Chrome or Microsoft Edge browsers, make sure they are this version or newer:

Google Chrome (version 79 and newer) browser for Android, Chrome OS, Linux, macOS and Windows 10.

Microsoft Edge (version 79 and newer) browser for Android, Chrome OS, Linux, macOS and Windows 10.

Link to download the latest Google Chrome:

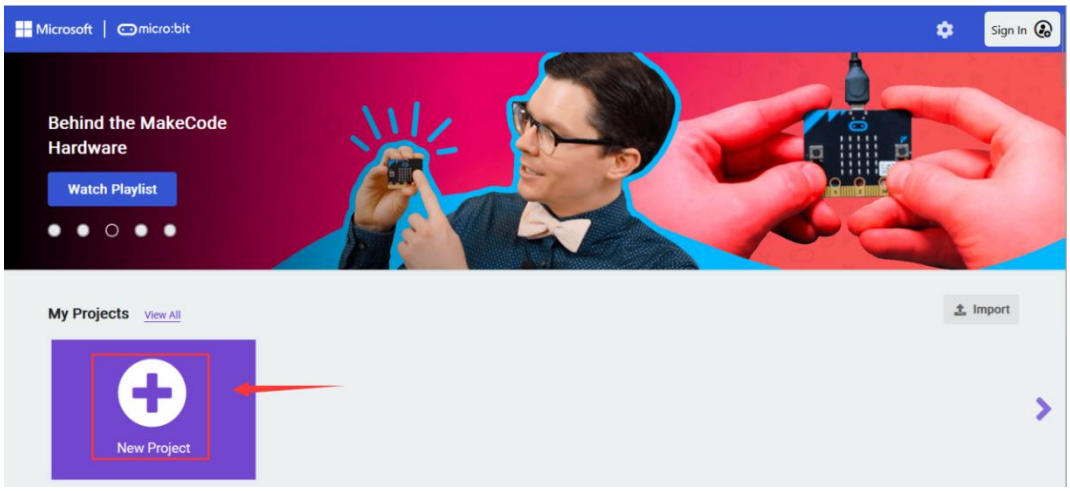
https://www.google.com/chrome/

Link to download the latest Microsoft Edge:

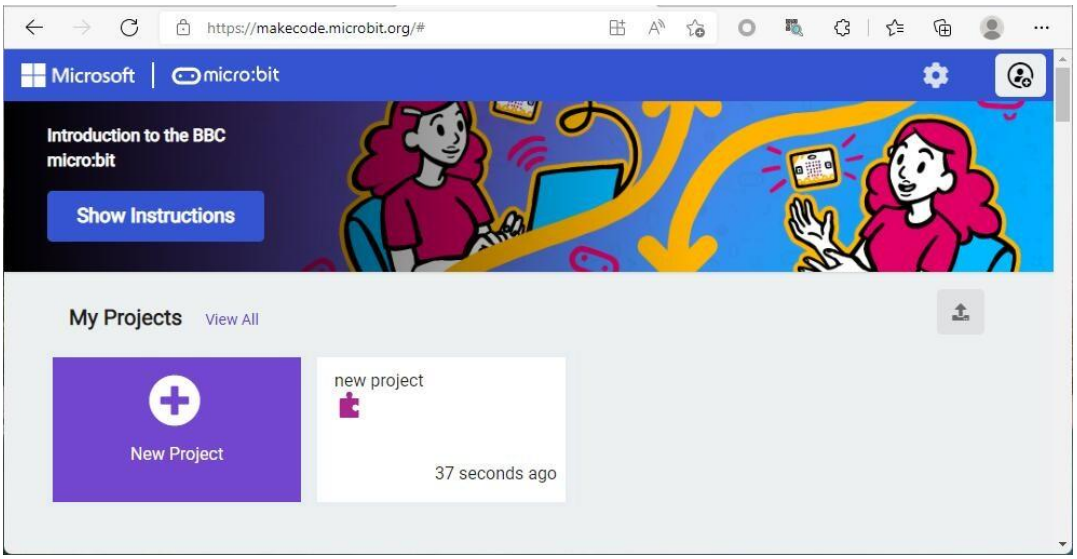
https://www.microsoft.com/en-us/edge/download

4.1 Create a new project

Open the Makecode editor on your browser: https://makecode.microbit.org，click"**New Project**", Then you can **give a name** for your project.

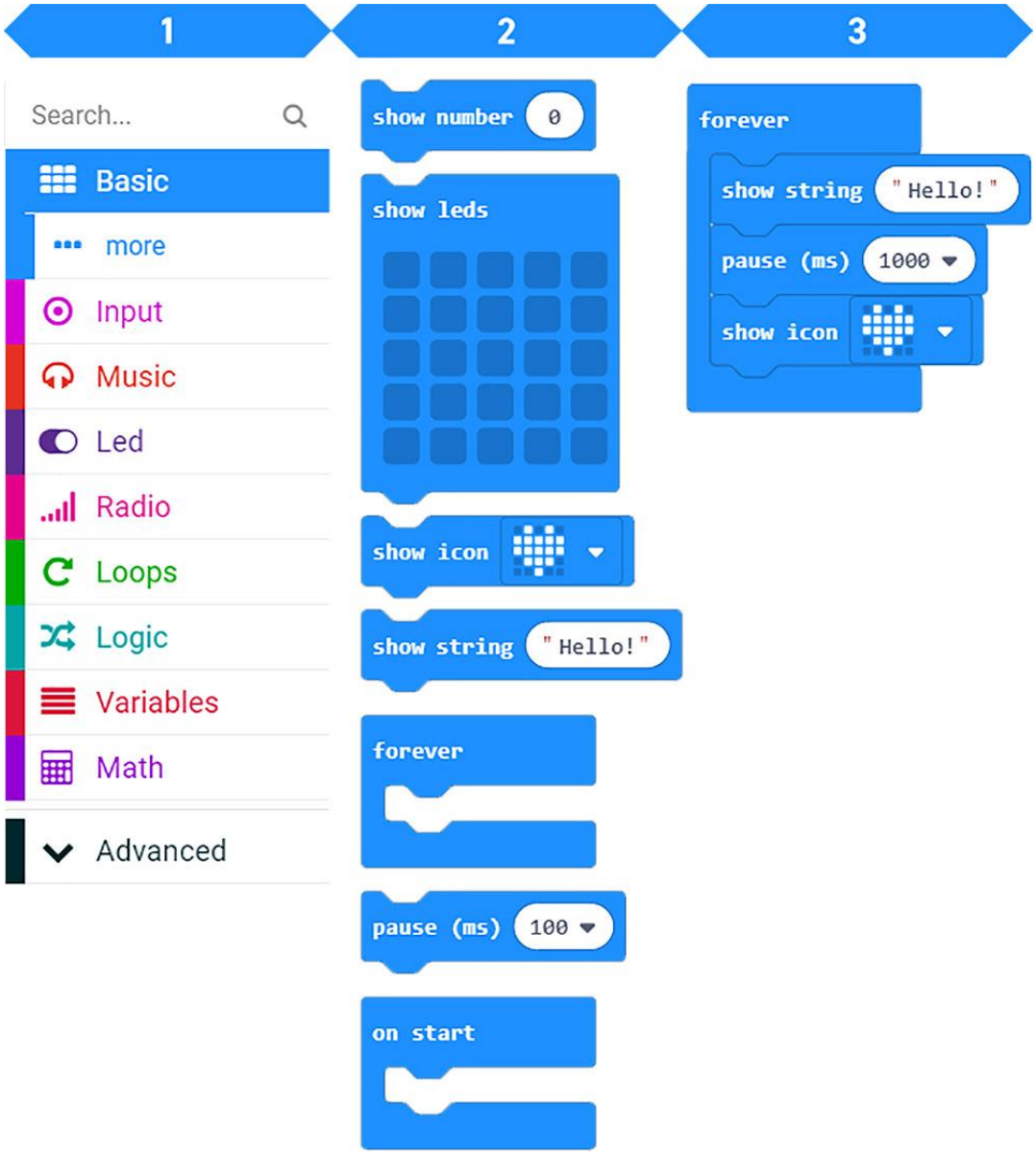


The newly created projects will be saved in the current browser. Just revisit the https://makecode.microbit.org website and find them in the project list.



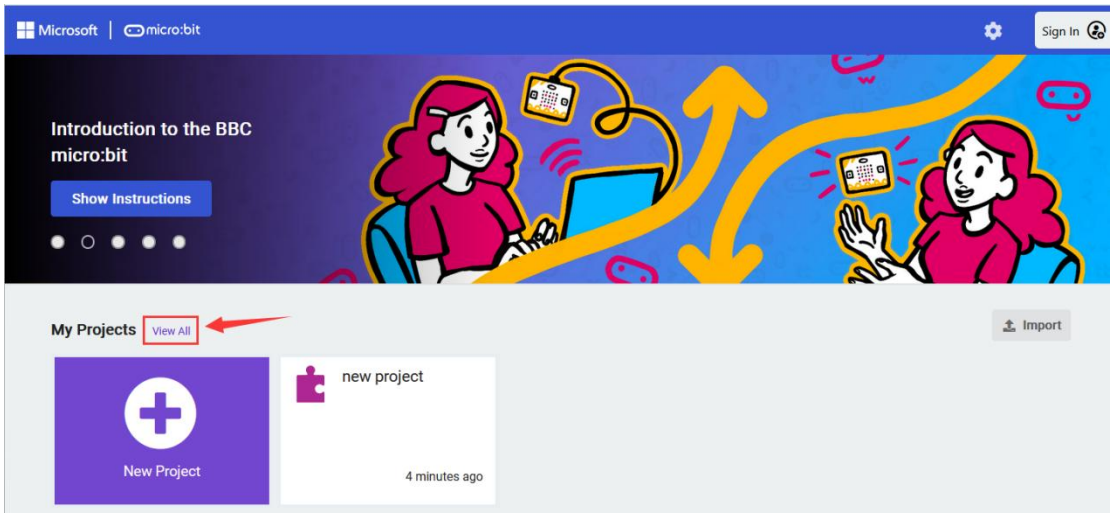
Selecting Blocks:

1. Select a block category from the list on the left-hand side of the page.
2. Select a block from the selected category, then drag it to the workspace area on the right.
3. Snap new blocks onto existing blocks in the workspace area. As the new blocks are dragged into the workspace, the editor highlights the connecting parts of each block when they are in a valid position to snap to existing blocks. Also, the shape of the blocks gives you an indication of where they might fit into your code blocks.

