

# Pi BPI-PicoW-S3

## Banana Pi BPI-PicoW-S3

ESP32-S3, Xtensa 32 bit LX7  
External PSRAM, FLASH  
Ultra-low power 10uA  
2.4G WIFI, Bluetooth5, Bluetooth mesh  
1\*USB MicroUSB  
1\*Neopixel LED



The Banana Pi BPI-PicoW-S3 is a series of low-powered microcontrollers designed for IoT development and Maker DIY board. same size as Raspberry Pi Pico board, It supports 2.4 GHz Wi-Fi and Bluetooth® LE dual-mode wireless communication, the peripheral is compatible with low-power hardware design, and the power consumption is only 10uA in deep sleep mode. In terms of programming, the PicoW-S3 supports ESP-IDF, Arduino, micropython and other methods.

### key features

- ESP32-S3, Xtensa® 32 bit LX7
- External PSRAM, FLASH
- Ultra-low power 10uA
- 2.4G WIFI, Bluetooth 5, Bluetooth mesh
- GPIO, ADC, TOUCH, PWM, I2C, SPI, RMT, I2S, UART, LCD, CAMERA, USB, JTAG
- 1\*microUSB
- 1\*Full color LED

### BPI-PicoW-S3 VS Rraspberry Pi PicoW, BPI-Leaf-S3, ESP32-S3-DevKitC-1

Development board	BPI-PicoW-S3	Rraspberry Pi PicoW	BPI-Leaf-S3	ESP32-S3-DevKitC-1
GPIO pinout	27	27	36	36
3.3v pin	1	1	2	2
5v pin	2	2	1	1
GND pin	8	8	4	4

Full color LED	1 on GPIO48	None	1 on GPIO48	1 on GPIO48
Chip directly connected to USB	MicroUSB port x1	MicroUSB port x1	Type-C USB port x1	MicroUSB port x1
UART TTL to USB	None	None	None	CP2102-MicroUSB interface x1
External battery socket	None	None	3.7v lithium battery power supply interface	None
Battery charging	None	None	500mA charging	None
I <sup>2</sup> C 4pin connector	None	None	1	None

## Espressif ESP32-S3

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Esp32-S3 is an MCU chip that integrates 2.4 GHz Wi-Fi and Bluetooth 5 (LE) and supports Long Range mode. The ESP32-S3 runs on an Xtensa® 32-bit LX7 dual-core processor with a high frequency of 240 MHz, 512 KB built-in SRAM (TCM), 45 programmable GPIO pins, and a rich communication interface. Esp32-s3 supports larger capacity of high-speed Octal SPI flash and off-chip RAM, and supports user-configured data caching and instruction caching.

What follows is a description of the most important features of ESP32-S3.

- **Wi-Fi + Bluetooth 5 (LE) Wireless Connectivity:** ESP32-S3 supports a 2.4 GHz Wi-Fi (802.11 b/g/n) with 40 MHz of bandwidth support. The Bluetooth Low Energy subsystem supports long range through Coded PHY and advertisement extension. It also supports higher transmission speed and data throughput, with 2 Mbps PHY. Both Wi-Fi and BLE have superior RF performance that is maintained even at high temperatures.
- **AI Acceleration Support:** ESP32-S3 has additional support for vector instructions in the MCU, which provides acceleration for neural network computing and signal processing workloads. The software libraries for the above-mentioned optimized functions will become available very soon, in the form of updates to ESP-DSP and ESP-NN.
- **Rich IO interfaces:** ESP32-S3 has 45 programmable GPIOs and common peripheral interfaces such as SPI, I2S, I2C, PWM, RMT, ADC, UART, SD/MMC host controller and TWAI/TM controller. Fourteen of the GPIOs can be configured as capacitive touch inputs for HMI interaction. In addition, ESP32-S3 is equipped with an ultra-low power coprocessor (ULP) and supports multiple low-power modes, making it widely applicable to various low-power application scenarios.
- **Security mechanism:** ESP32-S3 provides comprehensive security mechanism and protection measures for IoT devices to prevent all kinds of malicious attacks and threats. It supports Flash encryption based on AES-XTS algorithm, secure startup based on RSA algorithm, digital signature and HMAC. Esp32-s3 also includes a new "World Controller" module, which provides two non-interfering execution environments to implement a trusted execution environment or permission separation mechanism.

