

# P2 Migration Guide

## Preliminary pre-release version 2022-01-20

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                                     | Argon                                |
|--------------------------------|--|--|--------------------------------------|
| User application size          | 1024 KB (1 MB)                               | 128 KB                                 | 256 KB                               |
| Flash file system <sup>1</sup> | 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 <sup>2</sup>               | 512 KB                                       | 128 KB                                 | 256 KB                               |
| Flash <sup>3</sup>             | 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                              |
| 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) <sup>4</sup> | Optional external (Wi-Fi) <sup>4</sup> | Optional external (BLE) <sup>4</sup> |
| Peripherals                    | USB 2.0                                      | USB 1.1                                | USB 1.1                              |
| Digital GPIO                   | 22   | 24                                     | 20                                   |
| Analog (ADC)                   | 4  | 13                                     | 6                                    |
| Analog (DAC)                   |  | 2                                      |                                      |
| UART                           | 1  | 2                                      | 1                                    |
| SPI                            | 2  | 2                                      | 2                                    |
| PWM                            | 7  | 12                                     | 8                                    |
| I2C                            | 1  | 1                                      | 1                                    |
| CAN                            |  | 1                                      |                                      |
| I2S                            |  | 1                                      | 1                                    |
| JTAG                           |  | ✓                                      |                                      |
| SWD                            | ✓  | ✓                                      | ✓                                    |

<sup>1</sup>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.

<sup>2</sup> Total RAM; amount available to user applications is smaller.

<sup>3</sup> 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.

<sup>4</sup> Onboard or external antenna is selectable in software.

# Hardware

## 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 (module pin 22), A4 (module pin 21), DAC/A6 (module pin 24) do not exist on the P2 and are NC.

You will need to use different pins if you are currently using these pins.

## SPI

Both the P1 and P2 have two SPI ports, however the pins are different for **SPI** (primary SPI).

|          | P1 | P2       |
|----------|----|----------|
| SPI SCK  | A3 | D20 / S2 |
| SPI MISO | A4 | D19 / S1 |
| SPI MOSI | A5 | D18 / S0 |

The following are all SPI-related pins on the P1 and P2:

| Pin | P1 Pin Name | P1 SPI      | P2 Pin Name | P2 SPI      |
|-----|-------------|-------------|-------------|-------------|
| 21  | A4          | SPI (MISO)  | NC          |             |
| 22  | A3          | SPI (SCK)   | NC          |             |
| 23  | A5          | SPI (MOSI)  | A5 / D17    | SPI (MOSI)  |
| 40  | P1S0        |             | S0 / D18    | SPI (MOSI)  |
| 41  | P1S1        |             | S1 / D19    | SPI (MISO)  |
| 42  | P1S2        |             | S2 / D20    | SPI (SCK)   |
| 45  | D2          | SPI1 (MOSI) | D2          | SPI1 (MOSI) |
| 49  | A2          | SPI (SS)    | A2 / D14    |             |
| 51  | D3          | SPI1 (MISO) | D3          | SPI1 (MISO) |
| 52  | D4          | SPI1 (SCK)  | D4          | SPI1 (SCK)  |
| 53  | D5          | SPI1 (SS)   | D5          | SPI1 (SS)   |

## SPI - Gen 2 devices (including 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 |

## SERIAL (UART)

The primary UART serial ( `Serial1` ) is on the TX and RX pins on both the P1 and P2. There is no hardware flow control on this port on the P1 or P2.

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.

| Pin | P1 Pin Name | P1 Serial    | P2 Pin Name | P2 Serial     |
|-----|-------------|--------------|-------------|---------------|
| 31  | RGBB        | Serial2 (RX) | RGBB        |               |
| 32  | RGBG        | Serial2 (TX) | RGBG        |               |
| 45  | D2          |              | D2          | Serial2 (RTS) |
| 51  | D3          |              | D3          | Serial2 (CTS) |
| 52  | D4          |              | D4          | Serial2 (RX)  |
| 53  | D5          |              | D5          | Serial2 (TX)  |
| 63  | RX          | Serial1 (RX) | RX / D10    | Serial1 (RX)  |
| 64  | TX          | Serial1 (TX) | TX / D9     | Serial1 (TX)  |

|                      | P1       | 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 |          | ✓ <sup>1</sup> |

<sup>1</sup>CTS/RTS flow control only on Serial2. It is optional.