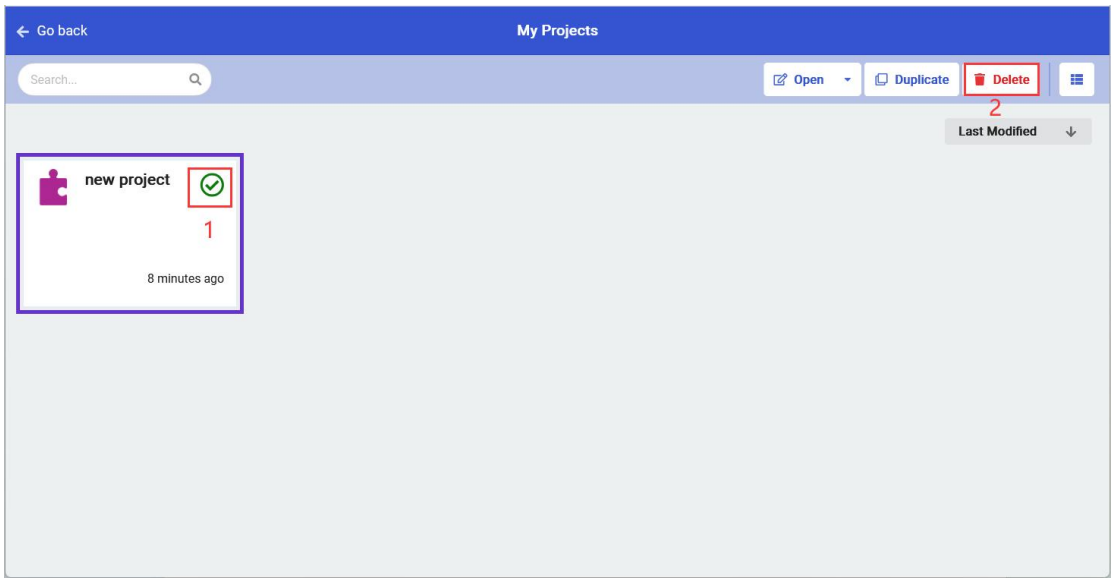


4.1 Delete a Project

Click"**View All**":

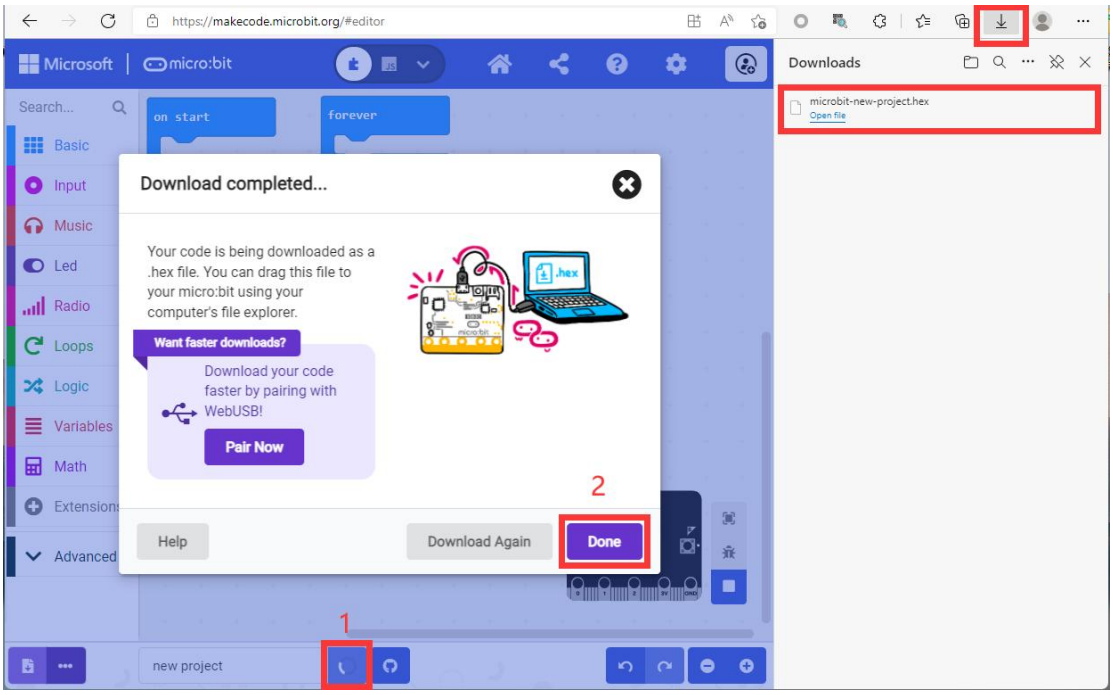


Select the project you want to delete, and click **Delete** button.



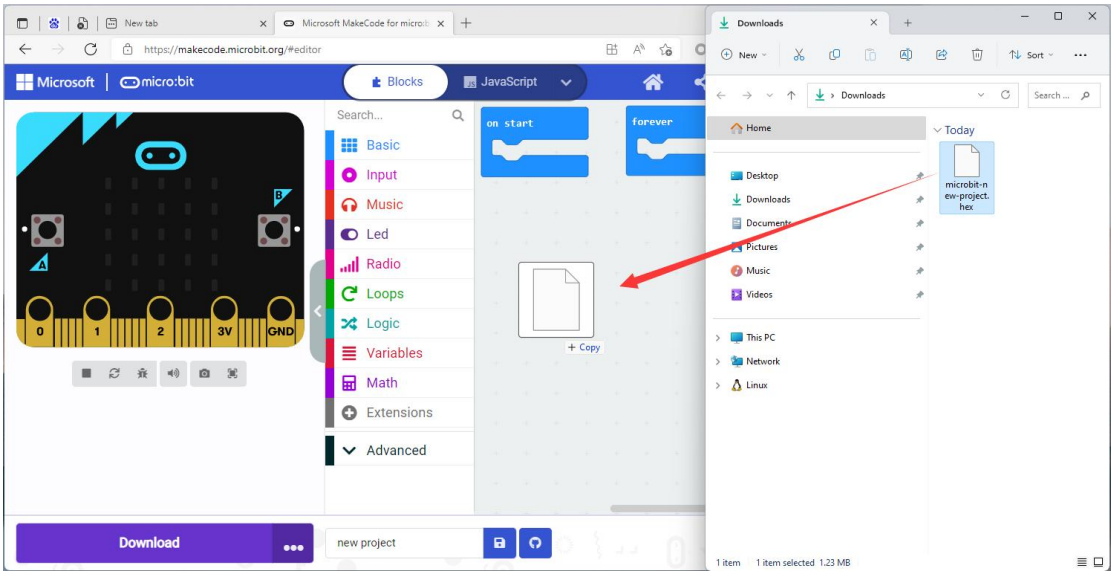
4.3 Save a project

Click the "**Save**" button, and then click the "**Done**" button to save the project to your computer, as shown below:



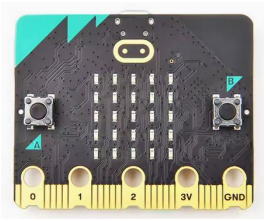
4.4 Import Files

Simply drag the local "HEX" project file to the work area of the MakeCode editor, as shown below:

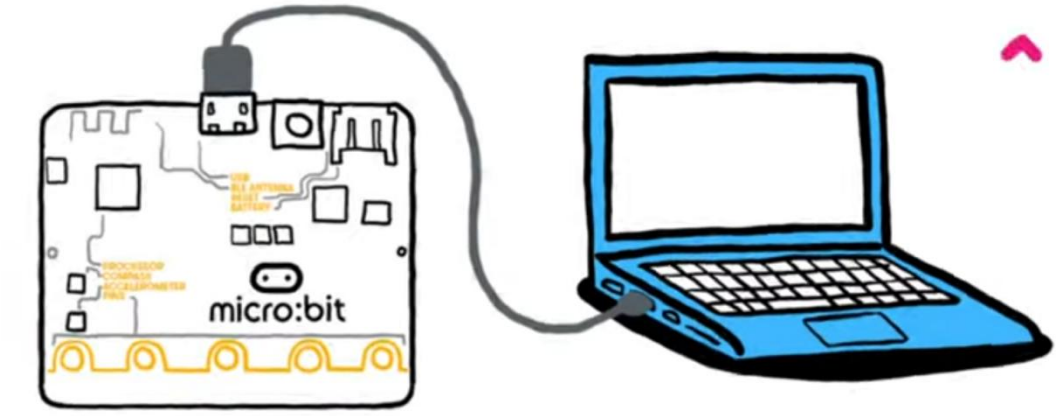


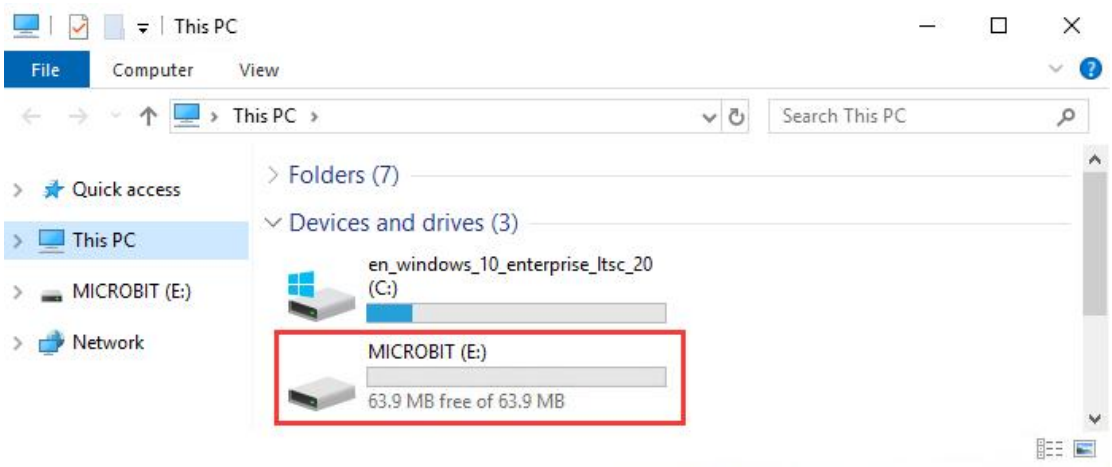
4.5 Upload code

Things you need：

PC	Micro:bit v2.x.x	Micro USB Cable
		

Use a Micro USB cable to connect the micro:bit board to the PC. You will find a new USB disk called MICROBIT on the PC:

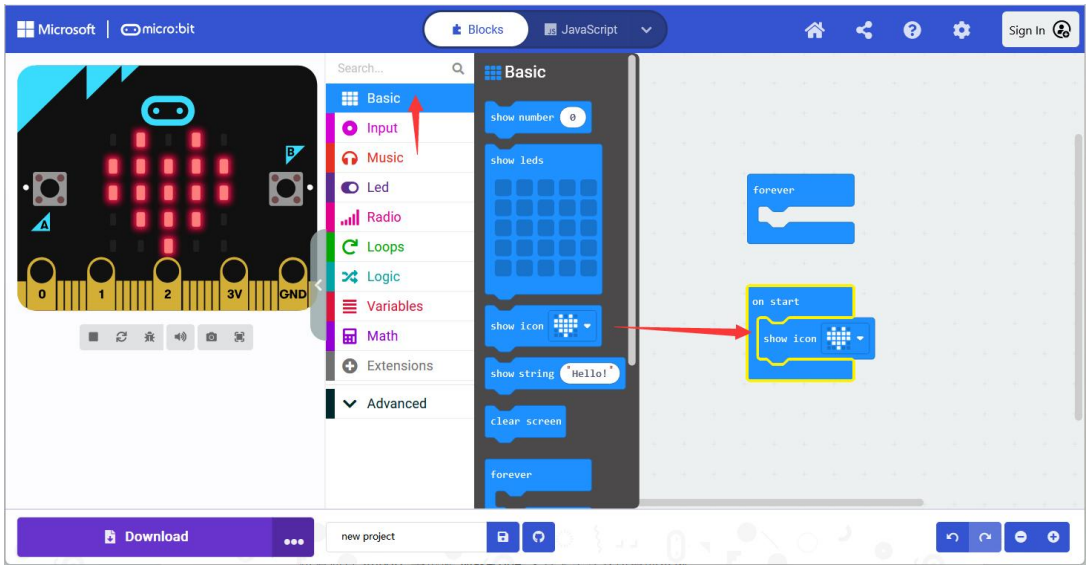




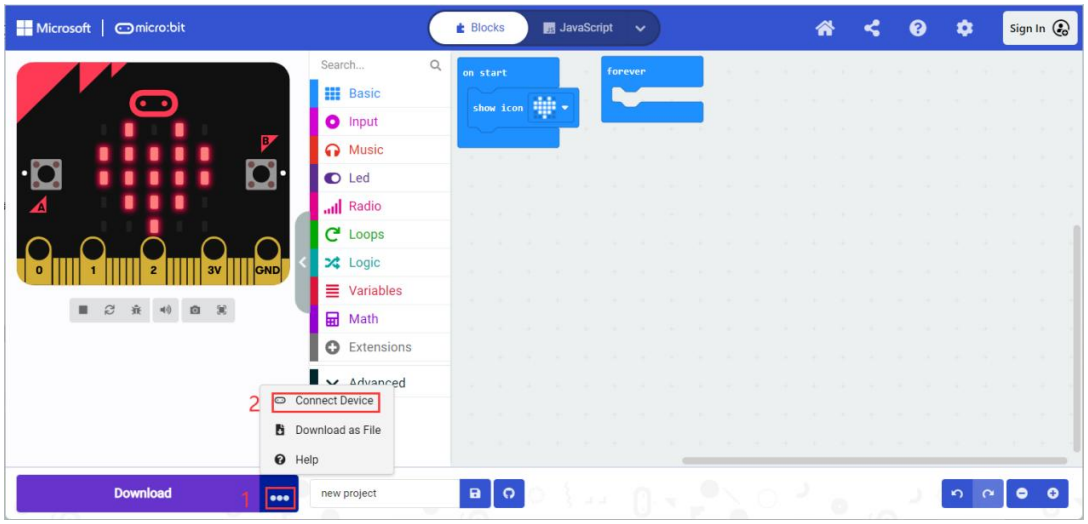
Open the MakeCode editor on your browser, hold down the left mouse button,

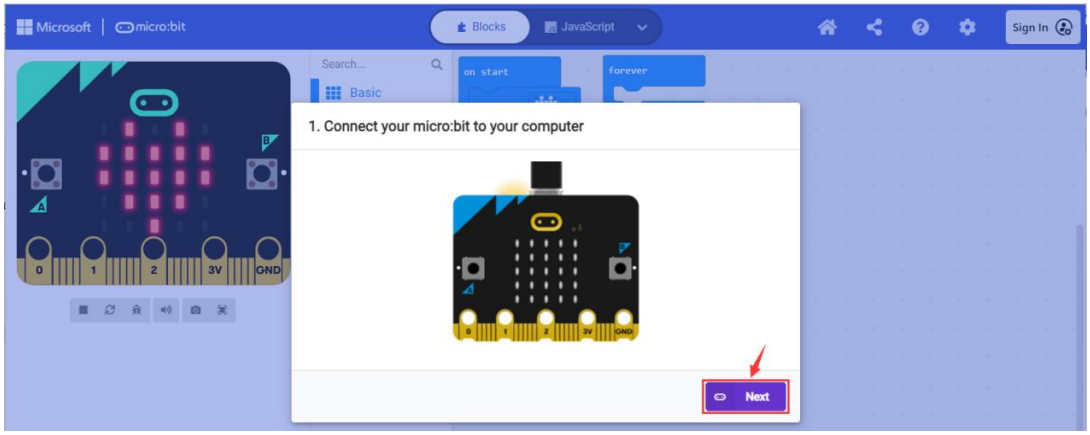
and drag the **show icon** statement on the left to the working area on the right:

https://makecode.microbit.org/#editor

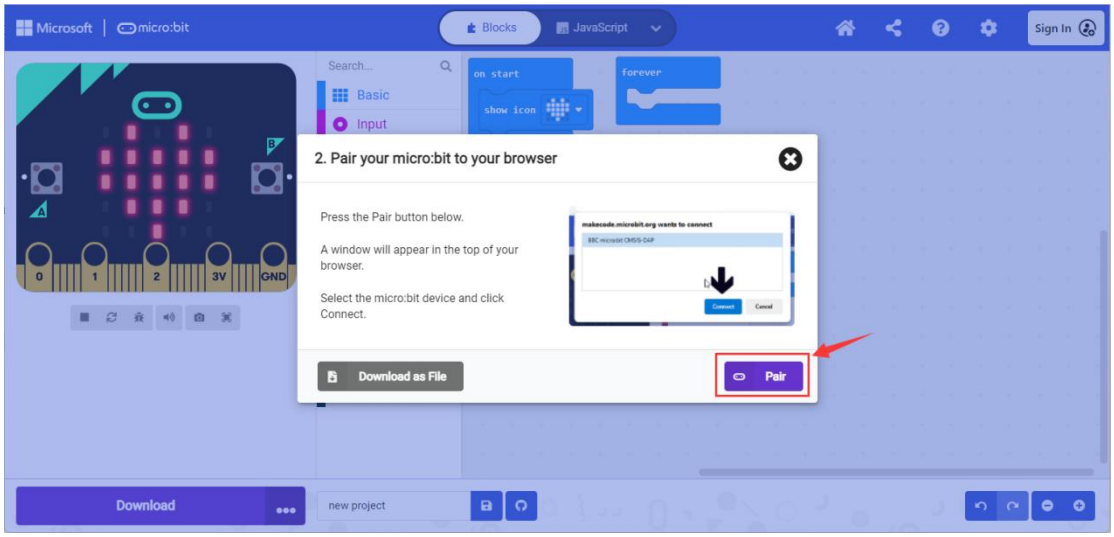


Click on the **three dots** next to the Download button. Then click the "**Connect Device**", and then click the "**Next**" , as shown below:

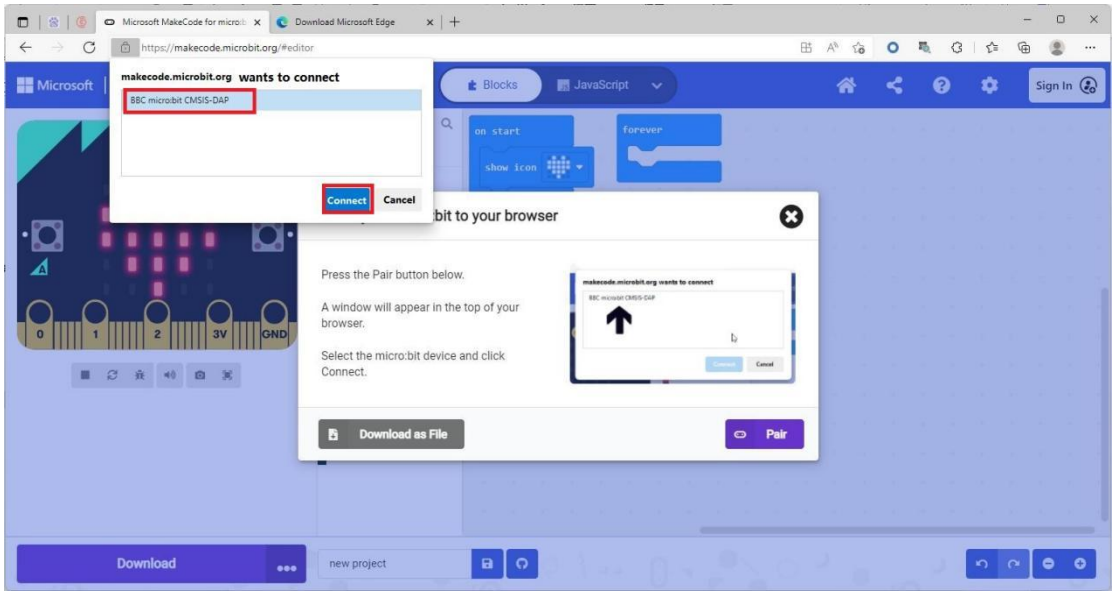




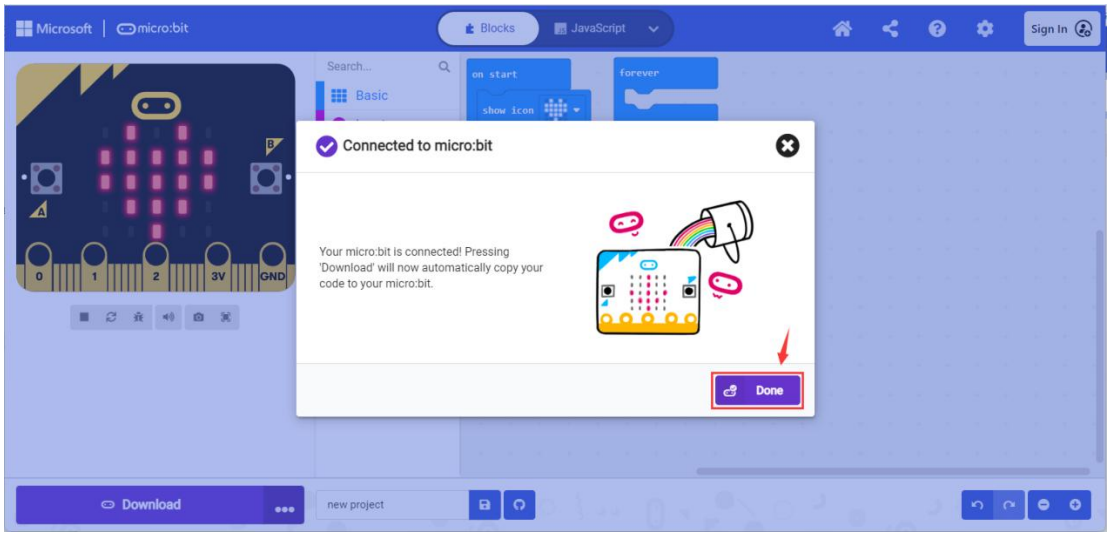
Click the "**Pair**" button:



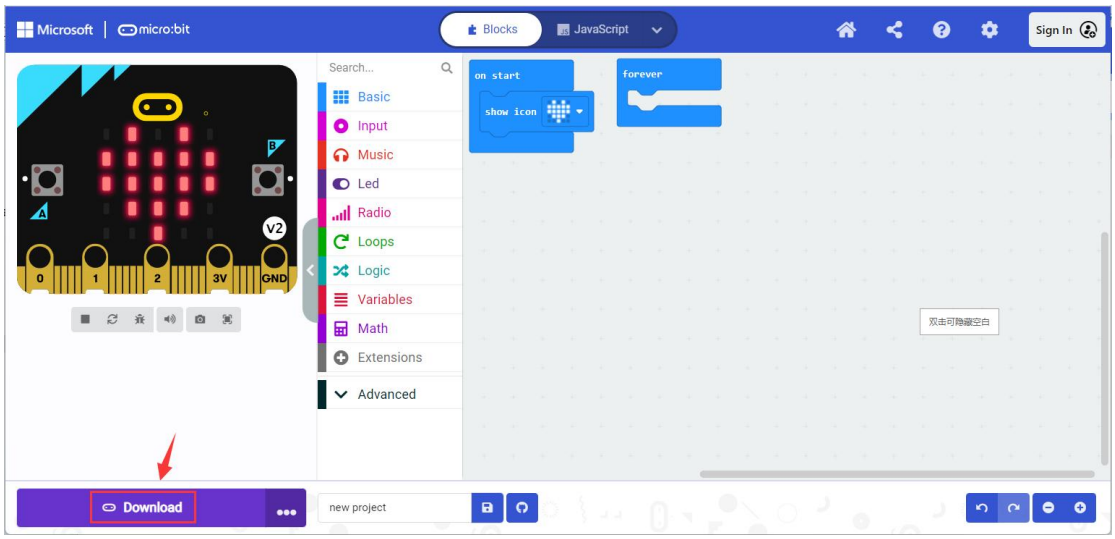
Select the Micro:bit board you want to connect to, and then click "**Connect**":

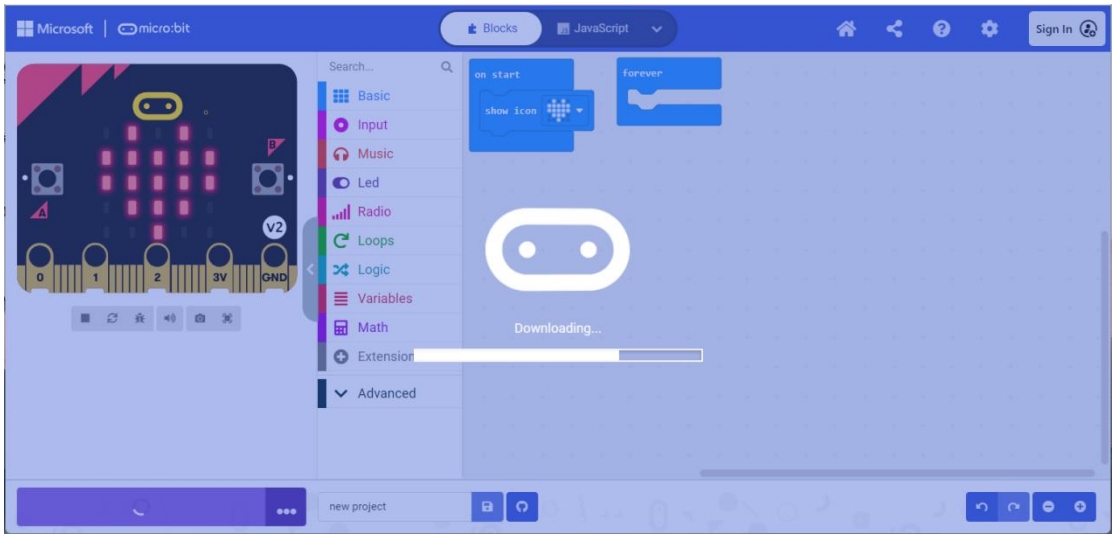


The connection is successful, click"**Done**"：

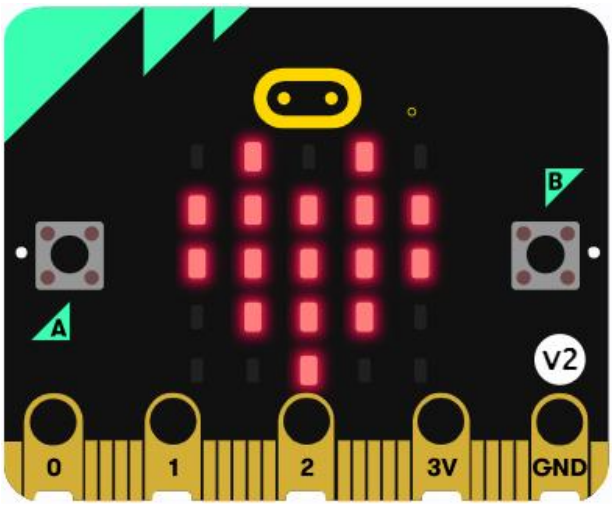


Click the "**Download**" button, you can flash the code to the Micro:bit with WebUSB.





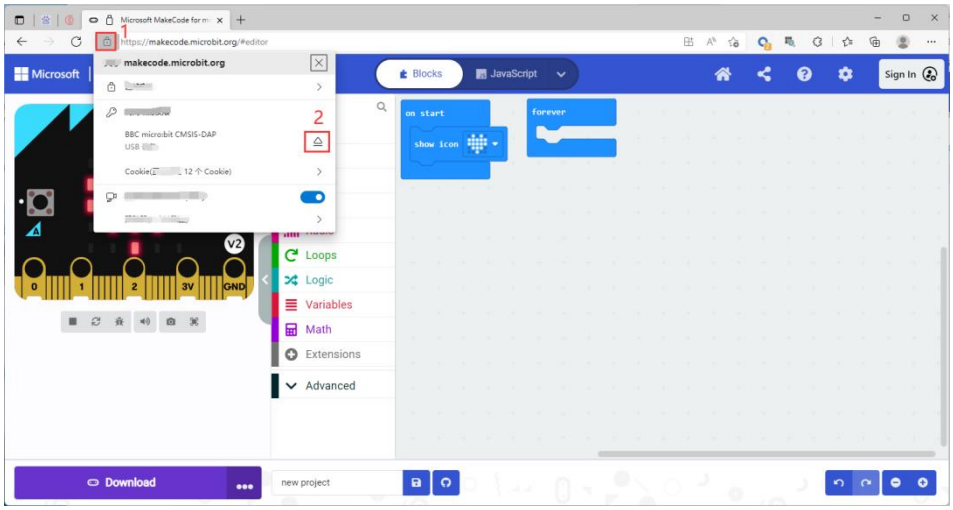
After uploading the code, the dot matrix of the Micro:bit board displays a heart shape:



4.6 Unpairing Microbit

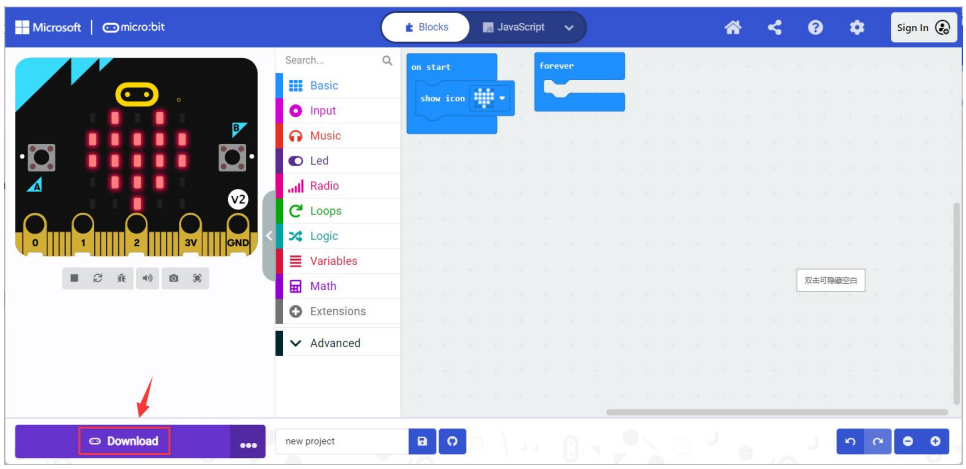
-Click the button to the left of your browser's search box.

-Select the Microbit device you want to disconnect and click the button to the right of it.

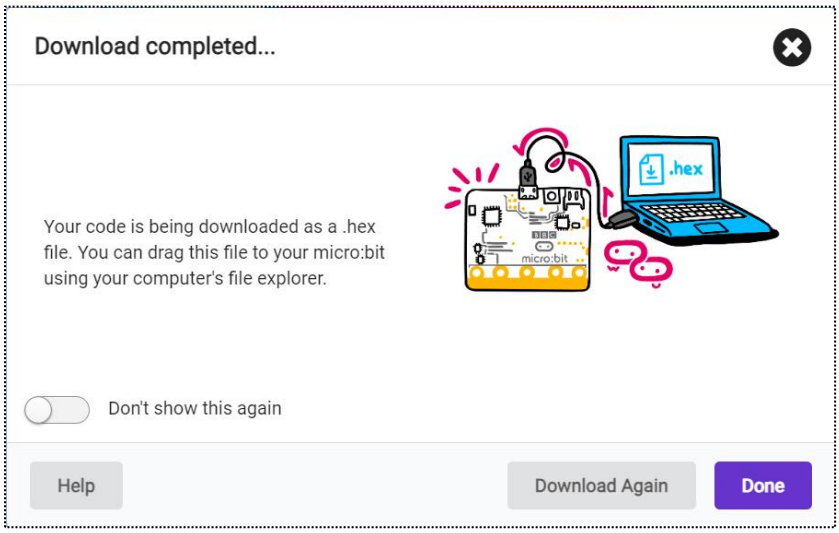


4.7 Upload the HEX file to the Micro:bit

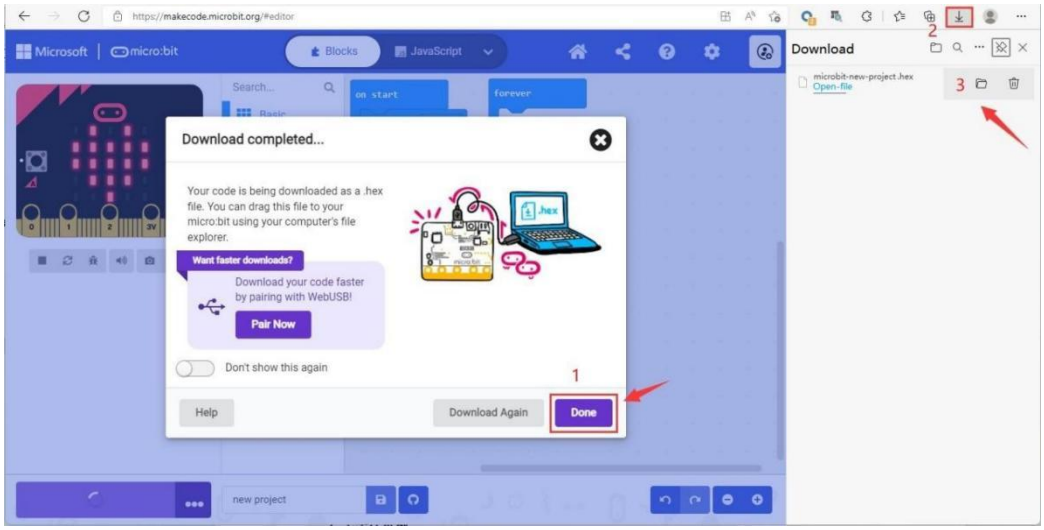
If the Micro:bit is not paired with Microsoft Edge or Google Chrome browser, or if you are using Safari/Firefox/Other browser that may not support WebUSB, directly click the "**Download**" button, the code won't transfer directly to your microbit, it will be downloaded as a .hexfile. Just like click the save icon to save a copy of the hex file to your computer.



