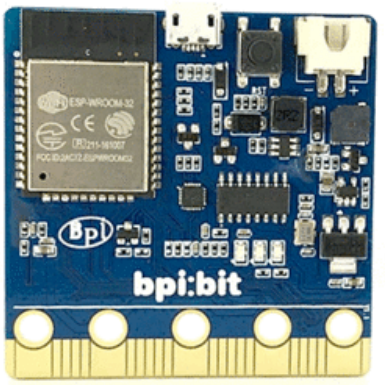
BPI-Bit

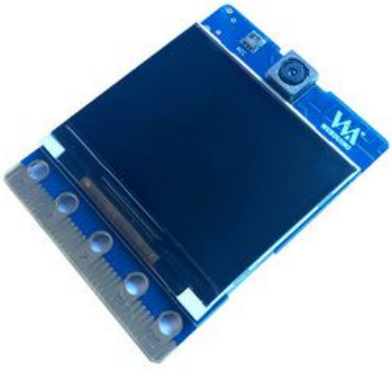
Contents

Introduction

The **BPI bit** (also referred to as **BPI-bit**, stylised as **bpi:bit**) is an ESP32 with 32-bit Xtensa LX6 dual-core processor based embedded system. It supports Webduino, Arduino, MicroPython as well as Scratch X programming environments.

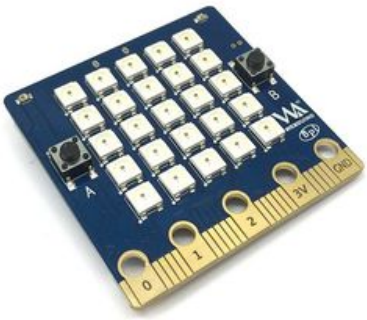


Overview: BPI:bit



BPI-AI Kendryte K210 RISC-V

BPI-UNO32 with ESP32 design

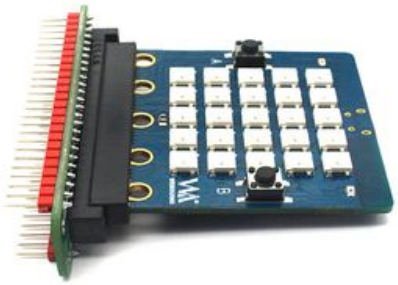


Overview: BPI:bit

Overview: BPI:bit for Webduino

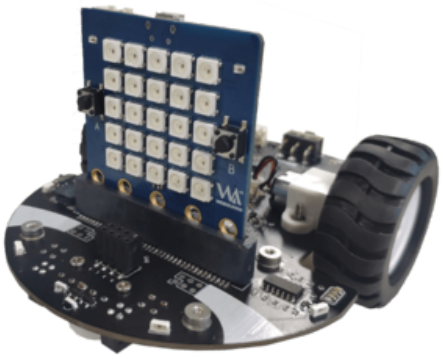
BPI-bit acrylic shell compatible LEGO bricks