## ANALOG INPUT (ADC)

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

| Pin | P1 Pin Name | P1 ADC | P2 Pin Name | P2 ADC |
|-----|-------------|--------|-------------|--------|
| 21  | A4          | ✓      | NC          |        |
| 22  | A3          | ✓      | NC          |        |
| 23  | A5          | ✓      | A5 / D17    | ✓      |
| 24  | DAC / A6    | ✓      | NC          |        |
| 30  | WKP / A7    | ✓      | D11 / WKP   |        |

|    |      |   |          |   |
|----|------|---|----------|---|
| 35 | D1   |   | D1 / A4  | ✓ |
| 36 | D0   |   | D0 / A3  | ✓ |
| 40 | P1S0 | ✓ | S0 / D18 |   |
| 41 | P1S1 | ✓ | S1 / D19 |   |
| 42 | P1S2 | ✓ | S2 / D20 |   |
| 43 | A1   | ✓ | A1 / D13 | ✓ |
| 44 | P1S3 | ✓ | S3 / D21 |   |
| 48 | P1S5 | ✓ | S5 / D23 |   |
| 49 | A2   | ✓ | A2 / D14 | ✓ |
| 50 | A0   | ✓ | A0 / D12 | ✓ |

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.

## PWM (PULSE-WIDTH MODULATION)

The pins that support PWM are different on the P1 and P2.

| Pin | P1 Pin Name | P1 PWM | P2 Pin Name | P2 PWM |
|-----|-------------|--------|-------------|--------|
| 21  | A4          | ✓      | NC          |        |
| 23  | A5          | ✓      | A5 / D17    | ✓      |
| 30  | WKP / A7    | ✓      | D11 / WKP   |        |
| 33  | P1S6        | ✓      | S6 / D24    |        |
| 35  | D1          | ✓      | D1 / A4     | ✓      |
| 36  | D0          | ✓      | D0 / A3     | ✓      |
| 40  | P1S0        | ✓      | S0 / D18    | ✓      |
| 41  | P1S1        | ✓      | S1 / D19    | ✓      |
| 45  | D2          | ✓      | D2          |        |
| 49  | A2          |        | A2 / D14    | ✓      |
| 51  | D3          | ✓      | D3          |        |
| 63  | RX          | ✓      | RX / D10    |        |
| 64  | TX          | ✓      | TX / D9     |        |

## DIGITAL TO ANALOG CONVERTER (DAC)

The P1 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.

| Pin | P1 Pin Name | P1 DAC | P2 Pin Name | P2 DAC |
|-----|-------------|--------|-------------|--------|
| 22  | A3          | ✓      | NC          |        |
| 24  | DAC / A6    | ✓      | NC          |        |

## WKP (A7)

|            | P1  | 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 P1 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.

| Pin | P1 Pin Name | P1 CAN | P2 Pin Name | P2 CAN |
|-----|-------------|--------|-------------|--------|
| 35  | D1          | ✓      | D1 / A4     |        |
| 45  | D2          | ✓      | D2          |        |

## I2S (SOUND)

The P1 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.

| Pin | P1 Pin Name | P1 I2S   | P2 Pin Name | P2 I2S |
|-----|-------------|----------|-------------|--------|
| 45  | D2          | I2S3_SD  | D2          |        |
| 46  | SETUP       | I2S3_MCK | SETUP       |        |
| 52  | D4          | I2S3_SCK | D4          |        |
| 53  | D5          | I2S3_WS  | D5          |        |

## INTERRUPTS

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

## PIN FUNCTIONS REMOVED

The following pins served P1-specific uses and are NC on the P2. You should not connect anything to these pins.

| Pin | Pin Name      | Description             |
|-----|---------------|-------------------------|
| 7   | WL_REG_ON     | BCM43362 Debugging Pin. |
| 16  | WL_JTAG_TDI   | BCM43362 Debugging Pin. |
| 17  | WL_JTAG_TCK   | BCM43362 Debugging Pin. |
| 18  | WL_JTAG_TRSTN | BCM43362 Debugging Pin. |

