Photon 2 from Argon Migration Guide

Preliminary pre-release version 2022-03-14

This is an preliminary pre-release migration guide and the contents are subject to change. The Photon 2 design has not been finalized so changes are likely.

The Photon 2 is a development module with a microcontroller and Wi-Fi networking. The form-factor is similar to the Argon (Adafruit Feather), but the Photon 2 supports 2.4 GHz and 5 GHz Wi-Fi, BLE, and has much larger RAM and flash that can support larger applications.

It is intended to replace both the Photon and Argon modules. It contains the same module as the P2, making it easier to migrate from a pin-based development module to a SMD mass-production module if desired.

Feature	Photon 2	Photon	Argon
User application size	1024 KB (1 MB)	128 KB	256 KB
Flash file system[1]	2 MB		2 MB
MCU	RTL8721DM	STM32F205RGY6	nRF52840
	Realtek Semiconductor	ST Microelectronics	Nordic Semiconductor
CPU	Cortex M33 @ 200 MHz	Cortex M3 @ 120 MHz	Cortex M3 @ 64 MHz
	Cortex M23 @ 20 MHz		
RAM[2]	512 KB	128 KB	256 KB
Flash[3]	16 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
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	Separate Wi-Fi and BLE antennas
	Built-in PCB antenna (Wi-Fi & BLE)	Built-in PCB 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 (BLE)[4]
Peripherals	USB 2.0	USB 1.1	USB 1.1
Digital GPIO	20	24	20
Analog (ADC)	6	13	6
Analog (DAC)		2	
UART	3	2	1
SPI	2	2	2
PWM	6	12	8

I2C	1	1	1
CAN		1	
I2S		1	1
JTAG		✓	
SWD	✓	✓	✓

[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.

There are two Photon 2 migration guides, depending on what you are migrating from:

- From Photon
- From Argon

Hardware

ANTENNAS

The Argon requires an external Wi-Fi antenna, and has a built-in chip antenna for BLE. It can optionally use an external chip antenna.

The Photon 2 has a built-in trace antenna that is shared by Wi-Fi and BLE. It can optionally use an external 2.4 GHz antenna for both Wi-Fi and BLE.

SPI

Pins for both `SPI` and `SPI1` are unchanged between the Argon and Photon 2.

Pin	Argon Pin Name	Argon SPI	Photon 2 Pin Name	Photon 2 SPI
10	A5 / D14	SPI (SS)	A5 / D14	SPI (SS)
11	SCK / D13	SPI (SCK)	SCK / D13	SPI (SCK)
12	MOSI / D12	SPI (MOSI)	MOSI / D12	SPI (MOSI)
13	MISO / D11	SPI (MISO)	MISO / D11	SPI (MISO)
18	D2	SPI1 (SCK)	D2	SPI1 (SCK)
19	D3	SPI1 (MOSI)	D3	SPI1 (MOSI)
20	D4	SPI1 (MISO)	D4	SPI1 (MISO)
21	D5		D5 / WKP	SPI1 (SS)

- Any available GPIO can be used for SS/CS (chip select) pins.
- Each SPI device must have a unique CS pin.
- The Argon supports SPI slave mode only on `SPI1` (D pins).

SPI - Gen 3 devices (including Argon)

	SPI	SPI1
Maximum rate	32 MHz	32 MHz
Default rate	16 MHz	16 MHz
Clock	64 MHz	64 MHz

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

SPI - Photon 2

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

SERIAL (UART)

The primary UART serial (`Serial1`) is on the TX and RX pins on both the Photon 2 and Argon. There is no hardware flow control on this port on the Photon 2 or Argon.

The secondary UART serial (`Serial2`) is on different pins, however it does not conflict with the RGB LED, and also supports CTS/RTS hardware flow control.

There is a third UART serial (`Serial3`) on the Photon 2 that also supports optional CTS/RTS hardware flow control.