BPI:bit gpio expansion board

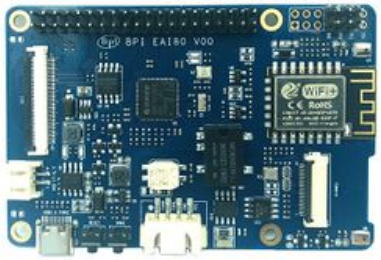


BPI:bit gpio expansion board

BPI:bit robot expansion board

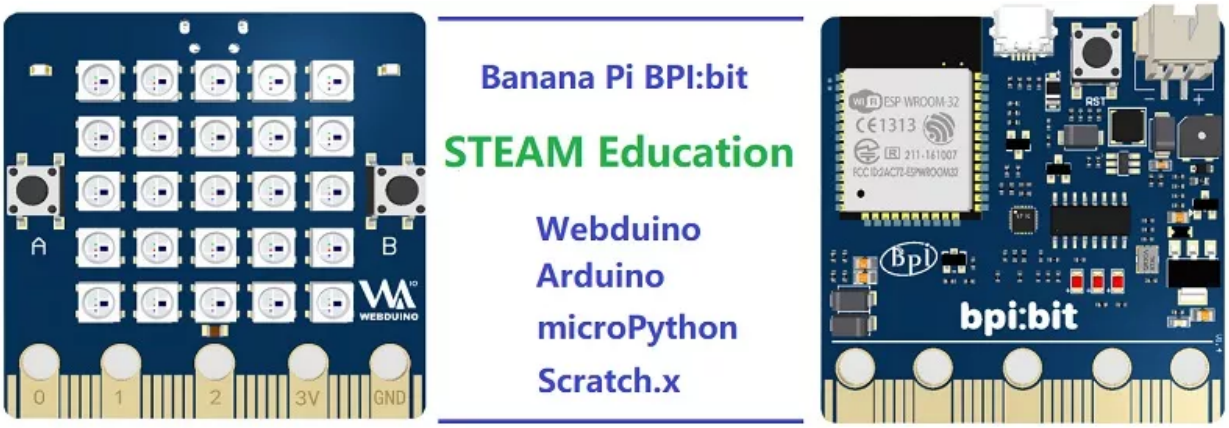


BPI Q-Car kit with BPI:Bit board

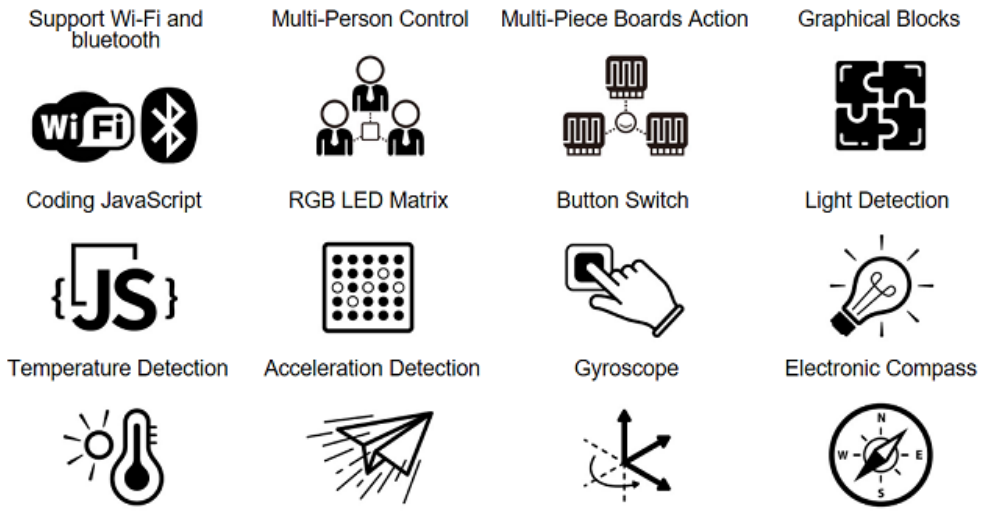


BPI-EAI80 AI board Gree EAI80 chip design

BPI-K210 RISC-V AIoT board



BPI:bit hardware main function:



bpi:bit board is 5 cm x 5 cm in size, weighs 10 ~ 12 grams, it houses a 20-Pin edge connector, built-in lighting matrix with 25 programmable full-color LEDs , two photosensitive light sensors, two programmable buttons, an NTC resistor, a buzzer and a nine shaft sensor (triaxial acceleration Three-axis gyroscope and three-axis magnetic compass),

the I/O space configuration is as follows:

- Full color LED matrix: GPIO4

- Photosensitive sensor: GPIO36 (Analog A0, upper left), GPIO39 (Analog A3, upper right)
- Button switch : GPIO35 (Botton A), GPIO27 (Botton B)
- Temperature sensor: GPIO34 (Analog A6)
- Buzzer: GPIO25
- MPU-9250 9-axis sensor: GPIO0, GPIO21(SDA), GPIO22(SCL)