|    |                |   |
|----|----------------|---|
| 19 | WL_JTAG_TMS    | BCM43362 Debugging Pin.   |
| 20 | WL_JTAG_TDO    | BCM43362 Debugging Pin.   |
| 21 | A4             | A4 Analog in, GPIO, SPI.  |
| 22 | A3             | A3 True analog out, analog in, GPIO.  |
| 24 | DAC / A6       | DAC/A6 True analog out, analog in, GPIO.  |
| 38 | VBAT           | Battery for internal real-time clock, backup registers, and SRAM. Supply 1.65VDC to 3.6 VDC at 19 $\mu$ A.. |
| 38 | VBAT_MICRO     | Battery for internal real-time clock.   |
| 56 | BTCX_STATUS    | Coexistence signal: Bluetooth status and TX/RX direction.   |
| 57 | BTCX_RF_ACTIVE | Coexistence signal: Bluetooth is active.  |
| 58 | BTCX_TXCONF    | Output giving Bluetooth permission to TX.   |
| 60 | WL_SLEEP_CLK   | BCM43362 Debugging Pin  |

## PIN FUNCTIONS ADDED

The following pins were NC on the P1 but are used on the P2.

| Pin | Pin Name  | Description                             |
|-----|-----------|---|
| 12  | VBAT_MEAS | Battery voltage measurement (optional). |

## FULL MODULE PIN COMPARISON

### Module Pin 1 (GND)

#### Unchanged between P1 and P2

|             |   |
|-------------|---|
| Pin Name    | GND   |
| Description | Ground. Be sure you connect all P1 ground pins. |

### Module Pin 2

|             | P1                    | P2                      |
|-------------|-----------------------|-------------------------|
| Pin Name    | VBAT_WL               | 3V3_RF                  |
| Description | Battery for BCM43362. | 3.3V power to RF module |

### Module Pin 3

|             | P1                    | P2                      |
|-------------|-----------------------|-------------------------|
| Pin Name    | VBAT_WL               | 3V3_RF                  |
| Description | Battery for BCM43362. | 3.3V power to RF module |

### Module Pin 4 (GND)

#### Unchanged between P1 and P2

|             |   |
|-------------|---|
| Pin Name    | GND   |
| Description | Ground. Be sure you connect all P1 ground pins. |

### Module Pin 5

|             | P1  | P2                    |
|-------------|---|-----------------------|
| Pin Name    | VDDIO_3V3_WL                                | 3V3_IO                |
| Description | Regulated 3.3V DC power input for BCM43362. | 3.3V power to MCU IO. |

**Module Pin 6 (GND)**

| Unchanged between P1 and P2 |   |
|-----------------------------|---|
| Pin Name                    | GND   |
| Description                 | Ground. Be sure you connect all P1 ground pins. |

**Module Pin 7**

|             | P1  | P2 |
|-------------|---|----|
| Pin Name    | WL_REG_ON   | NC |
| Description | BCM43362 Debugging Pin. No connection. Do not connect anything to this pin. |    |

**Module Pin 8 (NC)**

| Unchanged between P1 and P2 |   |
|-----------------------------|---|
| Pin Name                    | NC  |
| Description                 | No connection. Do not connect anything to this pin. |

**Module Pin 9 (NC)**

| Unchanged between P1 and P2 |   |
|-----------------------------|---|
| Pin Name                    | NC  |
| Description                 | No connection. Do not connect anything to this pin. |

**Module Pin 10 (NC)**

| Unchanged between P1 and P2 |   |
|-----------------------------|---|
| Pin Name                    | NC  |
| Description                 | No connection. Do not connect anything to this pin. |

**Module Pin 11 (NC)**

| Unchanged between P1 and P2 |   |
|-----------------------------|---|
| Pin Name                    | NC  |
| Description                 | No connection. Do not connect anything to this pin. |

**Module Pin 12**

|             | P1  | P2        |
|-------------|---|-----------|
| Pin Name    | NC  | VBAT_MEAS |
| Description | No connection. Do not connect anything to this pin. Battery voltage measurement (optional). |           |

**Module Pin 13 (GND)**

| Unchanged between P1 and P2 |   |
|-----------------------------|---|
| Pin Name                    | GND   |
| Description                 | Ground. Be sure you connect all P1 ground pins. |

**Module Pin 14 (NC)**

| Unchanged between P1 and P2 |   |
|-----------------------------|---|
| Pin Name                    | NC  |
| Description                 | No connection. Do not connect anything to this pin. |



## Module Pin 15 (GND)

### Unchanged between P1 and P2

|             |   |
|-------------|---|
| Pin Name    | GND   |
| Description | Ground. Be sure you connect all P1 ground pins. |

