{{title}}

Pre-release version 2022-04-08

This is an pre-release migration guide and the contents are subject to change.

The Particle P2 module is the next generation Wi-Fi module from Particle. It is footprint compatible with our prior module, the P1, but is built on an upgraded chipset, supporting advanced features such as 5 GHz Wi-Fi, a 200MHz CPU, and built-in Bluetooth BLE 5.0.

Feature	P2	P1	Photon	Argon
Style	SMD	SMD	Pin Module	Pin Module
Status LEDs	†	†	✓	✓
Reset and Mode Buttons	†	†	✓	✓
USB Connector	†	†	Micro B	Micro B
D7 Blue LED			✓	✓
LiPo Connector				✓
Battery Charger				✓
User application size	2048 KB (2 MB)	128 KB	128KB	256 KB
Flash file system[1]	2 MB			2 MB
MCU	RTL8721DM	STM32F205RGY6	STM32F205RGY6	nRF52840
	Realtek Semiconductor	ST Microelectronics	ST Microelectronics	Nordic Semiconductor
CPU	Cortex M33 @ 200 MHz	Cortex M3 @ 120 MHz	Cortex M3 @ 120 MHz	Cortex M3 @ 64 MHz
	Cortex M23 @ 20 MHz			
RAM[2]	512 KB	128KB	128 KB	256 KB

Flash[3]	16 MB	1 MB	1 MB	1 MB
Hardware FPU	✓			✓
Secure Boot	✓			
Trust Zone	✓			}
				}
Wi-Fi	802.11 a/b/g/n	802.11 b/g/n	802.11 b/g/n	802.11 b/g/n
2.4 GHz	✓	✓	✓	✓
5 GHz	✓			
Bluetooth	BLE 5.0			BLE 5.0
NFC Tag				External antenna required
Antenna	Shared for Wi-Fi and BLE	Wi-Fi only	Wi-Fi only	Separate Wi-Fi and BLE antennas
	Built-in PCB antenna (Wi-Fi & BLE)	Built-in PCB antenna (Wi-Fi)	Built-in chip antenna (Wi-Fi)	Built-in chip antenna (BLE)
				Required external antenna (Wi-Fi)
	Optional external (Wi-Fi & BLE)[4]	Optional external (Wi-Fi)[4]	Optional external (Wi-Fi)[4]	Optional external (BLE)[4]
Peripherals	USB 2.0	USB 1.1	USB 1.1	USB 1.1
Digital GPIO	22	24	18	20
Analog (ADC)	6	13	8	6
Analog (DAC)		2	2	
UART	1	2	2[6]	1
SPI	2	2	2	2
PWM	6	12	9	8
I2C	1	1	1	1
CAN		1	1	
I2S		1[5]	1[5]	1
JTAG		✓	✓	
SWD	✓	✓	✓	✓

† Optional but recommended. Add to your base board.

[1]A small amount of the flash file system is used by Device OS, most is available for user data storage using the POSIX filesystem API. This is separate from the flash memory used for Device OS, user application, and OTA transfers.

[2] Total RAM; amount available to user applications is smaller.

[3] Total built-in flash; amount available to user applications is smaller. The Argon also has a 4 MB external flash, a portion of which is available to user applications as a flash file system.

[4] Onboard or external antenna is selectable in software.

[5] The STM32 hardware supports I2S but there is no software support in Device OS or 3rd-party libraries.

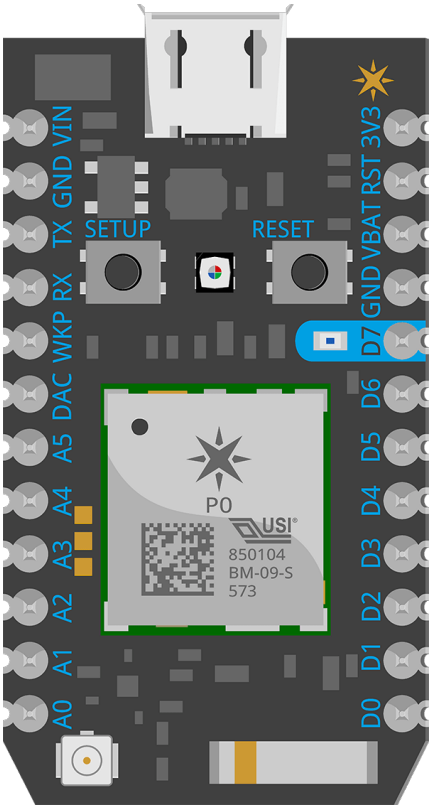
[6] The second UART on the Photon shares pins with the status LED, and requires unsoldering it (or its current limiting resistors) and using pads on the bottom of the module, making it impractical to

use.

Hardware

MODULE STYLE

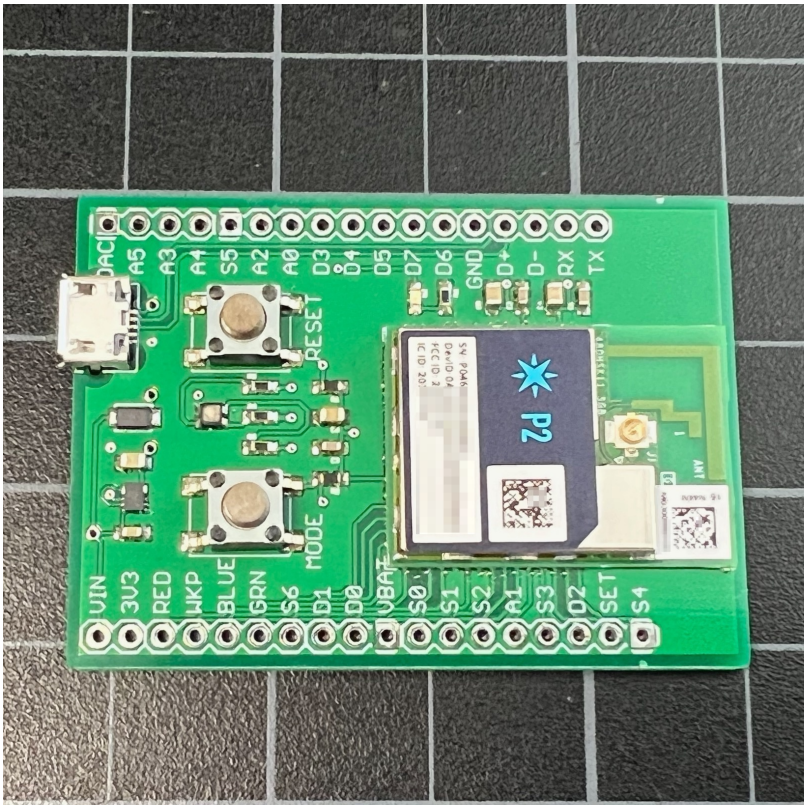
The primary difference is that the Photon is a pin-based module that can be installed in solderless breadboard for prototyping, can be installed in a socket on your custom board, or soldered directly to your board.