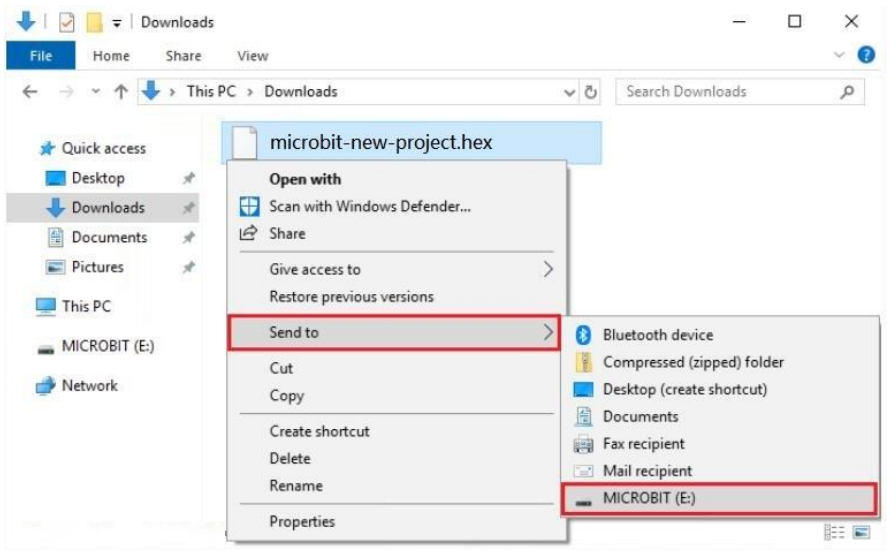
When the following interface appears, click the "✖" button and click "**Done**":



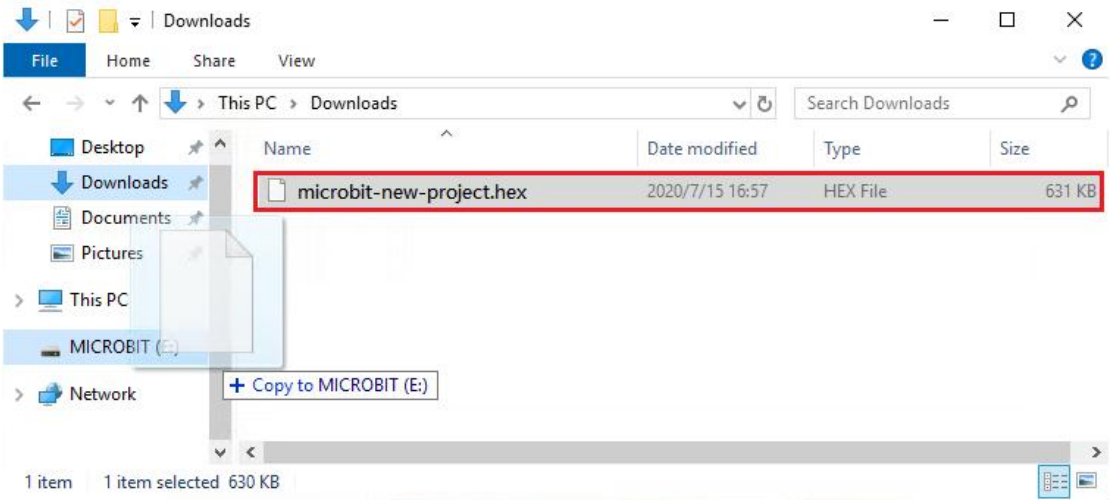
Find the downloaded hex file in the default save path of browser.



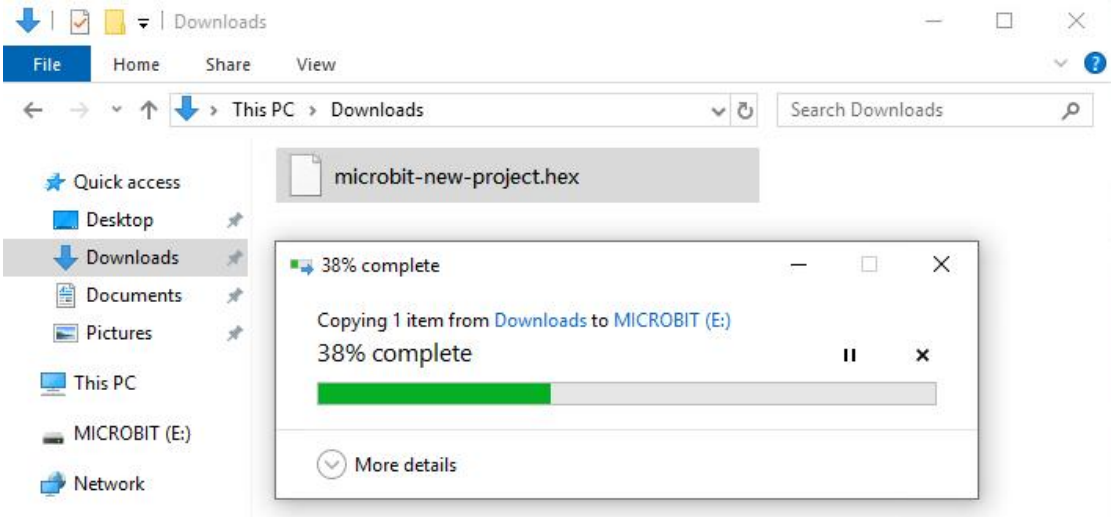
Then select the downloaded hex file，right click the mouse and click "Send to"，then you can send the hex file to your Microbit:



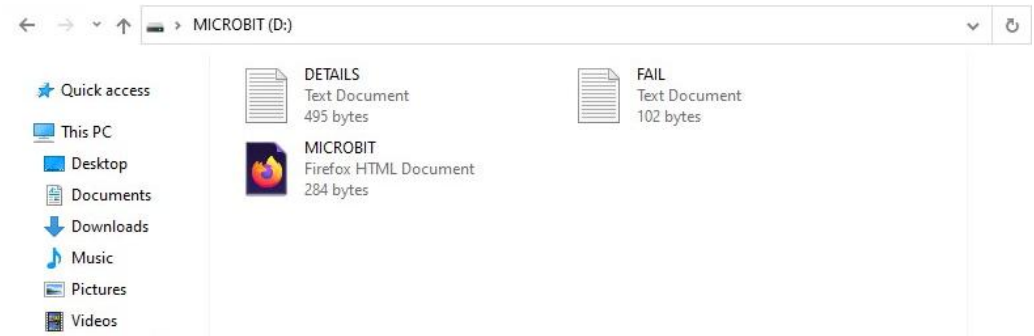
If you do not use the "**Send to**" button, you can directly drag the hex file to the Micro:bit:



The following interface indicates that the code is being uploaded, at the same time, the yellow LED on the back of the Microbit will also flash rapidly until the code upload is complete.



After the code upload is complete, the Micro Bit will disconnect and reconnect. If you look at the contents of the MICROBIT drive, you will not see the .hex file listed, this is normal, but your hex file will start automatically.



4.8 Learn the basic syntax of Makecode

The Micro:bit platform provides official MakeCode API and device usage documents for your reference.

To use APIs: https://makecode.microbit.org/reference

To use device: https://makecode.microbit.org/device

Logic and data types: https://makecode.microbit.org/blocks

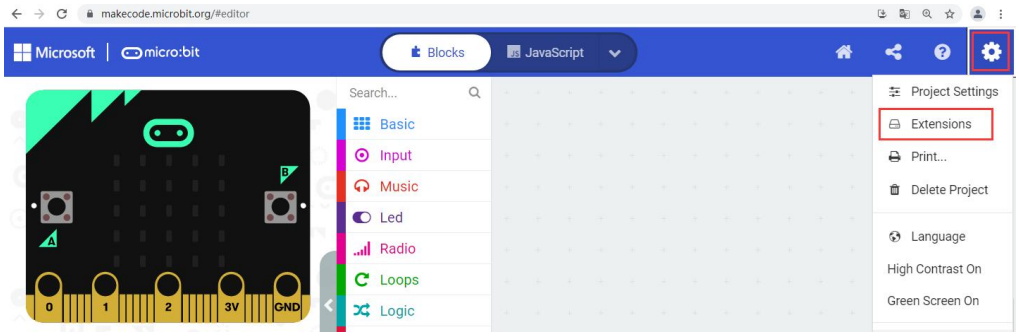
5. MakeCode Extension for mShield

We have developed an extension for mShield expansion board, which makes it easier for us to use MakeCode to program mShield.

5.1 Add mShield extension

The steps to add the extension to the Makecode are as follows:

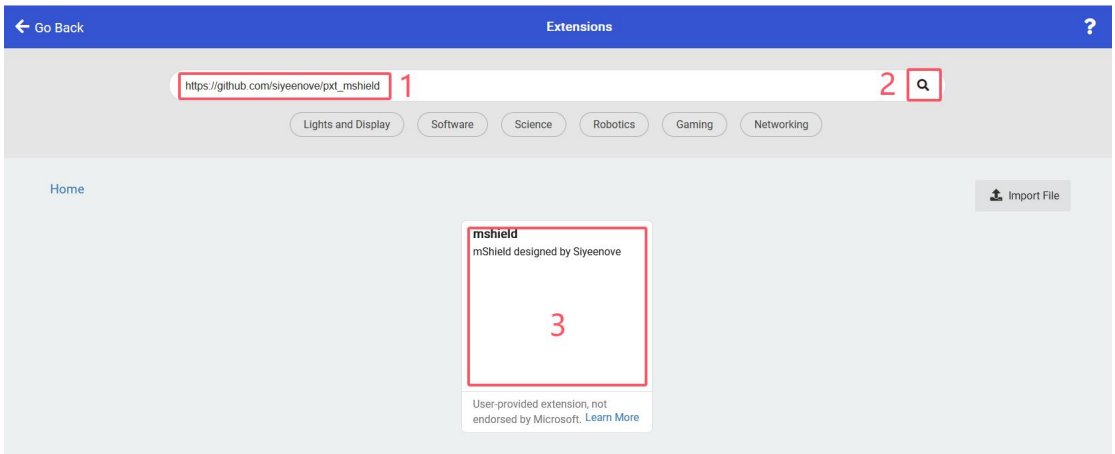
Click the **Settings** button in the upper right corner of the interface and click "**Extensions**"



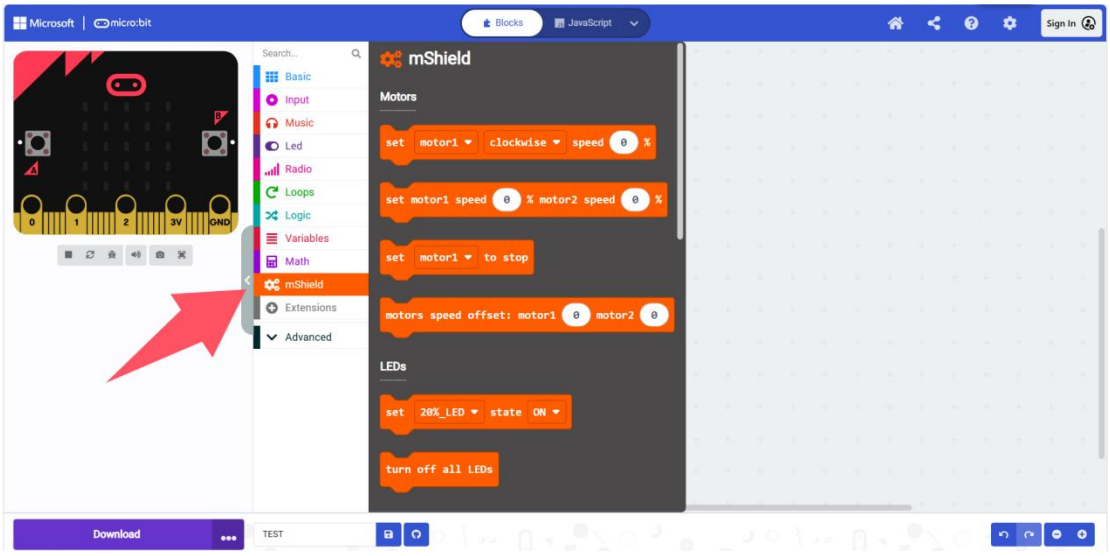
Extension link for mShield：**https://github.com/siyeenove/pxt_mshield**

Copy the above link into the search box on the extension page and click the search button on the right.