## Module Pin 16

|             | P1                      | P2  |
|-------------|-------------------------|---|
| Pin Name    | WL_JTAG_TDI             | NC  |
| Description | BCM43362 Debugging Pin. | No connection. Do not connect anything to this pin. |

## Module Pin 17

|             | P1                      | P2  |
|-------------|-------------------------|---|
| Pin Name    | WL_JTAG_TCK             | NC  |
| Description | BCM43362 Debugging Pin. | No connection. Do not connect anything to this pin. |

## Module Pin 18

|             | P1                      | P2  |
|-------------|-------------------------|---|
| Pin Name    | WL_JTAG_TRSTN           | NC  |
| Description | BCM43362 Debugging Pin. | No connection. Do not connect anything to this pin. |

## Module Pin 19

|             | P1                      | P2  |
|-------------|-------------------------|---|
| Pin Name    | WL_JTAG_TMS             | NC  |
| Description | BCM43362 Debugging Pin. | No connection. Do not connect anything to this pin. |

## Module Pin 20

|             | P1                      | P2  |
|-------------|-------------------------|---|
| Pin Name    | WL_JTAG_TDO             | NC  |
| Description | BCM43362 Debugging Pin. | No connection. Do not connect anything to this pin. |

## Module Pin 21

|                            | P1  | P2  |
|----------------------------|---|---|
| Pin Name                   | A4  | NC  |
| Description                | A4 Analog in, GPIO, SPI.  | No connection. Do not connect anything to this pin. |
| Supports digitalRead       | Yes   | n/a   |
| Supports digitalWrite      | Yes   | n/a   |
| Supports analogRead        | Yes   | n/a   |
| Supports analogWrite (PWM) | Yes. D3 and A4 share the same PWM channel and the PWM duty cycle is set for both.     | n/a   |
| Supports tone              | Yes. D3 and A4 share the same PWM channel and only one frequency can be set for both. | n/a   |
| SPI interface              | MISO. Use SPI object.   | n/a   |

|                          |  |     |
|--------------------------|--|-----|
| Supports attachInterrupt | Yes. D1 and A4 share the same interrupt handler. | n/a |
| Input is 5V Tolerant     | Yes  | n/a |

### Module Pin 22

|                            | P1  | P2  |
|----------------------------|---|---|
| Pin Name                   | A3  | NC  |
| Description                | A3 True analog out, analog in, GPIO.                  | No connection. Do not connect anything to this pin. |
| Supports digitalRead       | Yes   | n/a   |
| Supports digitalWrite      | Yes   | n/a   |
| Supports analogRead        | Yes   | n/a   |
| Supports analogWrite (DAC) | Yes   | n/a   |
| SPI interface              | SCK. Use SPI object.                                  | n/a   |
| Supports attachInterrupt   | Yes. D2, A0, and A3 share the same interrupt handler. | n/a   |

### Module Pin 23 (A5)

|                            | P1  | P2                            |
|----------------------------|---|-------------------------------|
| Pin Name                   | A5  | A5                            |
| Pin Alternate Name         | n/a   | D17                           |
| Description                | A5 Analog in, GPIO, SPI.  | A5 Analog in, GPIO, PWM, SPI. |
| 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.   | MOSI. Use SPI object.         |
| Supports attachInterrupt   | No  | Yes                           |
| Input is 5V Tolerant       | Yes   | No                            |

### Module Pin 24

|                            | P1                                       | P2  |
|----------------------------|--|---|
| Pin Name                   | DAC                                      | NC  |
| Pin Alternate Name         | A6                                       | n/a   |
| Description                | DAC/A6 True analog out, analog in, GPIO. | No connection. Do not connect anything to this pin. |
| Supports digitalRead       | Yes                                      | n/a   |
| Supports digitalWrite      | Yes                                      | n/a   |
| Supports analogRead        | Yes                                      | n/a   |
| Supports analogWrite (DAC) | Yes                                      | n/a   |

|                          |   |     |
|--------------------------|---|-----|
| Supports attachInterrupt | Yes. D3, DAC/A6, and P1S3 share the same interrupt handler. | n/a |
|--------------------------|---|-----|

### Module Pin 25 (GND)

#### Unchanged between P1 and P2

|             |   |
|-------------|---|
| Pin Name    | GND   |
| Description | Ground. Be sure you connect all P1 ground pins. |