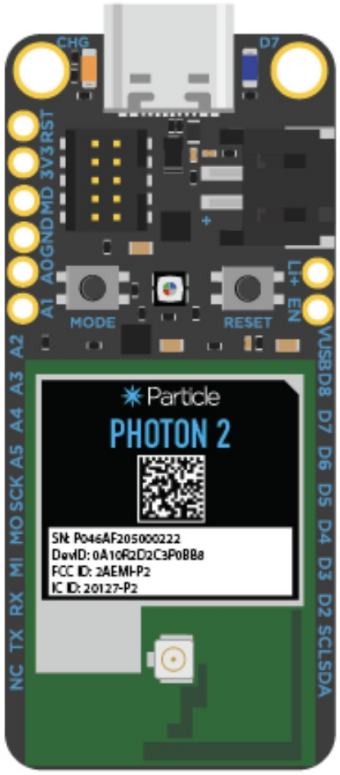
The P2 is only available as a SMD (surface mount device) that is typically reflow soldered to your base board. Your base board will need to be a custom printed circuit board, and cannot be a solderless breadboard or perforated prototyping board.

This can be done in small quantities by hand using a reflow oven or soldering hot plate. In quantity, it would be done by your PCBA (PCB with assembly) contractor.

This is a P2 on a hand-assembled P1 tutorial board, not an actual product. It was reflow soldered in an inexpensive T960 reflow oven.



The Photon 2 is a pin-based module that contains a P2, and may be appropriate in many cases. If you are planning on scaling, it may be advantageous to migrate from the Photon directly to the P2 as the Photon and Photon 2 are not pin-compatible and will require a redesign of your base board anyway.



STATUS LED

The P2 does not include a status LED on the module. We recommend adding one to your base board.

Alternatively, if you have a separate hardware control panel, it provides the ability to put the RGB LED there and not duplicate it on the module or base board.

Device OS assumes a common anode RGB LED. One common LED that meets the requirements is the Cree CLMVC-FKA-CL1D1L71BB7C3C3 which is inexpensive and easily procured. You need to add three current limiting resistors. With this LED, we typically use 1K ohm current limiting resistors. These are much larger than necessary. They make the LED less blinding but still provide sufficient current to light the LEDs. If you want maximum brightness you should use the calculated values - 33 ohm on red, and 66 ohm on green and blue.

If you are using a different LED, you should limit current to 2mA per color.

A detailed explanation of different color codes of the RGB system LED can be found here.

RESET AND MODE BUTTONS

The P2 does not include buttons on module. We highly recommend including reset and mode buttons on your base board.

For example, you could use two-inexpensive SMD switches. The 4.5mm E-Switch TL3305AF160QG costs $0.20 in single quantities.

USB CONNECTOR

The P2 does not include a USB connector on the module. We recommend including one on your base board. This can be a USB Micro B, as on the Photon and Argon, or you could use USB C.

Since you choose the connector you have the option of using a right-angle USB connector. This is handy if your board will be an enclosure where the board is recessed into the case under a removable cover. This can allow the USB connector to be accessed without removing the board from the enclosure.

Part	Example	Price
USB micro B connector	Amphenol FCI 10118194-0001LF	$0.42
CONN RCPT USB2.0 MICRO B SMD R/A	Amphenol FCI 10118194-0001LF	$0.42

SWD/JTAG

The P2 does not include a SWD/JTAG debugging connector on the board. We recommend including the following pins available for debugging:

Pin	Pin Name	Description	Interface	MCU
1	GND	Ground. Be sure you connect all P1 ground pins.		
34	RST	Hardware reset. Pull low to reset; can leave unconnected in normal operation.		CHIP_EN
54	D7	D7 GPIO, SWDIO	SWDIO	PA[27]
55	D6	D6 GPIO, SWCLK	SWCLK	PB[3]

TROUBLESHOOTING CONNECTOR

In some cases, you may want to omit the reset and mode buttons, status LED, USB connector, and SWD/JTAG pins from your board board. If you do, we highly recommend adding a debug

connector to make these features available for troubleshooting. The debug connector could be an actual connector, header pins, socket, card-edge connector, or SMD pads that allow an adapter or daughter card with these features.

VOLTAGE REGULATOR

The P2 requires regulated 3.3VDC at 500 mA. An voltage regulator is required on your base board if powering by USB (5V), LiPo (3.7V), or an external power source.

As of the first half of 2022, supply chain constraints are affecting the availability of voltage regulator components. There is no Device OS software dependency on the voltage regulator so you can choose any model as long as it meets the voltage and current requirements.

- This is often a switching regulator to save space, but this is not required.
  - The Photon used a Richtek RT8008 (3.3V), which is hard to procure.
  - The Argon used a Torex XCL223, which is no longer available. The pin compatible XCL224 is also no longer available.
- If the input voltage is close to 3.3V, such as 5V USB, a linear regulator can be used.