Click on the extension named **mshield** in the search results.

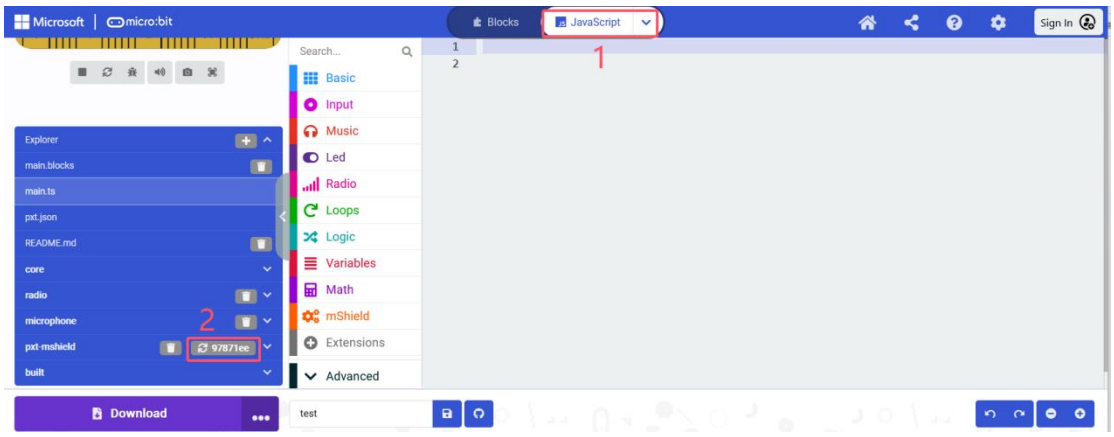


After a few seconds the page will jump to the Makecode main interface, and you will see the added **mShield** extension in the toolbox list.



5.2 Refresh mShield extension

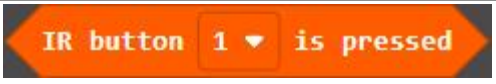
Open the project with the mCar extension added, and switch to the JavaScript programming interface to refresh the extension:

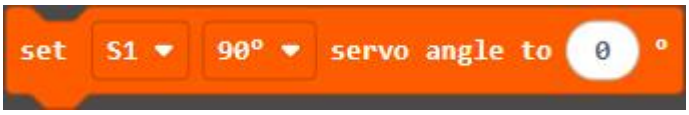


After refreshing, switch back to the "Blocks" interface.

5.3 Parsing of mShield extension statement

All Makecode statements based on mShield are integrated in the mShield extension package. The statement analysis is as follows:

Motors	 Set the mShield's motors to turn clockwise or counterclockwise, and at what speed.
	 Set the speed and direction of the left and right motors of the mShield.
	 Set the mShield motors to stop turning.
	 Adjust the speed of the motor1 and motor2 of mShield and save them permanently inside mShield. This statement can be used to adjust the speed of motors.
LEDs	 Turn ON the LED of the mShield.
Infrared sensor	 Infrared receiving loop function, this function has been processing the received infrared data.
	 Determine whether the data received by the infrared receiver is equal to the key value in the Statement tab.
Infrared sensor	 Read the data received by the infrared receiver. Before using this statement, use the "if" statement to determine when the return value is

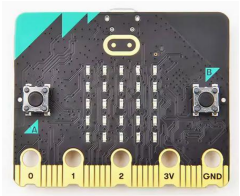
	not 0, and then the data will be valid.
PWM port	 Set the operation mode of S1, S2, S3 and S4 ports.
	 The statement used to make S1, S2, S3 and S4 output PWM signals.
	 To drive the servo statement, which can drive 90, 180, and 270 degree servos; the interface is the S1, S2, S3, and S4 expansion port on the mShield.
	 The driving statement of 360-degree servo; the interface is S1, S2, S3 and S4 expansion port on mShield.
Baterry	 Statement to sets the battery model and reads the battery voltage, returning the battery level between 0 and 100%. **It is recommended to execute this statement once when the machine is turned on.**
Others	 Read the version number of mCar and return a string value.

6. Example code

All sample codes are saved in the "sample code" folder.

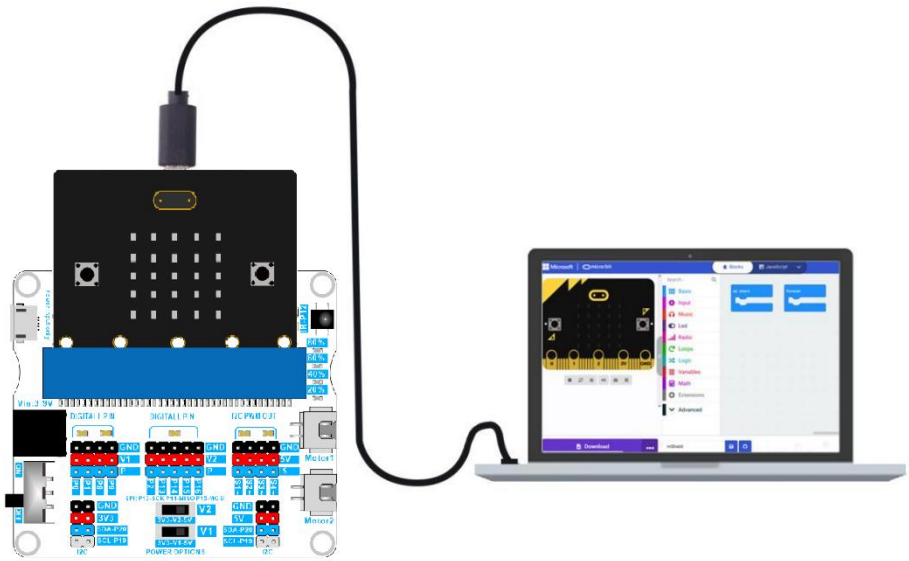
6.1 Firmware version

Prepare:

PC	Micro:bit V2.x.x	USB cable
		

Wiring:

Insert the Micro:bit V2 into the mShield expansion board with the LED matrix facing upwards, then connect the Micro:bit V2 to the computer using a USB cable.



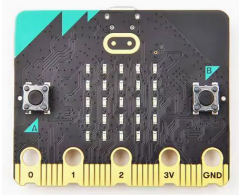
Code:

Result:

The mShield expansion board integrates an 8-bit microcontroller for driving motors, LEDs and S1-S4 ports. We have burned the firmware into it before leaving the factory. Through the above code, you can read the firmware version and display the version number in the microbit LED dot matrix.

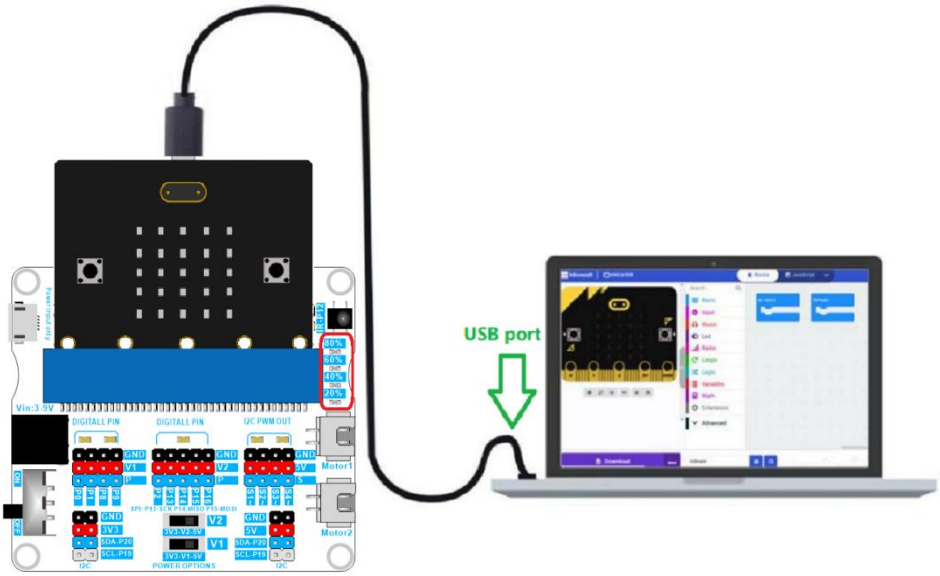
6.2 LEDs

Prepare:

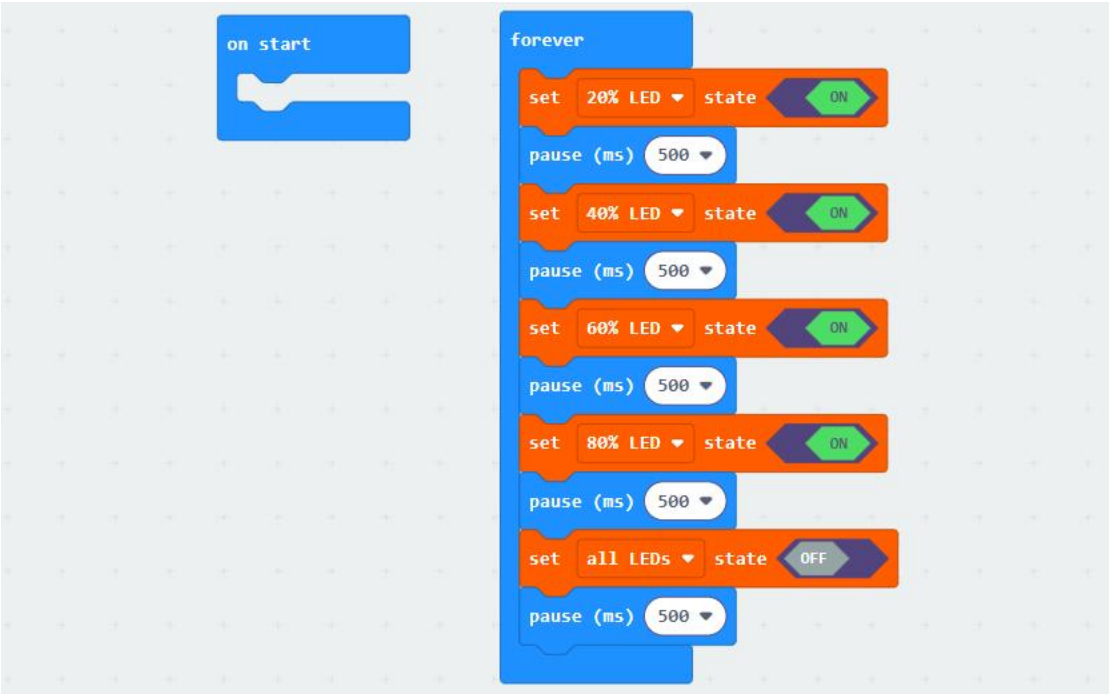
PC	Micro:bit V2.x.x	USB cable
		

Wiring:

Insert the Micro:bit V2 into the mShield expansion board with the LED matrix facing upwards, then connect the Micro:bit V2 to the computer using a USB cable.