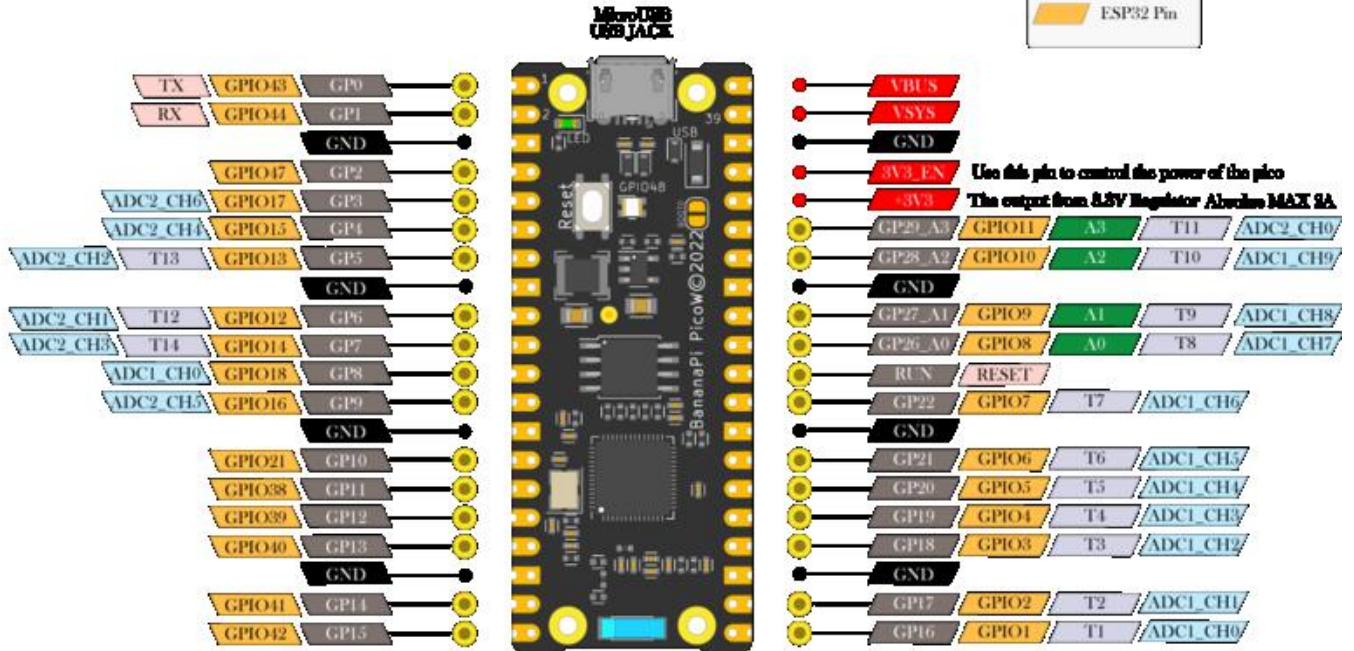
## Hardware interface

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# Pico W

## ESP32-S3

<https://www.banana-pi.org>



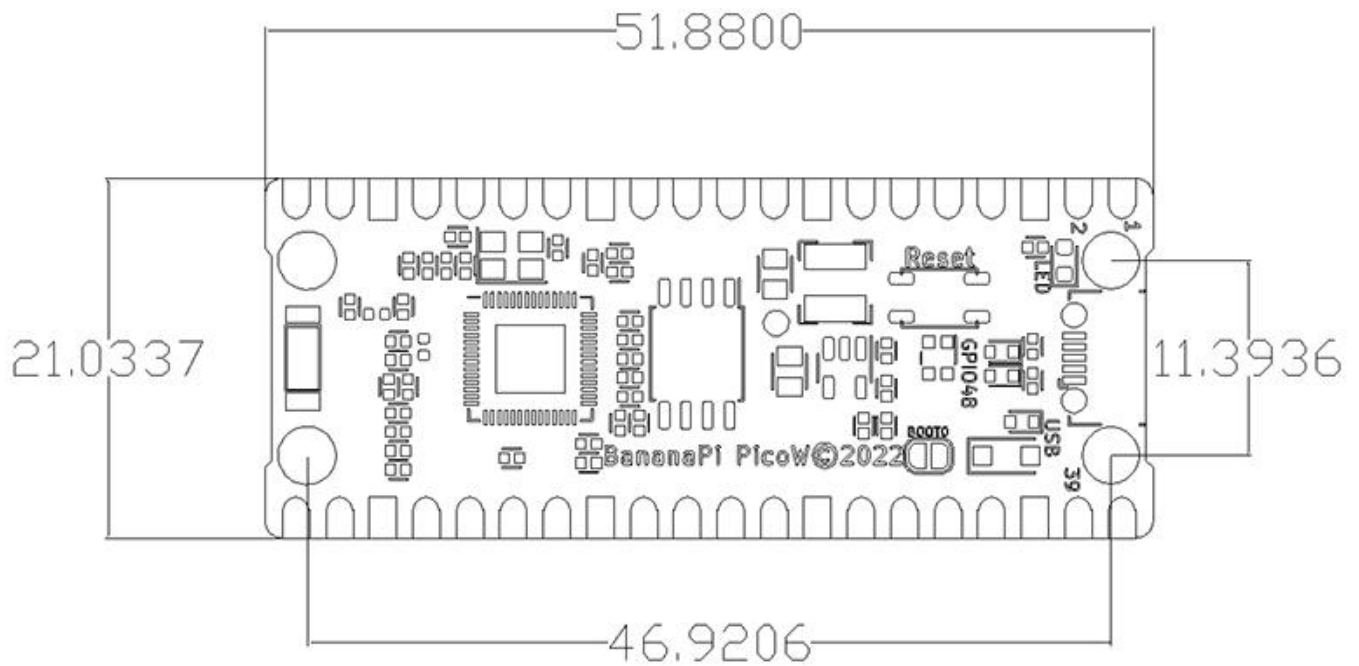
### BPI-PicoW-S3 Spec Sheet

SoC	ESP32-S3, Xtensa® 32-bit LX7 dual core
Basic frequency	240MHz MAX
Operating temperature	-40°C~+85°C
On-chip ROM	384KB
On-chip SRAM	320KB
Extetreal FLASH	8MB

In-packge PSRAM	2MB
WIFI	IEEE 802.11 b/g/n, 2.4Ghz band, 150Mbps
Bluetooth	Bluetooth 5, Bluetooth mesh
GPIO	BPI-PicoW-S3 has led out 27 available GPIOs
ADC	2 × 12-bit SAR ADC supporting 18 analog channel inputs
TOUCH Capacitive Touch Sensor	14
SPI	4
I2C	2. Support master or slave mode
I2S	2, input and output of serial stereo data
LCD	1, support 8-bit ~16-bit parallel RGB, I8080, MOTO6800 interface
CAMERA	1, supports 8-bit ~16-bit DVP image sensor interface
UART	3, supports asynchronous communication (RS232 and RS485) and IrDA
PWM	8 independent channels, 14-bit precision
MCPWM	2
USB	1 × Full Speed USB 2.0 OTG, MicroUSB Female
USB Serial/JTAG Controller	1, USB full speed standard, CDC-ACM, JTAG