VBAT

On the Photon, a lithium coin cell or supercap can be attached to the VBAT pin to keep the real-time clock running, and keep the backup SRAM (retained memory).

This feature is not available on the P2 or Gen 3 devices.

NO 5V TOLERANCE!

On Gen 2 devices (STM32F205), most pins are 5V tolerant. This is not the case for Gen 3 (nRF52840) and the P2 (RTL872x). You must not exceed 3.3V on any GPIO pin, including ports such as serial, I2C, and SPI.

PINS A3, A4, AND DAC (A6)

Pins A3, A4, DAC/A6 do not exist on the P2 and are NC.

You will need to use different pins if you are currently using these pins. There are a large number of additional pins (S0 - S6), however.

SPI

Both the Photon and P2 have two SPI ports, however the pins are different for primary SPI port.

The following are all SPI-related pins on the Photon and P2:

Photon Pin Name	Photon SPI	P2 Pin Name	P2 SPI
A2	SPI (SS)	A2 / D13	
A3	SPI (SCK)	D0 / A3	
A4	SPI (MISO)	D1 / A4	
A5	SPI (MOSI)	A5 / D14	
D2	SPI1 (MOSI)	D2	SPI1 (MOSI)

D3	SPI1 (MISO)	D3	SPI1 (MISO)
D4	SPI1 (SCK)	D4	SPI1 (SCK)
D5	SPI1 (SS)	D5	SPI1 (SS)
		S0 / D15	SPI (MOSI)
		S1 / D16	SPI (MISO)
		S2 / D17	SPI (SCK)
		S3 / D18	SPI (SS)

SPI - Gen 2 devices (including Photon and P1)

	SPI	SPI1
Maximum rate	30 MHz	15 MHz
Default rate	15 MHz	15 MHz
Clock	60 MHz	30 MHz

- Available clock divisors: 2, 4, 8, 16, 32, 64, 128, 256

SPI - P2

	SPI	SPI1
Maximum rate	25 MHz	50 MHz
Hardware peripheral	RTL872x SPI1	RTL872x SPI0

I2C

The P2 supports one I2C (two-wire serial interface) port on the same pins as the Photon.

However on the P2, D0 is shared with A3 and D1 is shared with D4, so you cannot use A3 and A4 at the same time as I2C.

Photon Pin Name	Photon I2C	P2 Pin Name	P2 I2C
A3		D0 / A3	Wire (SDA)
A4		D1 / A4	Wire (SCL)
D0	Wire (SDA)	D0 / A3	Wire (SDA)
D1	Wire (SCL)	D1 / A4	Wire (SCL)

- The P2 I2C port is not 5V tolerant

SERIAL (UART)

The primary UART serial (`Serial1`) is on the TX and RX pins on both the Photon and P2. There is no hardware flow control on this port on the Photon or P2.

The secondary UART serial (`Serial2`) is on different pins and also supports CTS/RTS hardware flow control.

On the Photon, the Serial2 port is shared with the RGB LED, and the Photon must be modified to remove the LED or the current limiting resistors, so using Serial2 on the Photon is impractical.

Photon Pin Name	Photon Serial	P2 Pin Name	P2 Serial
D2		D2	Serial2 (RTS)

D3		D3	Serial2 (CTS)
D4		D4	Serial2 (TX)
D5		D5	Serial2 (RX)
RGBB	Serial2 (RX)	RGBB	
RGBG	Serial2 (TX)	RGBG	
RX	Serial1 (RX)	RX / D9	Serial1 (RX)
TX	Serial1 (TX)	TX / D8	Serial1 (TX)

	Photon	P2
Buffer size	64 bytes	2048 bytes
7-bit mode	✓	✓
8-bit mode	✓	✓
9-bit mode	✓	
1 stop bit	✓	✓
2 stop bits	✓	✓
No parity	✓	✓
Even parity	✓	✓
Odd parity	✓	✓
Break detection	✓	
LIN bus support	✓	
Half duplex	✓	
CTS/RTS flow control		✓[1]

[1]CTS/RTS flow control only on Serial2. It is optional.

Supported Baud Rates:

Baud Rate	P1	P2
110		✓
300		✓
600		✓
1200	✓	✓
2400	✓	
4800	✓	
9600	✓	✓
14400		✓
19200	✓	✓
28800		✓
38400	✓	✓
57600	✓	✓
76800		✓
115200	✓	✓
128000		✓
153600		✓
230400	✓	✓
500000		✓
921600		✓

1000000	✓
1382400	✓
1444400	✓
1500000	✓
1843200	✓
2000000	✓
2100000	✓
2764800	✓
3000000	✓
3250000	✓
3692300	✓
3750000	✓
4000000	✓
6000000	✓

ANALOG INPUT (ADC)

For analog to digital conversion (ADC) using `analogRead()`, there are fewer ADC inputs on the P2:

Photon Pin Name	Photon ADC	P2 Pin Name	P2 ADC
A0	✓	A0 / D11	✓
A1	✓	A1 / D12	✓
A2	✓	A2 / D13	✓
A3	✓	D0 / A3	✓
A4	✓	D1 / A4	✓
A5	✓	A5 / D14	✓
D0		D0 / A3	✓
D1		D1 / A4	✓
DAC / A6	✓		
WKP / A7	✓	D10 / WKP	

On the P2, there are no pins A3 (hardware pin 21) and A4 (hardware pin 22); these are NC (no connection). However, P2 pin D0 (hardware pin 36) can be used as an analog input and has the alias A3. The same is true for P2 pin D1 (hardware pin 35), which has the alias A4.

The `setADCSampleTime()` function is not supported on the P2.

PWM (PULSE-WIDTH MODULATION)

The pins that support PWM are different on the Photon and P2.