Pin	Argon Pin Name	Argon Serial	Photon 2 Pin Name	Photon 2 Serial
8	A3 / D16		D16	Serial3 (RX)
11	SCK / D13		SCK / D13	Serial3 (TX)
12	MOSI / D12		MOSI / D12	Serial3 (RTS)
13	MISO / D11		MISO / D11	Serial3 (CTS)
14	RX / D10	Serial1 RX	RX / D10	Serial1 (RX)
15	TX / D09	Serial1 TX	TX / D9	Serial1 (TX)
18	D2	Serial1 RTS	D2	Serial2 (RTS)
19	D3	Serial1 CTS	D3	Serial2 (TX)
20	D4		D4	Serial2 (RX)
21	D5		D5 / WKP	Serial2 (CTS)

	Argon	Photon 2
Buffer size	64 bytes[2]	2048 bytes
7-bit mode		✓
8-bit mode	✓	✓
1 stop bit	✓	✓
2 stop bits		✓
No parity	✓	✓
Even parity	✓	✓
Odd parity		✓
CTS/RTS flow control		✓[1]

[1]CTS/RTS flow control only on `Serial2` and `Serial3` . It is optional.

[2]On the Argon, the buffer be resized larger in Device OS 3.2.0 and later.

ANALOG INPUT (ADC)

For analog to digital conversion (ADC) using `analogRead()` .

- Pin A0, A1, A2, and A5 are analog inputs on both the Argon and Photon 2.
- Pins A3 and A4 are only analog inputs on the Argon.
- Pins D0 and D1 can also be used as analog inputs on the Photon 2.

Pin	Argon Pin Name	Argon ADC	Photon 2 Pin Name	Photon 2 ADC
5	A0 / D19	✓	A0 / D19	✓
6	A1 / D18	✓	A1 / D18	✓
7	A2 / D17	✓	A2 / D17	✓
8	A3 / D16	✓	D16	
9	A4 / D15	✓	D15	
10	A5 / D14	✓	A5 / D14	✓
16	D0		D0 / A3	✓
17	D1		D1 / A4	✓

PWM (PULSE-WIDTH MODULATION)

The pins that support PWM are different on the Argon and Photon 2.

Pin	Argon Pin Name	Argon PWM	Photon 2 Pin Name	Photon 2 PWM
5	A0 / D19	✓	A0 / D19	
6	A1 / D18	✓	A1 / D18	
7	A2 / D17	✓	A2 / D17	✓
8	A3 / D16	✓	D16	
9	A4 / D15	✓	D15	
10	A5 / D14	✓	A5 / D14	✓
16	D0		D0 / A3	✓
17	D1		D1 / A4	✓
18	D2	✓	D2	
19	D3	✓	D3	✓
20	D4	✓	D4	✓
21	D5	✓	D5 / WKP	
22	D6	✓	D6	
23	D7	✓	D7	

All available PWM pins on the Photon 2 share a single timer. This means that they must all share a single frequency, but can have different duty cycles.

CAN (CONTROLLER AREA NETWORK)

Neither the Argon nor the Photon 2 support CAN.

- 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 Photon 2.

I2S (SOUND)

The Argon supports I2S (sound) input and output with a third-party library.

There is no software support for I2S on the Photon 2, and while the RTL872x hardware supports I2S, the pins that it requires are in use by other ports.

INTERRUPTS

All pins can be used for interrupts on Gen 3 devices and the Photon 2.

There is a limit of 8 pin interrupts on the Argon; this limitation does not exist on the Photon 2.

RETAINED MEMORY

Retained memory, also referred to as Backup RAM or SRAM, that is preserved across device reset, is not available on the Photon 2. 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 Photon 2, however care must be taken to avoid excessive wear of the flash for frequently changing data.