### Module Pin 26 (3V3)

#### Unchanged between P1 and P2

|             |                   |
|-------------|-------------------|
| Pin Name    | 3V3               |
| Description | 3.3V power to MCU |

### Module Pin 27 (3V3)

#### Unchanged between P1 and P2

|             |                   |
|-------------|-------------------|
| Pin Name    | 3V3               |
| Description | 3.3V power to MCU |

### Module Pin 28 (GND)

#### Unchanged between P1 and P2

|             |   |
|-------------|---|
| Pin Name    | GND   |
| Description | Ground. Be sure you connect all P1 ground pins. |

### Module Pin 29 (RGBR)

|                          | P1                       | P2          |
|--------------------------|--------------------------|-------------|
| 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          |

### Module Pin 30

|                            | P1  | P2                        |
|----------------------------|---|---------------------------|
| Pin Name                   | WKP   | D11                       |
| 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. WKP/A7, P1S0, and P1S2 share the same interrupt handler. | Yes                       |
| Input is 5V Tolerant       | Yes   | No                        |

### Module Pin 31 (RGBB)

|                          | P1                       | P2           |
|--------------------------|--------------------------|--------------|
| 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           |

#### Module Pin 32 (RGBG)

|                          | P1                       | P2            |
|--------------------------|--------------------------|---------------|
| 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            |

#### Module Pin 33

|                            | P1        | P2                                  |
|----------------------------|-----------|-------------------------------------|
| Pin Name                   | P1S6      | S6                                  |
| Pin Alternate Name         | n/a       | D24                                 |
| Description                | P1S6 GPIO | S6 GPIO. (Was P1S6/TESTMODE on P1.) |
| Supports digitalRead       | Yes       | Yes                                 |
| Supports digitalWrite      | Yes       | Yes                                 |
| Supports analogWrite (PWM) | Yes       | No                                  |
| Supports tone              | Yes       | No                                  |
| Supports attachInterrupt   | Yes       | Yes                                 |

#### Module Pin 34 (RST)

| Unchanged between P1 and P2 |   |
|-----------------------------|---|
| Pin Name                    | RST   |
| Description                 | Hardware reset. Pull low to reset; can leave unconnected in normal operation. |

#### Module Pin 35 (D1)

|                            | P1                | P2                              |
|----------------------------|-------------------|---------------------------------|
| Pin Name                   | D1                | D1                              |
| Pin Alternate Name         | n/a               | A4                              |
| Description                | D0 GPIO, I2C, CAN | D1 GPIO, PWM, I2C, 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   |

### Module Pin 36 (D0)

|                            | P1   | P2   |
|----------------------------|--|--|
| Pin Name                   | D0   | D0   |
| Pin Alternate Name         | n/a  | A3   |
| Description                | D0 GPIO, I2C   | D0 GPIO, PWM, I2C, 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   |

### Module Pin 37 (GND)

| Unchanged between P1 and P2 |   |
|-----------------------------|---|
| Pin Name                    | GND   |
| Description                 | Ground. Be sure you connect all P1 ground pins. |

### Module Pin 38

|             | P1  | P2  |
|-------------|---|---|
| Pin Name    | VBAT  | NC  |
| Description | Battery for internal real-time clock, backup registers, and SRAM. Supply 1.65VDC to 3.6 VDC at 19 $\mu$ A.. | No connection. Do not connect anything to this pin. |

### Module Pin 39 (GND)

| Unchanged between P1 and P2 |   |
|-----------------------------|---|
| Pin Name                    | GND   |
| Description                 | Ground. Be sure you connect all P1 ground pins. |

### Module Pin 40

|          | P1   | P2 |
|----------|------|----|
| Pin Name | P1S0 | S0 |

|                            |   |                                      |
|----------------------------|---|--------------------------------------|
| Pin Alternate Name         | n/a   | D18                                  |
| Description                | P1S0 Analog in, GPIO, PWM.                                    | S0 GPIO, PWM, SPI. (Was P1S0 on P1.) |
| Supports digitalRead       | Yes   | Yes                                  |
| Supports digitalWrite      | Yes   | Yes                                  |
| Supports analogRead        | Yes   | No                                   |
| Supports analogWrite (PWM) | Yes   | Yes                                  |
| Supports tone              | Yes.  | Yes                                  |
| SPI interface              | n/a   | MOSI. Use SPI object.                |
| Supports attachInterrupt   | Yes. WKP/A7, P1S0, and P1S2 share the same interrupt handler. | Yes                                  |
| Input is 5V Tolerant       | Yes   | No                                   |