Photon Pin Name	Photon PWM	P2 Pin Name	P2 PWM
A2		A2 / D13	✓
A3		D0 / A3	✓
A4	Yes. D3 and A4 share the same PWM channel and the PWM duty cycle is set for both.	D1 / A4	✓
A5	Yes. D2 and A5 share the same PWM channel and the PWM duty cycle is set for both.	A5 / D14	✓

D0	✓	D0 / A3	✓
D1	✓	D1 / A4	✓
D2	Yes. D2 and A5 share the same PWM channel and the PWM duty cycle is set for both.	D2	
D3	Yes. D3 and A4 share the same PWM channel and the PWM duty cycle is set for both.	D3	
RX	✓	RX / D9	
		S0 / D15	✓
		S1 / D16	✓
TX	✓	TX / D8	
WKP / A7	✓	D10 / WKP	

All available PWM pins on the P2 share a single timer. This means that they must all share a single frequency, but can have different duty cycles.

DIGITAL TO ANALOG CONVERTER (DAC)

The Photon supports DAC one A3 and A6 (DAC). There is no DAC on the P2 or Gen 3 devices.

If you need a DAC, it's easy to add one via I2C or SPI on your base board.

Photon Pin Name	Photon DAC	P2 Pin Name	P2 DAC
A3	✓	D0 / A3	
DAC / A6	✓		

WKP (A7)

	Photon	P2
Module Pin	30	30
Pin Name	WKP	WKP
	A7	D11
Analog Input	✓	
PWM	✓	

On Gen 2 devices (STM32), only the WKP pin can wake from HIBERNATE sleep mode.

This restriction does not exist on the P2 and Gen 3 devices; any pin can be used to wake from all sleep modes.

CAN (CONTROLLER AREA NETWORK)

The Photon supports CAN on pins D1 and D2. There is no CAN on the P2 or Gen 3 devices (except the Tracker).

- The Tracker SoM includes CAN via a MCP25625 CAN interface with integrated transceiver.
- Both the MCP2515 and MCP25625 work with the library used on the Tracker and can be used to add CAN to the P2.

Photon Pin Name	Photon CAN	P2 Pin Name	P2 CAN
D1	CAN2_TX	D1 / A4	
D2	CAN2_RX	D2	

I2S (SOUND)

The Photon theoretically had I2S sound available on pins D1 and D2, however there has never been support for it in Device OS.

There is no software support for I2S on the P2 either, and while the RTL872x hardware supports I2S, the pins that it requires are in use by other ports.

Photon Pin Name	Photon I2S	P2 Pin Name	P2 I2S
D2	I2S3_SD	D2	
D4	I2S3_SCK	D4	
D5	I2S3_WS	D5	
SETUP	I2S3_MCK	SETUP	

INTERRUPTS

There are many limitations for interrupts on the STM32F205. All pins can be used for interrupts on Gen 3 devices and the P2.

RETAINED MEMORY

Retained memory, also referred to as Backup RAM or SRAM, that is preserved across device reset, is not available on the P2. This also prevents system usage of retained memory, including session resumption on reset.

On Gen 2 and Gen 3 devices, retained memory is 3068 bytes.

The flash file system can be used for data storage on the P2, however care must be taken to avoid excessive wear of the flash for frequently changing data.

FLASH FILE SYSTEM

The Photon did not have a flash file system.

The P2 has a 2 MB flash file system using the same POSIX API as Gen 3 devices. A small amount of space is reserved for system use including configuration data. Most of the space is available for user application use.

EEPROM

The EEPROM emulation API is the same across the Photon and P2.

The Photon had 2047 bytes of emulated EEPROM. The P2 has 4096 bytes of emulated EEPROM. On the P2 and Gen 3 devices, the EEPROM is actually just a file on the flash file system.

PIN FUNCTIONS REMOVED

The following pins served Photon-specific uses and are NC on the P2. You should not connect anything to these pins.

- Pins A3 and A4 on the P2 are shared with D0 and D1. You cannot use A3 and A4 at ths same time as I2C (`Wire`) on the P2.

Pin Name	Description
DAC / A6	DAC/A6 True analog out, analog in, GPIO.
VBAT	Battery for internal real-time clock, backup registers, and SRAM. Supply 1.65VDC to 3.6 VDC at 19 µA..
VIN	Power in 3.6V to 5.5 VDC. Or power out (when powered by USB) 4.8 VDC at 1A maximum.

PIN FUNCTIONS ADDED

Pin	Pin Name	Description
5	3V3_IO	3.3V power to MCU IO.
2	3V3_RF	3.3V power to RF module
40	S0 / D15	S0 GPIO, PWM, SPI MOSI. (Was P1S0 on P1.)
41	S1 / D16	S1 GPIO, PWM, SPI MISO. (Was P1S1 on P1.)
42	S2 / D17	S2 GPIO, SPI SCK. (Was P1S2 on P1.)
44	S3 / D18	S3 GPIO. (Was P1S3 on P1.), SPI SS
47	S4 / D19	S4 GPIO. (Was P1S4 on P1.)
48	S5 / D20	S5 GPIO. (Was P1S5 on P1.)
33	S6 / D21	S6 GPIO. (Was P1S6/TESTMODE on P1.)
12	VBAT_MEAS	Battery voltage measurement (optional).

RECOMMENDED PIN MAPPINGS

SPI prioritized

In this mapping, the SPI pins are preserved from Photon to P2 at the expense of two ADCs. Note, however, that SS can be any pin, so you could a different pin for SS and preserve the use of A2 as an ADC.