USB

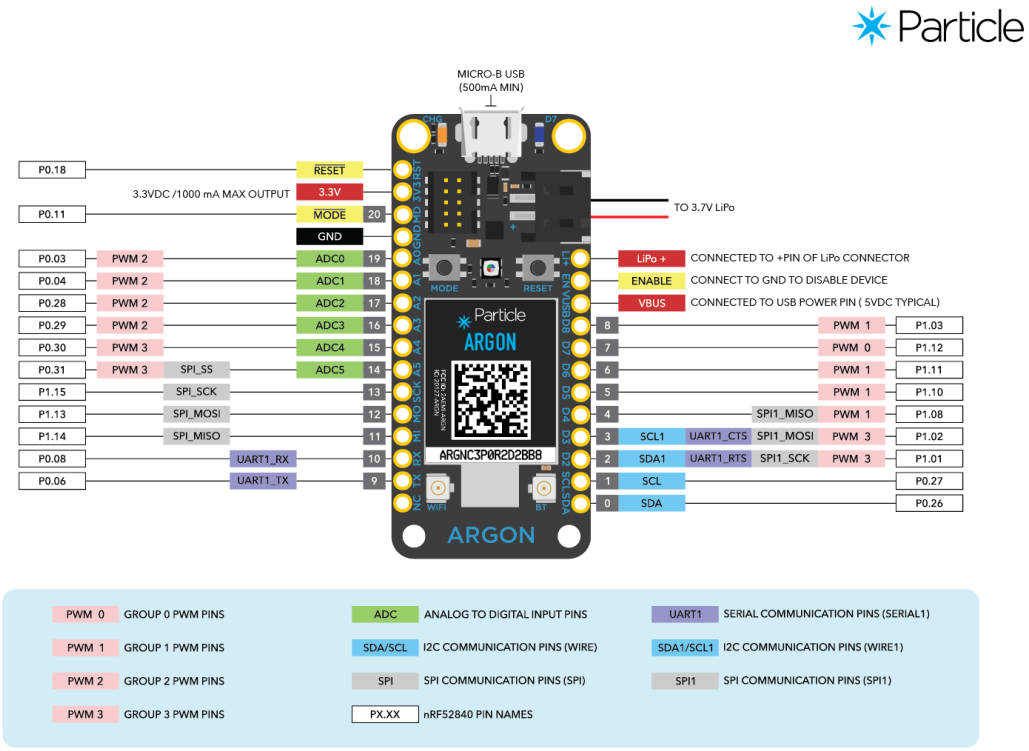
The Photon 2 has a USB C connector, like the Tracker One and Tracker Eval Board.

The Argon has a Micro USB B connector.

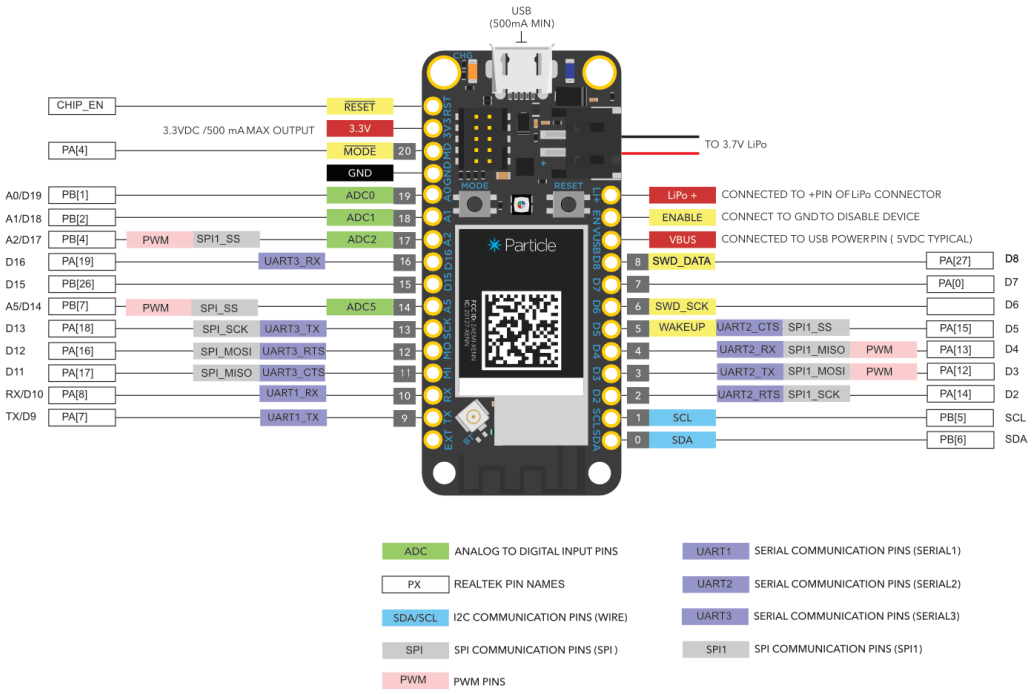
NFC TAG

The Photon 2 does not have NFC Tag support. The Argon does.