Temperature sensor	1, the measurement range is $-20\text{ }^{\circ}\text{C}$ to $110\text{ }^{\circ}\text{C}$ , for monitoring the internal temperature of the chip
SD/MMC	1 $\times$ SDIO host interface, with 2 card slots, supports SD card 3.0 and 3.01, SDIO 3.0, CE-ATA 1.1, MMC 4.41, eMMC 4.5 and 4.51
TWAI® Controller	1, compatible with ISO11898-1 (CAN specification 2.0)
Generic DMA Controller	5 receive channels and 5 transmit channels
RMT	4-channel transmit, 4-channel receive, shared 384 $\times$ 32-bit RAM
Pulse Counter	4 pulse count controllers (units), each unit has 2 independent channels
Timer	4 $\times$ 54-bit general-purpose timers, 16-bit clock prescaler, 1 $\times$ 52-bit system timer, 3 $\times$ watchdog timers
External crystal	40Mhz
RTC and Low Power Management	Power Management Unit (PMU) + Ultra Low Power Coprocessor (ULP)
Low power consumption current	10uA
Working Voltage	3.3V
Input voltage	3.3V~5.5V
Maximum discharge current	2A@3.3V DC/DC
Controllable full color LED	1
Controllable monochrome LED	1

## Hardware Size



**BPI-PicoW-S3 size chart**

Pin spacing	2.54mm
Hole Spacing	11.4mm/ 47mm
Hole size	Inner diameter 2.1mm/Outer diameter 3.4mm
Mainboard size	21 × 51.88(mm)/0.83 x 2.04(inches)
Thickness	1.2mm

The pin spacing is compatible with universal boards (hole boards, dot matrix boards) and breadboards, which is convenient for debugging applications.

## GPIO define

**BPI-PicoW-S3 peripheral GPIO pin assignment**

Peripheral Interface	Signal	Pins
ADC	ADC1_CH0~9	GPIO 1~10

	ADC2_CH0~9	GPIO 11~20
Touch Sensor	TOUCH1~14	GPIO 1~14
JTAG	MTCK	GPIO 39
	MTDO	GPIO 40
	MTDI	GPIO 41
	MTMS	GPIO 42
UART	<i>Default assigned pins, can be redefined as any GPIO</i>	
	U0RXD_in	GPIO 44
	U0CTS_in	GPIO 16
	U0DSR_in	Any GPIO
	U0TXD_out	GPIO43
	U0RTS_out	GPIO 15
	U0DTR_out	Any GPIO
	U1RXD_in	GPIO 18
	U1CTS_in	GPIO 20
	U1DSR_in	Any GPIO
	U1TXD_out	GPIO 17

	U1RTS_out	GPIO 19
	U1DTR_out	Any GPIO
	U2	Any GPIO
I2C	Any GPIO	
PWM	Any GPIO	
I2S	Any GPIO	
LCD	Any GPIO	
CAMERA	Any GPIO	
RMT	Any GPIO	
SPI0/1	Used for FLASH and PSRAM	
SPI2/3	Any GPIO	
Pulse Counter	Any GPIO	
USB OTG	D-	GPIO 19 (internal PHY)
	D+	GPIO 20 (internal PHY)
	VP	GPIO 42 (External PHY)
	VM	GPIO 41 (External PHY)
	RCV	GPIO21 (External PHY)



	OEN	GPIO 40 (External PHY)
	VPO	GPIO 39 (External PHY)
	VMO	GPIO38 (External PHY)
USB Serial/JTAG	D-	GPIO 19 (internal PHY)
	D+	GPIO 20 (internal PHY)
	VP	GPIO 42 (External PHY)
	VM	GPIO 41 (External PHY)
	OEN	GPIO 40 (External PHY)
	VPO	GPIO 39 (External PHY)
	VMO	GPIO38 (External PHY)
SD/MMC	Any GPIO	
MCPWM	Any GPIO	
TWAI	Any GPIO	
Full Color LED	GPIO 48	
Monochrome LED	GPIO 46	