Photon Pin Name	Photon Description	P2 Pin Name	P2 Description	P2 Pin Number	MCU
A0	A0 Analog in, GPIO	A0 / D11	A0 Analog in, GPIO	50	PB[1]
A1	A1 Analog in, GPIO	A1 / D12	A1 Analog in, GPIO	43	PB[2]
A2	A2 Analog in, GPIO, SPI SS	S3 / D18	S3 GPIO. (Was P1S3 on P1.), SPI SS	44	PB[26]
A3	A3 True analog out, analog in, GPIO.	S2 / D17	S2 GPIO, SPI SCK. (Was P1S2 on P1.)	42	PA[14]
A4	A4 Analog in, GPIO, SPI MISO.	S1 / D16	S1 GPIO, PWM, SPI MISO. (Was P1S1 on P1.)	41	PA[13]
A5	A5 Analog in, GPIO, SPI MOSI.	S0 / D15	S0 GPIO, PWM, SPI MOSI. (Was P1S0 on P1.)	40	PA[12]
D0	D0 GPIO, I2C SDA	D0 / A3	D0 GPIO, PWM, I2C SDA, A3 Analog In	36	PB[6]
D1	D0 GPIO, I2C SCL, CAN TX	D1 / A4	D1 GPIO, PWM, I2C SCL, A4 Analog In	35	PB[5]
D2	D2 GPIO, SPI1 MOSI, CAN RX	D2	D2 GPIO, Serial2 RTS, SPI1 MOSI	45	PA[16]
D3	D3 GPIO, SPI1 MISO	D3	D3 GPIO, Serial2 CTS, SPI1 MISO	51	PA[17]
D4	D4 GPIO, SPI1 SCK	D4	D4 GPIO, Serial2 TX, SPI1 SCK	52	PA[18]
D5	D5 GPIO, SPI1 SS	D5	D5 GPIO, Serial2 RX, SPI1 SS	53	PA[19]
D6	D6 GPIO, SWCLK	D6	D6 GPIO, SWCLK	55	PB[3]
D7	D7 GPIO, Blue LED, SWDIO	D7	D7 GPIO, SWDIO	54	PA[27]

DAC / A6	DAC/A6 True analog out, analog in, GPIO.	S5 / D20	S5 GPIO. (Was P1S5 on P1.)	48	PB[29]
RX	Serial1 RX (received data), GPIO, PWM.	RX / D9	Serial1 RX (received data), GPIO	63	PA[8]
TX	Serial1 TX (transmitted data), GPIO, PWM.	TX / D8	Serial1 TX (transmitted data), GPIO	64	PA[7]
WKP / A7	WKP/A7 Wakeup (active high), analog in, GPIO.	S6 / D21	S6 GPIO. (Was P1S6/TESTMODE on P1.)	33	PB[31]

ADC prioritized

In this mapping, there are two more ADC pins, but primary SPI on the A pins cannot be used.

Photon Pin Name	Photon Description	P2 Pin Name	P2 Description	P2 Pin Number	MCU
A0	A0 Analog in, GPIO	A0 / D11	A0 Analog in, GPIO	50	PB[1]
A1	A1 Analog in, GPIO	A1 / D12	A1 Analog in, GPIO	43	PB[2]
A2	A2 Analog in, GPIO, SPI SS	A2 / D13	A2 Analog in, PWM, GPIO	49	PB[7]
A3	A3 True analog out, analog in, GPIO.	A2 / D13	A2 Analog in, PWM, GPIO	49	PB[7]
A5	A5 Analog in, GPIO, SPI MOSI.	A5 / D14	A5 Analog in, GPIO, PWM.	23	PB[4]
D0	D0 GPIO, I2C SDA	D0 / A3	D0 GPIO, PWM, I2C SDA, A3 Analog In	36	PB[6]
D1	D0 GPIO, I2C SCL, CAN TX	D1 / A4	D1 GPIO, PWM, I2C SCL, A4 Analog In	35	PB[5]
D2	D2 GPIO, SPI1 MOSI, CAN RX	D2	D2 GPIO, Serial2 RTS, SPI1 MOSI	45	PA[16]
D3	D3 GPIO, SPI1 MISO	D3	D3 GPIO, Serial2 CTS, SPI1 MISO	51	PA[17]
D4	D4 GPIO, SPI1 SCK	D4	D4 GPIO, Serial2 TX, SPI1 SCK	52	PA[18]
D5	D5 GPIO, SPI1 SS	D5	D5 GPIO, Serial2 RX, SPI1 SS	53	PA[19]
D6	D6 GPIO, SWCLK	D6	D6 GPIO, SWCLK	55	PB[3]
D7	D7 GPIO, Blue LED, SWDIO	D7	D7 GPIO, SWDIO	54	PA[27]
DAC / A6	DAC/A6 True analog out, analog in, GPIO.	S5 / D20	S5 GPIO. (Was P1S5 on P1.)	48	PB[29]
RX	Serial1 RX (received data), GPIO, PWM.	RX / D9	Serial1 RX (received data), GPIO	63	PA[8]
TX	Serial1 TX (transmitted data), GPIO, PWM.	TX / D8	Serial1 TX (transmitted data), GPIO	64	PA[7]
WKP / A7	WKP/A7 Wakeup (active high), analog in, GPIO.	S6 / D21	S6 GPIO. (Was P1S6/TESTMODE on P1.)	33	PB[31]

FULL MODULE PIN COMPARISON

3V3

	Photon	P2
Pin Number	24	26
Pin Name	3V3	3V3
Description	Regulated 3.3V DC output, maximum load 100 mA. Or input 3.0V to 3.6V.	3.3V power to MCU

3V3_IO

	Added to P2
Pin Number	5
Pin Name	3V3_IO
Description	3.3V power to MCU IO.