FULL MODULE PIN COMPARISON



v1.0



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3V3

	Argon	Photon 2
Pin Name	3V3	3V3
Description	Regulated 3.3V DC output, maximum load 1000 mA	Regulated 3.3V DC output, maximum load 500 mA

A0

	Argon	Photon 2
Pin Name	A0	A0
Pin Alternate Name	D19	D19
Description	A0 Analog in, GPIO, PWM	A0 Analog in, GPIO
Supports digitalRead	Yes	Yes
Supports digitalWrite	Yes	Yes
Supports analogRead	Yes	Yes
Supports analogWrite (PWM)	Yes	No
Supports tone	A0, A1, A2, and A3 must have the same frequency.	No
Supports attachInterrupt	Yes. You can only have 8 active interrupt pins.	Yes

A1

	Argon	Photon 2
Pin Name	A1	A1
Pin Alternate Name	D18	D18
Description	A1 Analog in, GPIO, PWM	A1 Analog in, GPIO
Supports digitalRead	Yes	Yes
Supports digitalWrite	Yes	Yes
Supports analogRead	Yes	Yes
Supports analogWrite (PWM)	Yes	No

Supports tone	A0, A1, A2, and A3 must have the same frequency.	No
Supports attachInterrupt	Yes. You can only have 8 active interrupt pins.	Yes

A2

	Argon	Photon 2
Pin Name	A2	A2
Pin Alternate Name	D17	D17
Description	A2 Analog in, GPIO, PWM	A2 Analog in, GPIO, PWM.
Supports digitalRead	Yes	Yes
Supports digitalWrite	Yes	Yes
Supports analogRead	Yes	Yes
Supports analogWrite (PWM)	Yes	Yes
Supports tone	A0, A1, A2, and A3 must have the same frequency.	Yes
Supports attachInterrupt	Yes. You can only have 8 active interrupt pins.	Yes

A3

	Argon	Photon 2
Pin Name	A3	D16
Pin Alternate Name	D16	n/a
Description	A3 Analog in, GPIO, PWM	D16 GPIO, Serial3 RX. Was A3 on Argon.
Supports digitalRead	Yes	Yes
Supports digitalWrite	Yes	Yes
Supports analogRead	Yes	No
Supports analogWrite (PWM)	Yes	No
Supports tone	A0, A1, A2, and A3 must have the same frequency.	No
UART serial	n/a	RX. Use Serial3 object.
Supports attachInterrupt	Yes. You can only have 8 active interrupt pins.	Yes

A4

	Argon	Photon 2
Pin Name	A4	D15
Pin Alternate Name	D15	n/a
Description	A4 Analog in, GPIO, PWM	D15 GPIO, Was A4 on Argon.
Supports digitalRead	Yes	Yes
Supports digitalWrite	Yes	Yes
Supports analogRead	Yes	No
Supports analogWrite (PWM)	Yes	No
Supports tone	A4, A5, D2, and D3 must have the same frequency.	No
Supports attachInterrupt	Yes. You can only have 8 active interrupt pins.	Yes

A5

	Argon	Photon 2
Pin Name	A5	A5

Pin Alternate Name	D14	D14
Description	A5 Analog in, GPIO, PWM, SPI SS	A5 Analog in, PWM, SPI SS, GPIO
Supports digitalRead	Yes	Yes
Supports digitalWrite	Yes	Yes
Supports analogRead	Yes	Yes
Supports analogWrite (PWM)	Yes	Yes
Supports tone	A4, A5, D2, and D3 must have the same frequency.	Yes
SPI interface	SS. Use SPI object. This is only the default SS/CS pin, you can use any GPIO instead.	SS. Use SPI object. Can use any GPIO for SS/CS.
Supports attachInterrupt	Yes. You can only have 8 active interrupt pins.	Yes

D0

	Argon	**Photon 2**
Pin Name	D0	D0
Pin Alternate Name	n/a	A3
Description	I2C SDA, GPIO	D0 GPIO, PWM, I2C SDA, A3 Analog In
Supports digitalRead	Yes	Yes
Supports digitalWrite	Yes	Yes
Supports analogRead	No	Yes
Supports analogWrite (PWM)	No	Yes
Supports tone	No	Yes
I2C interface	SDA. Use Wire object.	SDA. Use Wire object. Use 1.5K to 10K external pull-up resistor.
Supports attachInterrupt	Yes. You can only have 8 active interrupt pins.	Yes

D1

	Argon	**Photon 2**
Pin Name	D1	D1
Pin Alternate Name	n/a	A4
Description	I2C SCL, GPIO	D1 GPIO, PWM, I2C SCL, A4 Analog In
Supports digitalRead	Yes	Yes
Supports digitalWrite	Yes	Yes
Supports analogRead	No	Yes
Supports analogWrite (PWM)	No	Yes
Supports tone	No	Yes
I2C interface	SCL. Use Wire object.	SCL. Use Wire object. Use 1.5K to 10K external pull-up resistor.
Supports attachInterrupt	Yes. You can only have 8 active interrupt pins.	Yes