### Module Pin 41

|                            | P1   | P2                                   |
|----------------------------|--|--------------------------------------|
| Pin Name                   | P1S1   | S1                                   |
| Pin Alternate Name         | n/a  | D19                                  |
| Description                | P1S1 Analog in, GPIO, PWM.                           | S1 GPIO, PWM, SPI. (Was P1S1 on P1.) |
| Supports digitalRead       | Yes  | Yes                                  |
| Supports digitalWrite      | Yes  | Yes                                  |
| Supports analogRead        | Yes  | No                                   |
| Supports analogWrite (PWM) | Yes  | Yes                                  |
| Supports tone              | Yes.   | Yes                                  |
| SPI interface              | n/a  | MISO. Use SPI object.                |
| Supports attachInterrupt   | Yes. P1S1 and P1S5 share the same interrupt handler. | Yes                                  |
| Input is 5V Tolerant       | Yes  | No                                   |

### Module Pin 42

|                          | P1  | P2                              |
|--------------------------|---|---------------------------------|
| Pin Name                 | P1S2  | S2                              |
| Pin Alternate Name       | n/a   | D20                             |
| Description              | P1S2 Analog in, GPIO  | S2 GPIO, SPI. (Was P1S2 on P1.) |
| Supports digitalRead     | Yes   | Yes                             |
| Supports digitalWrite    | Yes   | Yes                             |
| Supports analogRead      | Yes   | No                              |
| SPI interface            | n/a   | SCK. Use SPI object.            |
| Supports attachInterrupt | Yes. WKP/A7, P1S0, and P1S2 share the same interrupt handler. | Yes                             |
| Input is 5V Tolerant     | Yes   | No                              |

### Module Pin 43 (A1)

|          | P1 | P2 |
|----------|----|----|
| Pin Name | A1 | A1 |

|                          |  |                    |
|--------------------------|--|--------------------|
| Pin Alternate Name       | n/a  | D13                |
| 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. |                    |
| Input is 5V Tolerant     | Yes  | No                 |

#### Module Pin 44

|                          | P1  | P2                         |
|--------------------------|---|----------------------------|
| Pin Name                 | P1S3  | S3                         |
| Pin Alternate Name       | n/a   | D21                        |
| Description              | P1S3 Analog in, GPIO  | S3 GPIO. (Was P1S3 on P1.) |
| Supports digitalRead     | Yes   | Yes                        |
| Supports digitalWrite    | Yes   | Yes                        |
| Supports analogRead      | Yes   | No                         |
| Supports attachInterrupt | Yes. D3, DAC/A6, and P1S3 share the same interrupt handler. |                            |
| Input is 5V Tolerant     | Yes   | No                         |

#### Module Pin 45 (D2)

|                            | P1  | P2  |
|----------------------------|---|---|
| Pin Name                   | D2  | D2  |
| Description                | D2 GPIO, SPI1, CAN  | D2 GPIO, Serial2, SPI1                          |
| 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  |

#### Module Pin 46 (SETUP)

|             | P1  | P2  |
|-------------|---|---|
| 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 |

### Module Pin 47

|                          | P1   | P2                         |
|--------------------------|--|----------------------------|
| Pin Name                 | P1S4   | S4                         |
| Pin Alternate Name       | n/a  | D22                        |
| Description              | P1S4 GPIO  | S4 GPIO. (Was P1S4 on P1.) |
| Supports digitalRead     | Yes  | Yes                        |
| Supports digitalWrite    | Yes  | Yes                        |
| Supports attachInterrupt | Yes. D7 and P1S4 share the same interrupt handler. |                            |
| Input is 5V Tolerant     | Yes  | No                         |

### Module Pin 48

|                          | P1   | P2                         |
|--------------------------|--|----------------------------|
| Pin Name                 | P1S5   | S5                         |
| Pin Alternate Name       | n/a  | D23                        |
| Description              | P1S5 Analog in, GPIO                                 | S5 GPIO. (Was P1S5 on P1.) |
| Supports digitalRead     | Yes  | No                         |
| Supports digitalWrite    | Yes  | Yes                        |
| Supports analogRead      | Yes  | No                         |
| Supports attachInterrupt | Yes. P1S1 and P1S5 share the same interrupt handler. |                            |
| Input is 5V Tolerant     | Yes  | No                         |