Code：

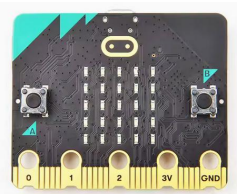


Result:

It will cycle through lighting each LED.

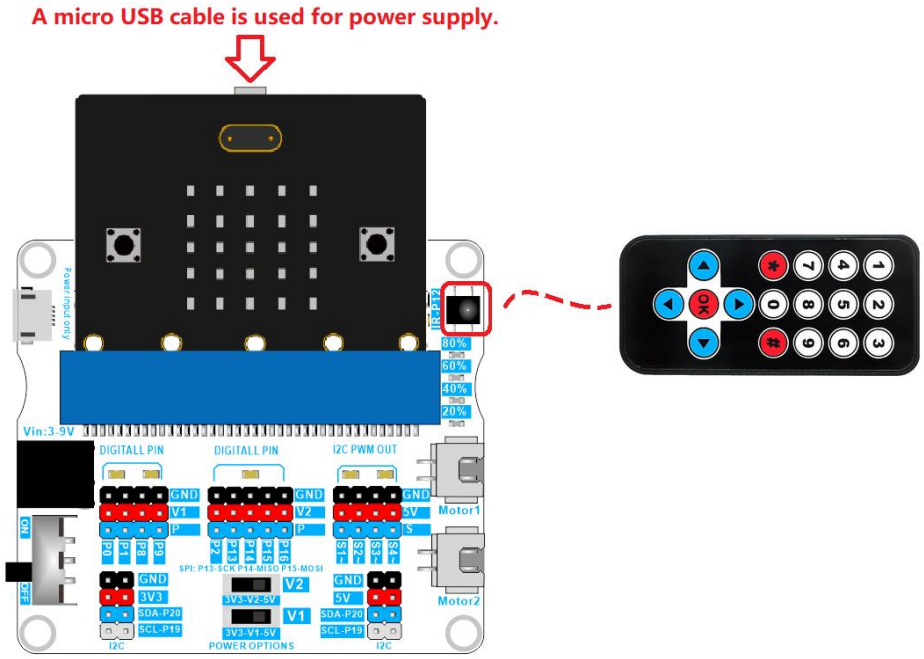
6.3 IR receiver

Prepare:

PC	Micro:bit V2.x.x	USB cable	IR remote
			

Wiring:

Insert the Micro:bit V2 into the mShield expansion board with the LED matrix facing upwards, then connect the Micro:bit V2 to the computer using a USB cable.



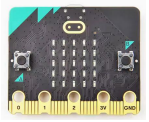
Code:

Result:

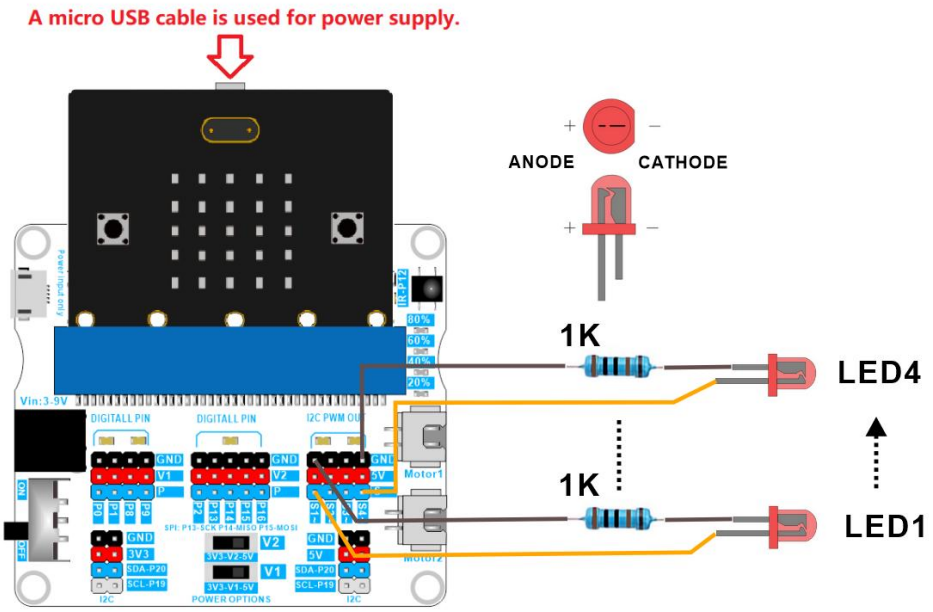
Point the remote control at the infrared receiver sensor on the expansion board and press any key; the corresponding key value will be displayed on the Micro:bit's LED matrix.

6.4 PWM

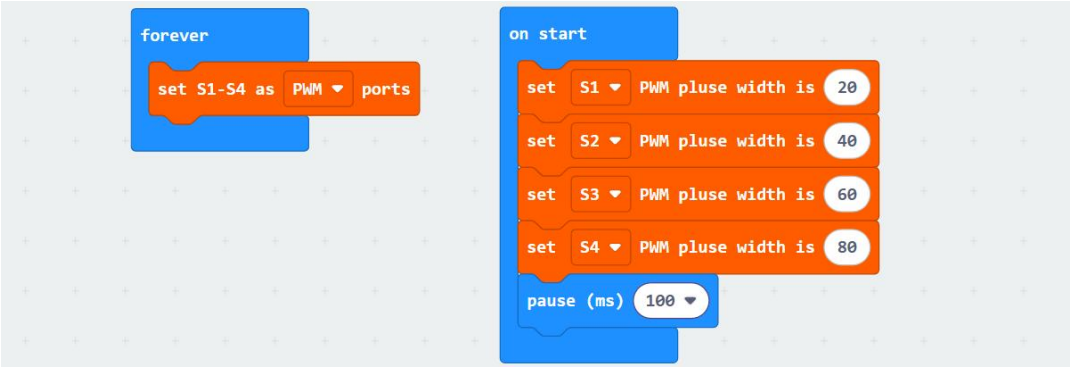
Prepare:

PC	Micro:bit V2.x.x	USB cable	LED
			
1K resistor	Female-to-female Dupont wires		
			

Wiring:



Code:

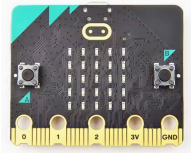


Result:

The S1, S2, S3, and S4 pins output PWM signals with duty cycles of 20%, 40%, 60%, and 80% respectively, resulting in the following LED brightness levels: LED1 < LED2 < LED3 < LED4.

6.5 Battery voltage

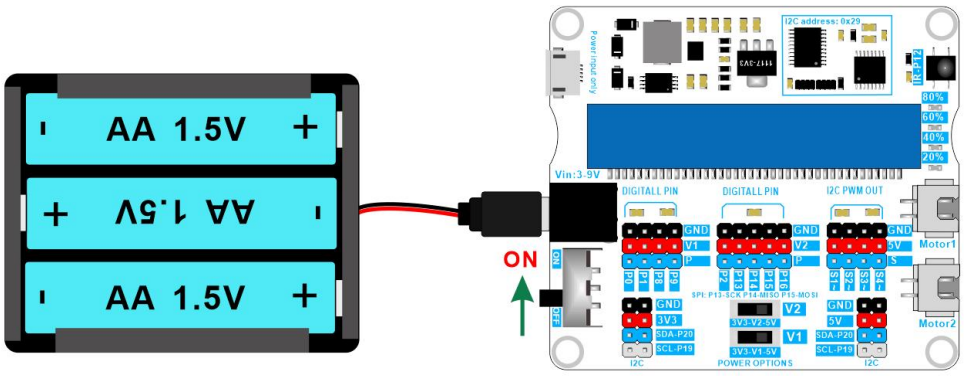
Prepare:

PC	Micro:bit V2.x.x	USB cable	3xAA battery power
			

Wiring:

Insert the Micro:bit V2 into the mShield expansion board with the LED matrix facing upwards, then connect the Micro:bit V2 to the computer using a USB cable.

Connect an external DC 3-9V power supply to the shield and turn on its power switch.



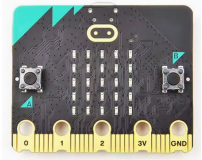
Code:

Result:

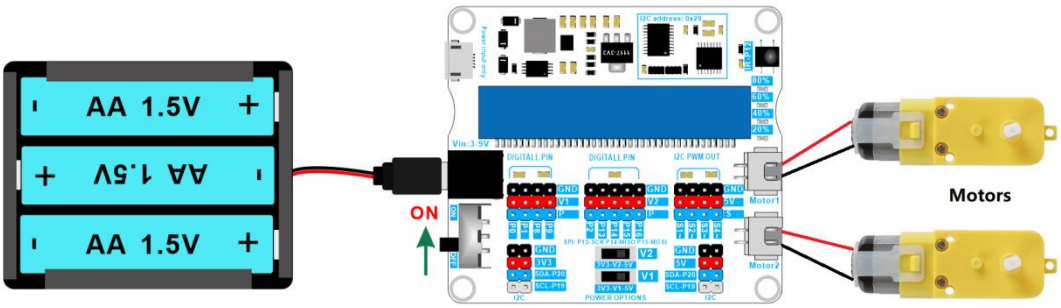
When the mShield is connected to three AA batteries in series, the micro:bit can read the voltage ratio of the batteries (0-100%) and display this value on the micro:bit LED matrix.