GPIO control of BPI:bit		
Light Sensor(L)	GPIO 36	Analog Input
Light Sensor(R)	GPIO 39	Analog Input
Botton A	GPIO 35	Digital Input
Botton B	GPIO 27	Digital Input
Temperature Sensor	GPIO 34	Analog Input
Buzzer	GPIO 25	PWM(Digital Output) / Analog Output
RGB_LED	GPIO 4	Digital Output
MPU9250_SCL	GPIO 22	Digital Output
MPU9250_SDA	GPIO 21	Digital Output
MPU9250_INT	GPIO 16	Digital Input
R_LED(SPI_SCK)	GPIO 18	Digital Output

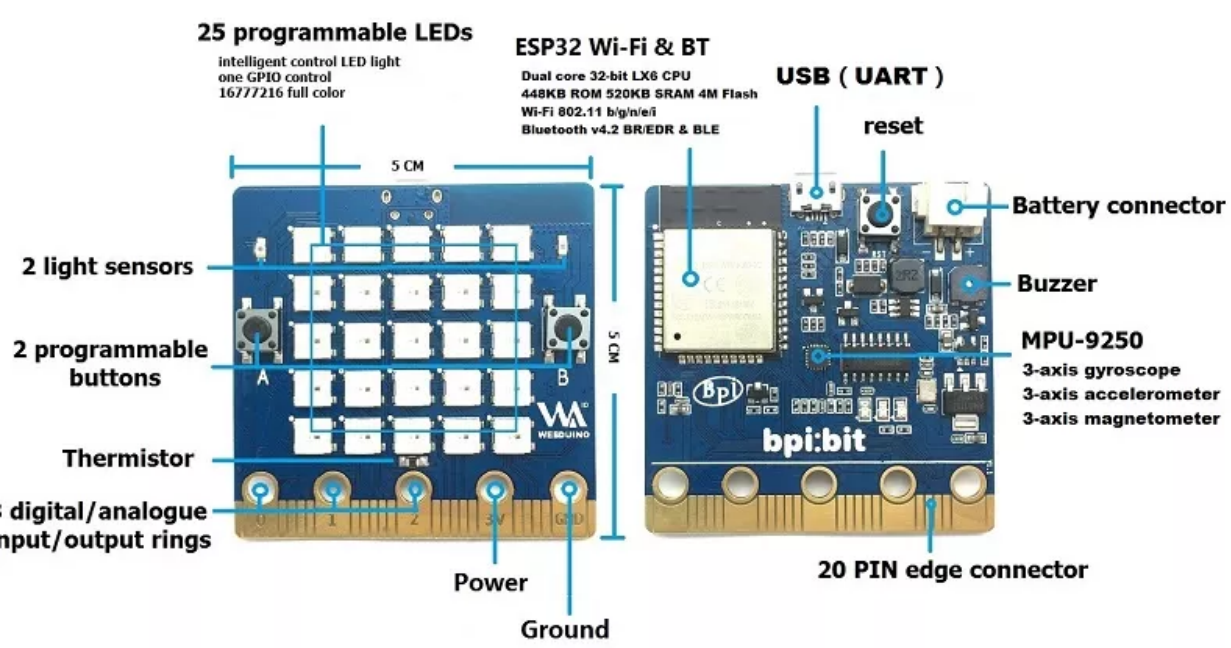
Hardware

Hardware description

Webduino Bit is the latest board of Webduino with much more sensors on top of its basic functions(Wi-Fi connection, muti-connectivity,multi-board...). It uses ESP32 module,one of the most efficient and stable chipset in the market, which has built-in 2.4G Wi-Fi and Bluetooth,448KB ROM,520KB SRAM,speed up to 600 DMIPS,and 40 nm technology.