D2

	Argon	Photon 2
Pin Name	D2	D2
Description	SPI1 SCK, Wire1 SDA, Serial1 RTS, PWM, GPIO	D2 GPIO, Serial2 RTS, SPI1 SCK.
Supports digitalRead	Yes	Yes
Supports digitalWrite	Yes	Yes
Supports analogWrite (PWM)	Yes	No
Supports tone	A4, A5, D2, and D3 must have the same frequency.	No
UART serial	Options RTS hardware flow control for Serial1	RTS. Use Serial2 object. Flow control optional.
SPI interface	SCK. Use SPI1 object.	SCK. Use SPI1 object.
I2C interface	SDA. Use Wire1 object.	n/a
Supports attachInterrupt	Yes. You can only have 8 active interrupt pins.	Yes

D3

	Argon	Photon 2
Pin Name	D3	D3
Description	SPI1 MOSI, Wire1 SCL, Serial1 CTS, PWM, GPIO	D3 GPIO, PWM, Serial2 TX, SPI1 MOSI.
Supports digitalRead	Yes	Yes
Supports digitalWrite	Yes	Yes
Supports analogWrite (PWM)	Yes	Yes
Supports tone	A4, A5, D2, and D3 must have the same frequency.	Yes
UART serial	Options CTS hardware flow control for Serial1	TX. Use Serial2 object.
SPI interface	MOSI. Use SPI1 object.	MOSI. Use SPI1 object.
I2C interface	SCL. Use Wire1 object.	n/a
Supports attachInterrupt	Yes. You can only have 8 active interrupt pins.	Yes

D4

	Argon	Photon 2
Pin Name	D4	D4
Description	SPI1 MISO, PWM, GPIO	D4 GPIO, PWM, Serial2 RX, SPI1 MISO.
Supports digitalRead	Yes	Yes
Supports digitalWrite	Yes	Yes
Supports analogWrite (PWM)	Yes	Yes
Supports tone	D4, D5, D6, and D7 must have the same frequency.	Yes
UART serial	n/a	RX. Use Serial2 object.
SPI interface	MISO. Use SPI1 object.	MISO. Use SPI1 object.
Supports attachInterrupt	Yes. You can only have 8 active interrupt pins.	Yes

D5

	Argon	Photon 2

Pin Name	D5	D5
Pin Alternate Name	n/a	WKP
Description	PWM, GPIO	GPIO D5, Serial2 CTS, SPI1 SS.
Supports digitalRead	Yes	Yes
Supports digitalWrite	Yes	Yes
Supports analogWrite (PWM)	Yes	No
Supports tone	D4, D5, D6, and D7 must have the same frequency.	No
UART serial	n/a	CTS. Use Serial2 object. Flow control optional.
SPI interface	n/a	SS. Use SPI1 object. Can use any GPIO for SPI SS/CS.
Supports attachInterrupt	Yes. You can only have 8 active interrupt pins.	Yes

D6

	Argon	Photon 2
Pin Name	D6	D6
Description	PWM, GPIO	D6 GPIO, SWCLK.
Supports digitalRead	Yes	Yes
Supports digitalWrite	Yes	Yes
Supports analogWrite (PWM)	Yes	No
Supports tone	D4, D5, D6, and D7 must have the same frequency.	No
Supports attachInterrupt	Yes. You can only have 8 active interrupt pins.	Yes
SWD interface	n/a	SWCLK. 40K pull-down at boot.

D7

	Argon	Photon 2
Pin Name	D7	D7
Description	PWM, GPIO	D7 GPIO. Blue LED.
Supports digitalRead	Yes	Yes
Supports digitalWrite	Yes	Yes
Supports analogWrite (PWM)	PWM is shared with the RGB LED, you can specify a different duty cycle but should not change the frequency.	No
Supports attachInterrupt	Yes. You can only have 8 active interrupt pins.	Yes

D8

	Argon	Photon 2
Pin Name	D8	D8
Description	GPIO, PWM	GPIO, PWM, SWDIO
Supports digitalRead	Yes	Yes.
Supports digitalWrite	Yes	Yes.

Supports analogWrite (PWM)	Yes	No
Supports tone	D4, D5, D6, and D7 must have the same frequency.	No
Supports attachInterrupt	Yes. You can only have 8 active interrupt pins.	Yes
SWD interface	n/a	SWDIO. 40K pull-up at boot.