3V3_RF

	Added to P2
Pin Number	2
Pin Name	3V3_RF
Description	3.3V power to RF module

A0

	Photon	P2
Pin Number	12	50
Pin Name	A0	A0
Pin Alternate Name	n/a	D11
Description	A0 Analog in, GPIO	A0 Analog in, GPIO
Supports digitalRead	Yes	Yes
Supports digitalWrite	Yes	Yes
Supports analogRead	Yes	Yes
Supports attachInterrupt	Yes. D2, A0, and A3 share the same interrupt handler.	Yes
Input is 5V Tolerant	Yes	No

A1

	Photon	P2
Pin Number	11	43
Pin Name	A1	A1
Pin Alternate Name	n/a	D12
Description	A1 Analog in, GPIO	A1 Analog in, GPIO
Supports digitalRead	Yes	Yes
Supports digitalWrite	Yes	Yes
Supports analogRead	Yes	Yes
Supports attachInterrupt	Yes. D4 and A1 share the same interrupt handler.	Yes
Input is 5V Tolerant	Yes	No

A2

	Photon	P2
Pin Number	10	49
Pin Name	A2	A2
Pin Alternate Name	n/a	D13
Description	A2 Analog in, GPIO, SPI SS	A2 Analog in, PWM, GPIO
Supports digitalRead	Yes	Yes
Supports digitalWrite	Yes	Yes
Supports analogRead	Yes	Yes

Supports analogWrite (PWM)	No	Yes
Supports tone	No	Yes
SPI interface	SS. Use SPI object. This is only the default SS/CS pin, you can use any GPIO instead.	n/a
Supports attachInterrupt	Yes	Yes
Input is 5V Tolerant	Yes	No

A3

	Photon	P2
Pin Number	9	36
Pin Name	A3	D0
Pin Alternate Name	n/a	A3
Description	A3 True analog out, analog in, GPIO.	D0 GPIO, PWM, I2C SDA, A3 Analog In
Supports digitalRead	Yes	Yes
Supports digitalWrite	Yes	Yes
Supports analogRead	Yes	Yes
Supports analogWrite (DAC)	Yes	No
Supports analogWrite (PWM)	No	Yes
Supports tone	No	Yes
SPI interface	SCK. Use SPI object.	n/a
I2C interface	n/a	SDA. Use Wire object. Use 1.5K to 10K external pull-up resistor.
Supports attachInterrupt	Yes. D2, A0, and A3 share the same interrupt handler.	Yes

A4

	Photon	P2
Pin Number	8	35
Pin Name	A4	D1
Pin Alternate Name	n/a	A4
Description	A4 Analog in, GPIO, SPI MISO.	D1 GPIO, PWM, I2C SCL, A4 Analog In
Supports digitalRead	Yes	Yes
Supports digitalWrite	Yes	Yes
Supports analogRead	Yes	Yes
Supports analogWrite (PWM)	Yes. D3 and A4 share the same PWM channel and the PWM duty cycle is set for both.	Yes
Supports tone	Yes. D3 and A4 share the same PWM channel and only one frequency can be set for both.	Yes
SPI interface	MISO. Use SPI object.	n/a
I2C interface	n/a	SCL. Use Wire object. Use 1.5K to 10K external pull-up resistor.

Supports attachInterrupt	Yes. D1 and A4 share the same interrupt handler.	Yes
Input is 5V Tolerant	Yes	No

A5

	Photon	P2
Pin Number	7	23
Pin Name	A5	A5
Pin Alternate Name	n/a	D14
Description	A5 Analog in, GPIO, SPI MOSI.	A5 Analog in, GPIO, PWM.
Supports digitalRead	Yes	Yes
Supports digitalWrite	Yes	Yes
Supports analogRead	Yes	Yes
Supports analogWrite (PWM)	Yes. D2 and A5 share the same PWM channel and the PWM duty cycle is set for both.	Yes
Supports tone	Yes. D2 and A5 share the same PWM channel and only one frequency can be set for both.	Yes
SPI interface	MOSI. Use SPI object.	n/a
Supports attachInterrupt	No	Yes
Input is 5V Tolerant	Yes	No

D0

	Photon	P2
Pin Number	13	36
Pin Name	D0	D0
Pin Alternate Name	n/a	A3
Description	D0 GPIO, I2C SDA	D0 GPIO, PWM, I2C SDA, A3 Analog In
Supports digitalRead	Yes	Yes
Supports digitalWrite	Yes	Yes
Supports analogRead	No	Yes
Supports analogWrite (PWM)	Yes	Yes
Supports tone	Yes	Yes
I2C interface	SDA. Use Wire object. Use 1.5K to 10K external pull-up resistor. Is 5V tolerant.	SDA. Use Wire object. Use 1.5K to 10K external pull-up resistor.
Supports attachInterrupt	No	Yes
Input is 5V Tolerant	Yes	No

D1

	Photon	P2

Pin Number	14	35
Pin Name	D1	D1
Pin Alternate Name	n/a	A4
Description	D0 GPIO, I2C SCL, CAN TX	D1 GPIO, PWM, I2C SCL, A4 Analog In
Supports digitalRead	Yes	Yes
Supports digitalWrite	Yes	Yes
Supports analogRead	No	Yes
Supports analogWrite (PWM)	Yes	Yes
Supports tone	Yes	Yes
I2C interface	SCL. Use Wire object. Use 1.5K to 10K external pull-up resistor. Is 5V tolerant.	SCL. Use Wire object. Use 1.5K to 10K external pull-up resistor.
Supports attachInterrupt	Yes. D1 and A4 share the same interrupt handler.	Yes
CAN interface	CAN2_TX	n/a
Input is 5V Tolerant	Yes	No

D2

	Photon	**P2**
Pin Number	15	45
Pin Name	D2	D2
Description	D2 GPIO, SPI1 MOSI, CAN RX	D2 GPIO, Serial2 RTS, SPI1 MOSI
Supports digitalRead	Yes	Yes
Supports digitalWrite	Yes	Yes
Supports analogWrite (PWM)	Yes. D2 and A5 share the same PWM channel and the PWM duty cycle is set for both.	No
Supports tone	Yes. D2 and A5 share the same PWM channel and only one frequency can be set for both.	No
UART serial	n/a	RTS. Use Serial2 object. Flow control optional.
SPI interface	MOSI. Use SPI1 object.	MOSI. Use SPI1 object.
Supports attachInterrupt	Yes. D2, A0, and A3 share the same interrupt handler.	Yes
CAN interface	CAN2_RX	n/a
I2S interface	I2S3_SD	n/a
Input is 5V Tolerant	Yes	No