6.6 Motors

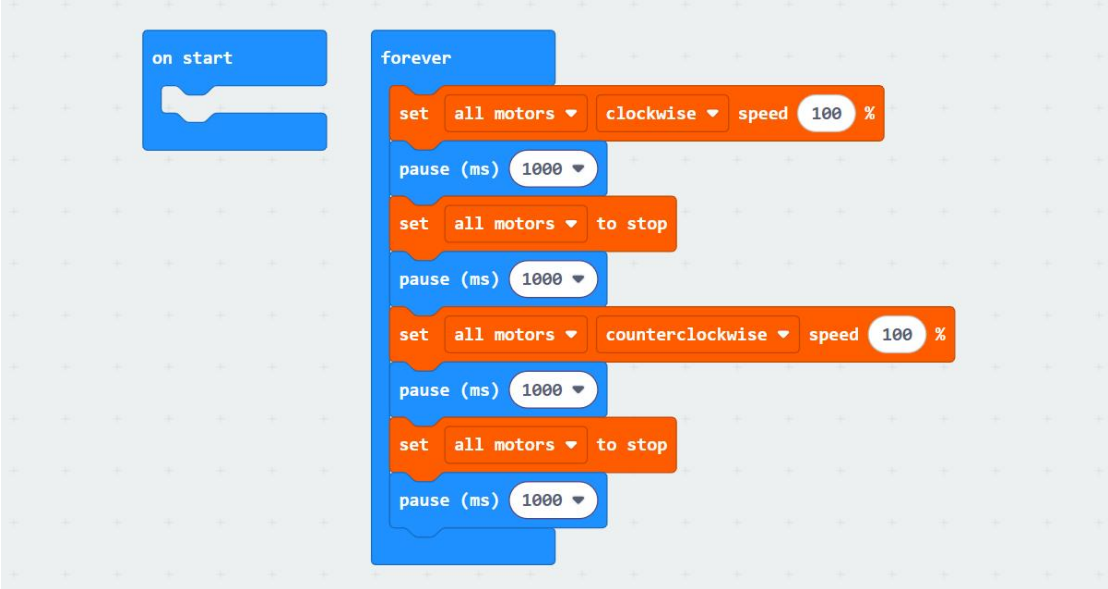
Prepare:

PC	Micro:bit V2.x.x	USB cable	Motor
			
3xAA battery power			
			

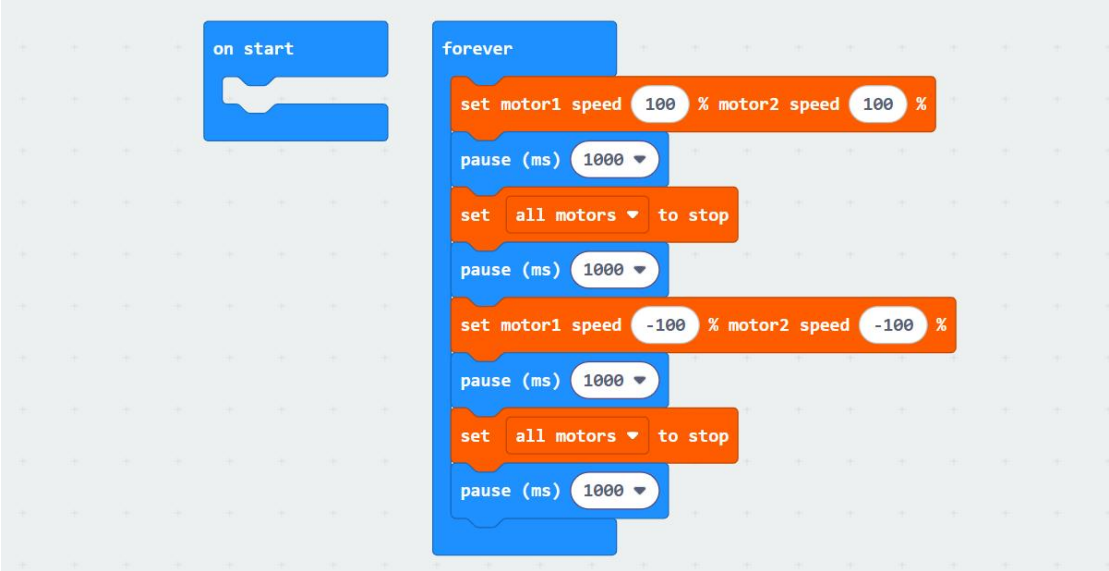
Wiring:



Code1：



Code2：

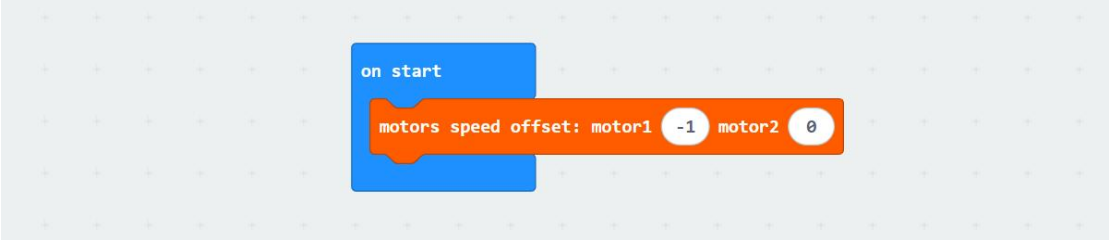


The results of these two codes are the same:

When external motors are connected to the Motor1 and Motor2 interfaces, Motor 1 and Motor 2 will first rotate clockwise for 1 second, then stop for 1 second; next, they will rotate counterclockwise for 1 second, and then stop for 1 second, repeating this cycle continuously.

Additional：

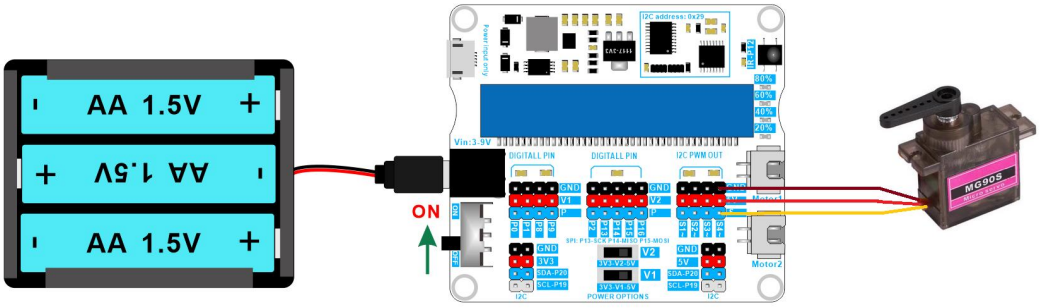
If, due to hardware differences in the motors, the two motors connected to the expansion board's motor interfaces have varying speeds despite being given the same speed value, we can address this discrepancy using the following statements. The compensated speed parameters can then be permanently saved in the mShield.



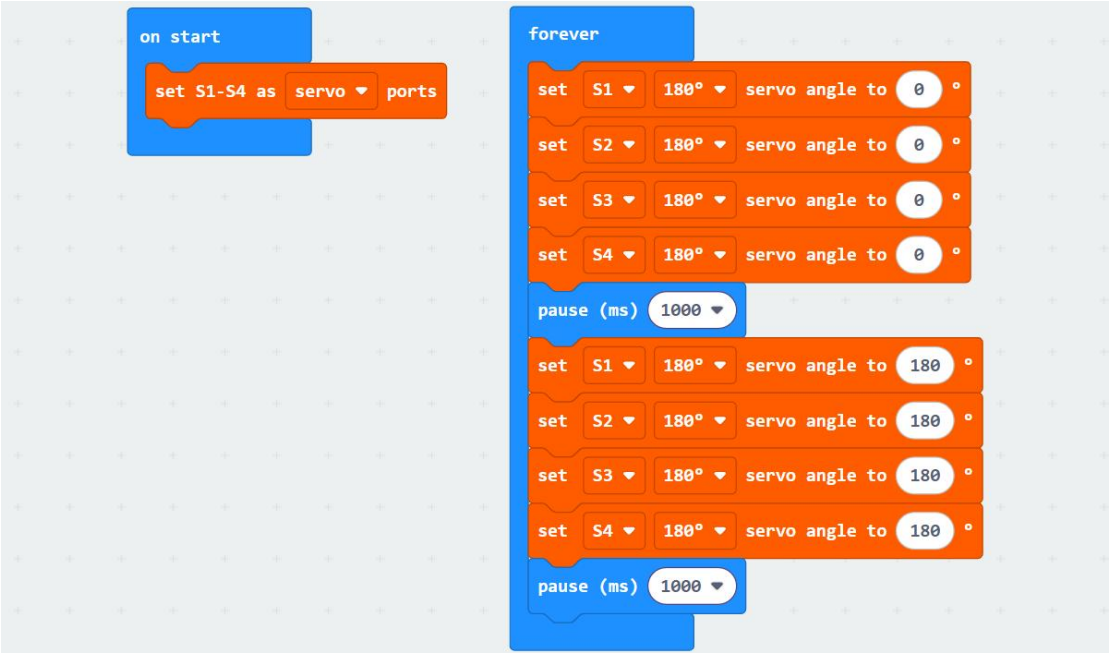
Motor speed compensation is achieved by reducing the speed of one motor to align the speeds of both motors. The compensation value ranges from -10 to 0. This statement only needs to be executed once during program runtime to permanently save the compensated speed parameters in the mShield. Subsequent code implementations do not require the inclusion of this statement unless further adjustments to the motor compensation speed are desired.

6.7 180 degree Servo

Wiring:



Code:



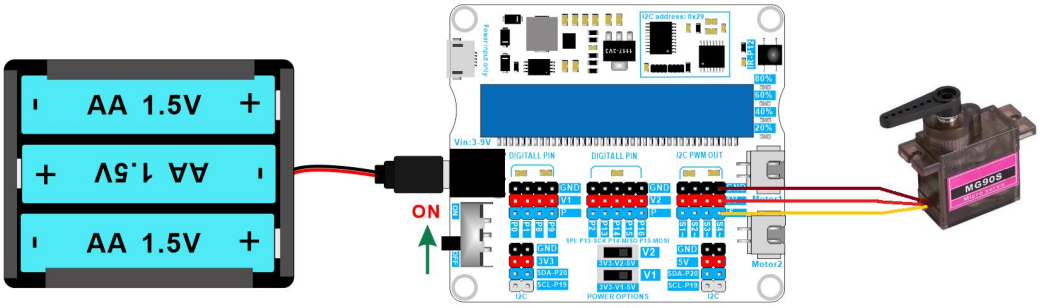
Result:

When the S1, S2, S3, and S4 pins are connected to an external 180-degree servo, the servo swings between 0 and 180 degrees at intervals of 1 second.

Note: The usage of a 90-degree servo is similar to the above code.

6.8 360 degree Servo

Wiring:



Code:

Result:

When the S1, S2, S3, and S4 pins are connected to an external 360-degree servo, the servo will rotate forward and reverse at the maximum speed at an interval of 1 second.

7.Contact us

If you couldn't find a solution above, please contact our support team.

To help us assist you quickly, please have the following information ready:

Your order number.
Product model (e.g., Expansion board M1E0002) and software version (e.g., MakeCode or Micropython).
A detailed description of the issue or your question.
Steps you have already tried.
Any relevant error message screenshots, photos, or code snippets.

Other Inquiries?

We value your input and are always looking to improve. Please feel free to reach out for:

Tutorial Errors & Feedback: Help us make our documentation better.
Product Ideas & Suggestions: We'd love to hear your great ideas.
Partnerships & Collaboration: Interested in working together? Let's talk.
Discounts & Promotions: Inquire about educational or bulk pricing.
Anything Else: For all other non-technical questions.

Support Channels

support@siyeenove.com

http://siyeenove.com