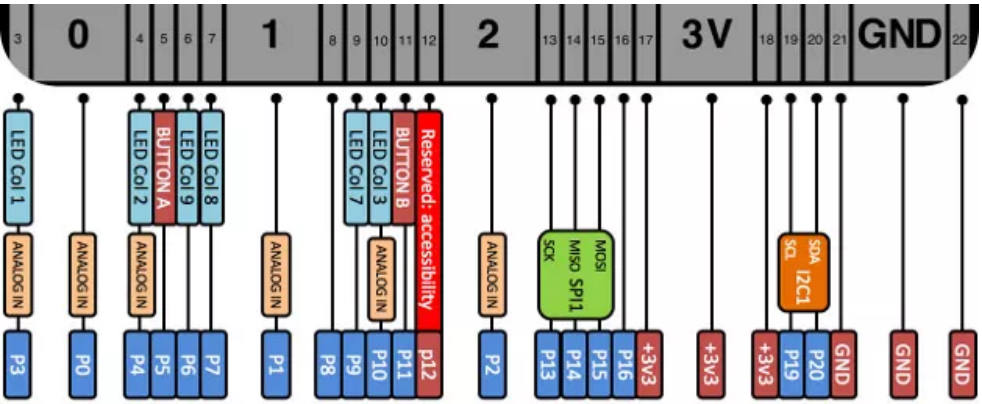
Webduion bit board has a compact size of 50mm x 50mm, weighs 10-12 grams.It has 20 pins at the bottom,25 full color LED array in the middle, two photo cells,two buttons, one thermistor,one buzzer,one 9-axis sensor(3-axis accelerometer,3-axis gyroscope and 3-axis magnetometer)

Hardware interface



PIN definitions

The edge interface is much compatible with those of micro:bit. so you may able to use micro:bit accessories on bpi:bit



HardWare PIN define of BPI:bit					
Pin Name	Analog Function1	Analog Function2	Function1	Function2	Power
P3	ADC2_CH4		GPIO13		
P0	ADC2_CH8	DAC_1	GPIO25		
P4	ADC2_CH3		GPIO16		
P5	ADC1_CH7		GPIO35		
P6	ADC2_CH5		GPIO12		
P7	ADC2_CH6		GPIO14		
P1	ADC1_CH4		GPIO32		
P8			GPIO16		
P9			GPIO17		
P10	ADC2_CH9	DAC_2	GPIO26		
P11	ADC2_CH7		GPIO27		
P12	ADC2_CH2		GPIO02		
P2	ADC1_CH5		GPIO33		
P13			GPIO18	SPI_SS	
P14			GPIO19	SPI_SCK	
P15			GPIO23	SPI_MISO	
P16			GPIO05	SPI_MOSI	
3V3					POWER:3V3
3V3					POWER:3V3
3V3					POWER:3V3
P19			GPIO22	I2C_SCL	
P20			GPIO21	I2C_SDA	
GND					GROUND
GND					GROUND
GND					GROUND

5*5 25 LED

BPI:bit have 25 LEDs on board, it can be controlled with a single GPIO.

25 5*5 LED list of BPI:bit				
20	15	10	5	0
21	16	11	6	1
22	17	12	7	2
23	18	13	8	3
24	19	14	9	4

MPU9250 9-axis sensor

The 9-axis sensor, MPU9250, is placed on the BPI:bit board. and MPU9250 uses I2C 0x69 address.

The 9-axis is the combination of 3 separate triple axis sensors. For more detailed information of this chip, click here MPU 9250 datasheet (https://github.com/yelvlab/BPI-BIT/blob/master/doc/MPU-9250A-01-v1.1.pdf) to view the datasheet.\

BPI-BIT MPU9250 Library and how to : https://github.com/BPI-STEAM/MPU9250

BPI:bit power

When you use BPI:bit, you need to supply the board first, and the bit supports three power supply modes

- 1.micro USB port:USB cable power supply, the design of BPI:bit board has Micro USB interface, which is quite common in daily life and is quite convenient to use.
- 2.Battery port:Through 2 pin battery power supply socket, can through the lithium battery, battery pack to power supply board, interface fool proof design, don't worry about the power supply through the 2 pin battery power supply socket, can through the lithium battery, battery pack to power supply board,

interface fool proof design, don't have to worry about power supply meet the problem.