D3

	Photon	**P2**
Pin Number	16	51
Pin Name	D3	D3

Description	D3 GPIO, SPI1 MISO	D3 GPIO, Serial2 CTS, SPI1 MISO
Supports digitalRead	Yes	Yes
Supports digitalWrite	Yes	Yes
Supports analogWrite (PWM)	Yes. D3 and A4 share the same PWM channel and the PWM duty cycle is set for both.	No
Supports tone	Yes. D3 and A4 share the same PWM channel and only one frequency can be set for both.	No
UART serial	n/a	CTS. Use Serial2 object. Flow control optional.
SPI interface	MISO. Use SPI1 object.	MISO. Use SPI1 object.
Supports attachInterrupt	Yes. D3 and DAC/A6 share the same interrupt handler.	Yes
Input is 5V Tolerant	Yes	No
JTAG interface	JTAG RST. 40K pull-up at boot.	n/a

D4

	Photon	**P2**
Pin Number	17	52
Pin Name	D4	D4
Description	D4 GPIO, SPI1 SCK	D4 GPIO, Serial2 TX, SPI1 SCK
Supports digitalRead	Yes	Yes
Supports digitalWrite	Yes	Yes
UART serial	n/a	TX. Use Serial2 object.
SPI interface	SCK. Use SPI1 object.	SCK. Use SPI1 object.
Supports attachInterrupt	Yes. D4 and A1 share the same interrupt handler.	Yes
I2S interface	I2S3_SCK	n/a
Input is 5V Tolerant	Yes	No
JTAG interface	JTAG TDO. Floating at boot.	n/a

D5

	Photon	**P2**
Pin Number	18	53
Pin Name	D5	D5
Description	D5 GPIO, SPI1 SS	D5 GPIO, Serial2 RX, SPI1 SS
Supports digitalRead	Yes	Yes
Supports digitalWrite	Yes	Yes
UART serial	n/a	RX. Use Serial2 object.
SPI interface	SS. Use SPI1 object. Can use any pin for SPI1 SS/CS however.	SS. Use SPI1 object. Can use any pin for SPI1 SS/CS however.
Supports attachInterrupt	Yes	Yes
I2S interface	I2S3_WS	n/a
Input is 5V Tolerant	Yes	No

JTAG interface	JTAG TDI. 40K pull-up at boot.	n/a

D6

	Photon	P2
Pin Number	19	55
Pin Name	D6	D6
Description	D6 GPIO, SWCLK	D6 GPIO, SWCLK
Supports digitalRead	Yes	Yes
Supports digitalWrite	Yes	Yes
Supports attachInterrupt	Yes	Yes
Input is 5V Tolerant	Yes	No
JTAG interface	JTAG TCK. 40K pull-down at boot.	n/a
SWD interface	SWCLK. 40K pull-down at boot.	SWCLK. 40K pull-down at boot.

D7

	Photon	P2
Pin Number	20	54
Pin Name	D7	D7
Description	D7 GPIO, Blue LED, SWDIO	D7 GPIO, SWDIO
Supports digitalRead	Yes. But the on-board LED will light when 3.3V is supplied on this pin as well.	Yes.
Supports digitalWrite	Yes. Note that this controls the on-board blue LED.	Yes. On the Photon this is the blue D7 LED.
Supports attachInterrupt	Yes	Yes
JTAG interface	JTAG TMS. 40K pull-up at boot.	n/a
SWD interface	SWDIO. 40K pull-up at boot.	SWDIO. 40K pull-up at boot.

DAC

	Removed from Photon
Pin Number	6
Pin Name	DAC
Pin Alternate Name	A6
Description	DAC/A6 True analog out, analog in, GPIO.
Supports digitalRead	Yes
Supports digitalWrite	Yes
Supports analogRead	Yes
Supports analogWrite (DAC)	Yes
Supports attachInterrupt	Yes. D3 and DAC/A6 share the same interrupt handler.

GND

	Photon	P2
Pin Number	2	1
Pin Name	GND	GND
Description	Ground. You only need to use one of the Photon ground pins.	Ground. Be sure you connect all P1 ground pins.

NC

	Added to P2
Pin Number	7
Pin Name	NC
Description	No connection. Do not connect anything to this pin.

RGBB

	Photon	P2
Pin Number	29	31
Pin Name	RGBB	RGBB
Description	RGB LED Blue	RGB LED Blue
UART serial	RX. Use Serial2 object.	n/a
Supports attachInterrupt	n/a	Yes
Input is 5V Tolerant	No, if LED is connected.	No

RGBG

	Photon	P2
Pin Number	28	32
Pin Name	RGBG	RGBG
Description	RGB LED Green	RGB LED Green
UART serial	TX. Use Serial2 object.	n/a
Supports attachInterrupt	n/a	Yes
Input is 5V Tolerant	No, if LED is connected.	No

RGBR

	Photon	P2
Pin Number	27	29
Pin Name	RGBR	RGBR
Description	RGB LED Red	RGB LED Red
Supports attachInterrupt	n/a	Yes
Input is 5V Tolerant	No, if LED is connected.	No

RST

	Photon	P2
Pin Number	23	34
Pin Name	RST	RST
Description	Hardware reset. Pull low to reset; can leave unconnected in normal operation.	Hardware reset. Pull low to reset; can leave unconnected in normal operation.