EN

	Unchanged between Argon and Photon 2
Pin Name	EN
Description	Power supply enable. Connect to GND to power down. Has internal weak (100K) pull-up.

GND

	Unchanged between Argon and Photon 2
Pin Name	GND
Description	Ground.

LI+

	Unchanged between Argon and Photon 2
Pin Name	LI+
Description	Connected to JST PH LiPo battery connector. 3.7V in or out.

MISO

	Argon	Photon 2
Pin Name	MISO	MISO
Pin Alternate Name	D11	D11
Description	SPI MISO, GPIO	SPI MISO, D11 GPIO, Serial3 CTS
Supports digitalRead	Yes	Yes
Supports digitalWrite	Yes	Yes
UART serial	n/a	CTS. Use Serial3 object. Flow control optional.
SPI interface	MISO. Use SPI object.	MISO. Use SPI object.
Supports attachInterrupt	Yes. You can only have 8 active interrupt pins.	Yes

MODE

	Argon	Photon 2
Pin Name	MODE	MODE
Pin Alternate Name	D20	n/a
Description	MODE button, has internal pull-up	MODE button, has internal pull-up

MOSI

	Argon	Photon 2
Pin Name	MOSI	MOSI
Pin Alternate Name	D12	D12
Description	SPI MOSI, GPIO	SPI MOSI, D12 GPIO, Serial3 RTS
Supports digitalRead	Yes	Yes
Supports digitalWrite	Yes	Yes

UART serial	n/a	RTS. Use Serial3 object. Flow control optional.
SPI interface	MOSI. Use SPI object.	MOSI. Use SPI object.
Supports attachInterrupt	Yes. You can only have 8 active interrupt pins.	Yes

RST

	Unchanged between Argon and Photon 2
Pin Name	RST
Description	Hardware reset. Pull low to reset; can leave unconnected in normal operation.

RX

	Argon	Photon 2
Pin Name	RX	RX
Pin Alternate Name	D10	D10
Description	Serial RX, GPIO	Serial1 RX (received data), GPIO
Supports digitalRead	Yes	Yes
Supports digitalWrite	Yes	Yes
UART serial	RX Use Serial1 object.	RX. Use Serial1 object.
Supports attachInterrupt	Yes. You can only have 8 active interrupt pins.	Yes

SCK

	Argon	Photon 2
Pin Name	SCK	SCK
Pin Alternate Name	D13	D13
Description	SPI SCK, GPIO	SPI SCK, D13 GPIO, Serial3 TX
Supports digitalRead	Yes	Yes
Supports digitalWrite	Yes	Yes
UART serial	n/a	TX. Use Serial3 object.
SPI interface	SCK. Use SPI object.	SCK. Use SPI object.
Supports attachInterrupt	Yes. You can only have 8 active interrupt pins.	Yes

TX

	Argon	Photon 2
Pin Name	TX	TX
Pin Alternate Name	D09	D9
Description	Serial TX, GPIO	Serial1 TX (transmitted data), GPIO
Supports digitalRead	Yes	Yes
Supports digitalWrite	Yes	Yes
UART serial	TX Use Serial1 object.	TX. Use Serial1 object.
Supports attachInterrupt	Yes. You can only have 8 active interrupt pins.	Yes

VUSB

	Unchanged between Argon and Photon 2
Pin Name	VUSB
Description	Power out (when powered by USB) 5 VDC at 1A maximum. Power in with limitations.

Input is 5V Tolerant	Yes

Software

WI-FI CONFIGURATION

The Photon 2 and Argon utilize BLE for configuration of Wi-Fi. Using BLE allow mobile apps to more easily set up the device Wi-Fi without having to modify the mobile device's network configuration. A React Native reference will be provided to simplify Wi-Fi setup.

Neither the Photon 2 nor Argon use the Wi-Fi based setup (SoftAP) that is used on the Photon and P1.

Feature	Photon 2	Photon	Argon
Wi-Fi (SoftAP)		✓	
BLE	✓		✓

BLE (BLUETOOTH LE)

- BLE long-range (coded PHY) is not supported on the Photon 2. It is on the Argon with Device OS 3.1 or later.

PLATFORM ID

The Platform ID of the Photon 2 will different from that of the Argon (12) because of the vastly different hardware.

If you have a product based on the Argon, you will need to create a separate product for devices using the Photon 2. 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	2022-03-02	RK	Pre-release
	2022-03-14	RK	Minor edits; no functional changes