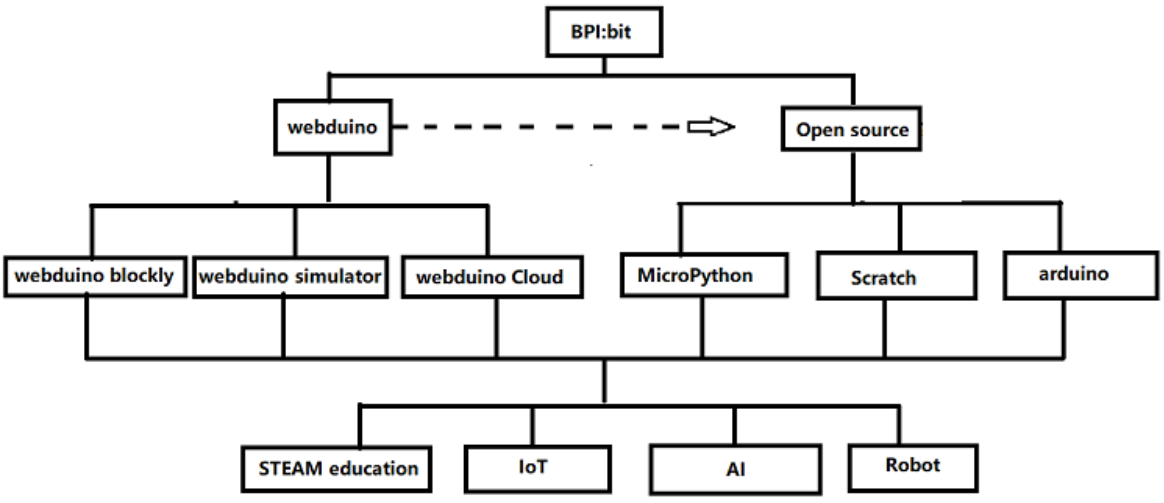
- 3.Goldfinger ：Power is supplied through the gold finger, and the gold finger at the bottom of the board contains the power interface. Meanwhile, it has both input and output functions and has high compatibility.

BPI:bit VS micro:bit

bpi:bit VS micro:bit		
Module	bpi:bit	micro:bit
CPU	Dual-core 32bit Xtensa LX6, up to 240MHz	NXP KL26Z 32bit ARM Cortex M0, up to 16MHz
RAM	520 KB	16 KB
ROM	448 KB	Unkown
Flash	4096 KB	256 KB
Bluetooth	BT4.2 BR/EDR and BLE	BLE only
WIFI	802.11 b/g/n/e/i	N/A
Buzzer	1x Buzzer	N/A
5*5 LEDS	25 intelligent-control full-color (16777216 color) LEDs, Cascading all LEDs by a single line.	25 red LEDs
photosensitive sensor	2 light sensors	Basic light detection function on LEDs
temperature sensor	Stand along temperature sensor	On CPU chip temperature sensor
Motion sensor	MPU-9250 9-axis Motion Tracking : 3-axis accelerometer, 3-axis magnetometer, 3-axis gyroscope	3-axis Accelerometer; 3-axis magnetometer; no gyroscope, no motion processor
IO interface	edge interface (compatible with most micro:bit I/O features)	edge interface
Button	2 programmable buttons	2 programmable buttons
micro USB	1x micro USB(UART)	1 x micro USB(Mass Storage Device)
Software	Webduino (http://www.webduino.com.cn), Arduino, MicroPython, Scratch X	Microsoft MakeCode, MicroPython, Scratch X
Size	5*5 cm	5*4 cm

BPI:bit Software development

BPI:bit Software development schedule and support applications:



BPI:bit for Webduino

BPI:bit for Webduino

BPI:bit for Arduino

BPI:bit for Arduino

BPI:bit for MicroPyhton

BPI:bit for MicroPython

BPI:bit for Scratch

BPI:bit for Scratch

BPI STEAM education website

https://bpi-steam.com/

Resources

- BPI:bit user manual (https://github.com/BPI-STEAM/BPI-BIT/blob/master/doc/BPI-bit_user_manual.pdf)
- BPI:bit V1.4 schematic diagram (https://github.com/BPI-STEAM/BPI-BIT/blob/master/doc/BPI-WEBDUINO-BIT-V1_4.pdf)
- BPI:bit V1.2 schematic diagram (https://github.com/BPI-STEAM/BPI-BIT/blob/master/doc/BPI-WEBDUINO-BIT-V1_2.pdf)
- BPI:bit dxf file (http://forum.banana-pi.org/uploads/default/original/2X/0/0b86ccaeb565cdeef093164fd1ff837727ca2887.rar)
- BPI:bit 3D design file (https://drive.google.com/file/d/1JoQqcHd12TBzTResew5SkeNFxlJ3BGL8/view?usp=sharing)
- Bananna Pi BPI:bit hardware introduce:https://www.youtube.com/watch?v=QVnlGKTittw
- BPI:bit Webduino Easy How-To's Episode 1: Initial Setup : https://www.youtube.com/watch?v=23_a27N3_7k
- How to Program Esp32 with Arduino IDE with C++ : https://technicalustad.com/program-esp32-with-arduino-ide-with-c/
- Banana Pi BPI:bit CE FCC RoHS Certification :http://forum.banana-pi.org/t/banana-pi-bpi-bit-ce-fcc-rohs-certification/7363
- BPI:bit platformio official support :https://docs.platformio.org/en/latest/boards/espressif32/bpi-bit.html
- BPI:bit for webduino wuyu online documents(TaiWan): https://sites.google.com/site/wenyuwebbit/
- BPI:bit for webduino chenlung document(TaiWan):https://sites.google.com/a/tssh.ntpc.edu.tw/chenlung/webduino-bit

Forum

free discuss forum : http://forum.banana-pi.org/c/bpi-bit

Github

- Webduino github (https://github.com/webduinoio)
- bpi:bit open soruce github (https://github.com/BPI-STEAM)
- BPI:bit for STEAM education online documents. Arduino,microPython,Webduino (https://doc.bpi-steam.com/en/latest/)
- ESP32 for arduino github (https://github.com/espressif/arduino-esp32)
- alankrantas BPI:bit github (https://github.com/alankrantas/micropython-BPIBIT)

test routine

- MPU9250 sample code

Useful links

- ESP32 规格书 (https://github.com/BPI-STEAM/BPI-BIT/blob/master/doc/ESP32-datesheet_english.pdf) ESP32 datasheet]
- ESP32 Arduino Tutorial Overview (https://www.dfrobot.com/blog-964.html)
- How to program ESP32 with arduino IDE with C++ (https://technicalustad.com/program-esp32-with-arduino-ide-with-c/?tdsourcetag=s_pcqq_aiomsg)
- Espressif ESP32 Resources (https://www.espressif.com/products/hardware/esp32/resources)
- Espressif ESP-IDF Programming Guide (https://esp-idf.readthedocs.io/en/latest/)
- MPU9250 datasheet (http://www.invensense.com/wp-content/uploads/2015/02/PS-MPU-9250A-01-v1.1.pdf)
- More others (https://github.com/BPI-STEAM/BPI-BIT/tree/master/doc)
- Webduino official website (http://webduino.io)
- Webduino website in China (http://www.webduino.com.cn/site/en/)
- Easy to buy bpi:bit sample form aliexpress (https://pt.aliexpress.com/store/product/O-BPI-bit-Webduino-e-placa-arduino-com-educa-o-EPS32-para-VAPOR/302756_32861694375.html?spm=a2g03.12010611.0.0.203230d9sYXj5K)
- Facebook group (https://www.facebook.com/groups/1618158071553661)