RX

	Photon	P2
Pin Number	4	63
Pin Name	RX	RX
Pin Alternate Name	n/a	D9
Description	Serial1 RX (received data), GPIO, PWM.	Serial1 RX (received data), GPIO

Supports digitalRead	Yes	Yes
Supports digitalWrite	Yes	Yes
Supports analogWrite (PWM)	Yes	No
Supports tone	Yes	No
UART serial	RX. Use Serial1 object.	RX. Use Serial1 object.
Supports attachInterrupt	Yes	Yes
Input is 5V Tolerant	Yes	No

S0

	Added to P2
Pin Number	40
Pin Name	S0
Pin Alternate Name	D15
Description	S0 GPIO, PWM, SPI MOSI. (Was P1S0 on P1.)
Supports digitalRead	Yes
Supports digitalWrite	Yes
Supports analogWrite (PWM)	Yes
Supports tone	Yes
SPI interface	MOSI. Use SPI object.
Supports attachInterrupt	Yes

S1

	Added to P2
Pin Number	41
Pin Name	S1
Pin Alternate Name	D16
Description	S1 GPIO, PWM, SPI MISO. (Was P1S1 on P1.)
Supports digitalRead	Yes
Supports digitalWrite	Yes
Supports analogWrite (PWM)	Yes
Supports tone	Yes
SPI interface	MISO. Use SPI object.
Supports attachInterrupt	Yes

S2

	Added to P2
Pin Number	42
Pin Name	S2
Pin Alternate Name	D17
Description	S2 GPIO, SPI SCK. (Was P1S2 on P1.)
Supports digitalRead	Yes
Supports digitalWrite	Yes
SPI interface	SCK. Use SPI object.
Supports attachInterrupt	Yes

S3

	Added to P2
Pin Number	44
Pin Name	S3
Pin Alternate Name	D18
Description	S3 GPIO. (Was P1S3 on P1.), SPI SS
Supports digitalRead	Yes
Supports digitalWrite	Yes
SPI interface	Default SS for SPI.
Supports attachInterrupt	Yes

S4

	Added to P2
Pin Number	47
Pin Name	S4
Pin Alternate Name	D19
Description	S4 GPIO. (Was P1S4 on P1.)
Supports digitalRead	Yes
Supports digitalWrite	Yes
Supports attachInterrupt	Yes

S5

	Added to P2
Pin Number	48
Pin Name	S5
Pin Alternate Name	D20
Description	S5 GPIO. (Was P1S5 on P1.)
Supports digitalWrite	Yes
Supports attachInterrupt	Yes

S6

	Added to P2
Pin Number	33
Pin Name	S6
Pin Alternate Name	D21
Description	S6 GPIO. (Was P1S6/TESTMODE on P1.)
Supports digitalRead	Yes
Supports digitalWrite	Yes
Supports attachInterrupt	Yes

SETUP

	Photon	P2
Pin Number	26	46
Pin Name	SETUP	SETUP

Description	SETUP button, has internal pull-up. Pin number constant is BTN.	SETUP button, has internal pull-up. Pin number constant is BTN.
Supports attachInterrupt	n/a	Yes
I2S interface	I2S3_MCK	n/a

TX

	Photon	P2
Pin Number	3	64
Pin Name	TX	TX
Pin Alternate Name	n/a	D8
Description	Serial1 TX (transmitted data), GPIO, PWM.	Serial1 TX (transmitted data), GPIO
Supports digitalRead	Yes	Yes
Supports digitalWrite	Yes	Yes
Supports analogWrite (PWM)	Yes	No
Supports tone	Yes	No
UART serial	TX. Use Serial1 object.	TX. Use Serial1 object.
Supports attachInterrupt	Yes	Yes
Input is 5V Tolerant	Yes	No

USBDATA-

	Photon	P2
Pin Number	30	62
Pin Name	USBDATA-	USBDATA-
Description	USB Data-	USB Data-
Input is 5V Tolerant	Yes	Yes

USBDATA+

	Photon	P2
Pin Number	31	61
Pin Name	USBDATA+	USBDATA+
Description	USB Data+	USB Data+
Input is 5V Tolerant	Yes	Yes

VBAT

	Removed from Photon
Pin Number	22
Pin Name	VBAT
Description	Battery for internal real-time clock, backup registers, and SRAM. Supply 1.65VDC to 3.6 VDC at 19 µA..

VBAT_MEAS

	Added to P2
Pin Number	12
Pin Name	VBAT_MEAS

Description	Battery voltage measurement (optional).

VIN

	Removed from Photon
Pin Number	1
Pin Name	VIN
Description	Power in 3.6V to 5.5 VDC. Or power out (when powered by USB) 4.8 VDC at 1A maximum.

WKP

	Photon	**P2**
Pin Number	5	30
Pin Name	WKP	D10
Pin Alternate Name	A7	WKP
Description	WKP/A7 Wakeup (active high), analog in, GPIO.	GPIO. (Was WKP/A7 on P1.)
Supports digitalRead	Yes	Yes
Supports digitalWrite	Yes	Yes
Supports analogRead	Yes	n/a
Supports analogWrite (PWM)	Yes	No
Supports tone	Yes	No
Supports attachInterrupt	Yes	Yes
Input is 5V Tolerant	Yes	No

Software

WI-FI CONFIGURATION

The P2 and Argon utilize BLE or USB for configuration of Wi-Fi rather than the SoftAP approach taken with the P1. Using BLE allow mobile apps to more easily set up the device Wi-Fi without having to modify the mobile device's network configuration.

Feature	P2	P1	Argon
Wi-Fi (SoftAP)		✓	
BLE	✓		✓

PLATFORM ID

The Platform ID of the P2 (32, `PLATFORM_P2`) is different from that of the Photon (6) because of the vastly different hardware.

If you have a product based on the Photon, you will need to create a separate product for devices using the P2. While you may be able to use the same source code to build your application, the firmware binaries uploaded to the console will be different, so they need to be separate products. This generally does not affect billing as only the number of devices, not the number of products, is counted toward your plan limits.

THIRD-PARTY LIBRARIES

Most third-party libraries are believed to be compatible. The exceptions include:

- Libraries that use peripherals that are not present (such as DAC)
- Libraries for MCU-specific features (such as ADC DMA)
- Libraries that are hardcoded to support only certain platforms by their PLATFORM_ID

Version History

Revision	Date	Author	Comments
pre	2022-04-06	RK	Pre-release
	2022-04-08	RK	Added recommended pin mappings
	2022-04-12	RK	Added serial baud rates