### Module Pin 49 (A2)

|                            | P1  | P2                      |
|----------------------------|---|-------------------------|
| Pin Name                   | A2  | A2                      |
| Pin Alternate Name         | n/a   | D14                     |
| 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                      |

### Module Pin 50 (A0)

|                    | P1  | P2  |
|--------------------|-----|-----|
| Pin Name           | A0  | A0  |
| Pin Alternate Name | n/a | D12 |



|                          |   |                    |
|--------------------------|---|--------------------|
| 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                 |

### Module Pin 51 (D3)

|                            | P1  | P2  |
|----------------------------|---|---|
| Pin Name                   | D3  | D3  |
| Description                | D3 GPIO, SPI1   | D3 GPIO, Serial2, SPI1                          |
| 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, DAC/A6, and P1S3 share the same interrupt handler.                           | Yes   |
| Input is 5V Tolerant       | Yes   | No  |
| JTAG interface             | JTAG RST. 40K pull-up at boot.  | n/a   |

### Module Pin 52 (D4)

|                          | P1   | P2                      |
|--------------------------|--|-------------------------|
| Pin Name                 | D4   | D4                      |
| Description              | D4 GPIO, SPI1                                    | D4 GPIO, Serial2, SPI1  |
| Supports digitalRead     | Yes  | Yes                     |
| Supports digitalWrite    | Yes  | Yes                     |
| UART serial              | n/a  | RX. 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                     |

### Module Pin 53 (D5)

|                      | P1            | P2                     |
|----------------------|---------------|------------------------|
| Pin Name             | D5            | D5                     |
| Description          | D5 GPIO, SPI1 | D5 GPIO, Serial2, SPI1 |
| Supports digitalRead | Yes           | Yes                    |

|                          |  |  |
|--------------------------|--|--|
| Supports digitalWrite    | Yes  | Yes  |
| UART serial              | n/a  | TX. 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  |

#### Module Pin 54 (D7)

|                          | P1   | P2  |
|--------------------------|--|---|
| Pin Name                 | D7   | D7  |
| Description              | D7 GPIO  | D7 GPIO                                     |
| Supports digitalRead     | Yes.   | Yes.  |
| Supports digitalWrite    | Yes. On the Photon this is the blue D7 LED.        | Yes. On the Photon this is the blue D7 LED. |
| Supports attachInterrupt | Yes. D7 and P1S4 share the same interrupt handler. | 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.                 |

#### Module Pin 55 (D6)

|                          | P1                               | P2                            |
|--------------------------|----------------------------------|-------------------------------|
| Pin Name                 | D6                               | D6                            |
| Description              | D6 GPIO                          | D6 GPIO                       |
| 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. |

#### Module Pin 56

|             | P1  | P2  |
|-------------|---|---|
| Pin Name    | BTCX_STATUS   | NC  |
| Description | Coexistence signal: Bluetooth status and TX/RX direction. | No connection. Do not connect anything to this pin. |

#### Module Pin 57

|             | P1                                       | P2  |
|-------------|--|---|
| Pin Name    | BTCX_RF_ACTIVE                           | NC  |
| Description | Coexistence signal: Bluetooth is active. | No connection. Do not connect anything to this pin. |

#### Module Pin 58

|             | P1  | P2 |
|-------------|---|----|
| Pin Name    | BTCX_TXCONF   | NC |
| Description | Output giving Bluetooth permission to TX. No connection. Do not connect anything to this pin. |    |

#### Module Pin 59 (GND)

| Unchanged between P1 and P2 |   |
|-----------------------------|---|
| Pin Name                    | GND   |
| Description                 | Ground. Be sure you connect all P1 ground pins. |

#### Module Pin 60

|             | P1                     | P2  |
|-------------|------------------------|---|
| Pin Name    | WL_SLEEP_CLK           | NC  |
| Description | BCM43362 Debugging Pin | No connection. Do not connect anything to this pin. |

#### Module Pin 61 (USBDATA+)

| Unchanged between P1 and P2 |           |
|-----------------------------|-----------|
| Pin Name                    | USBDATA+  |
| Description                 | USB Data+ |
| Input is 5V Tolerant        | Yes       |

#### Module Pin 62 (USBDATA-)

| Unchanged between P1 and P2 |           |
|-----------------------------|-----------|
| Pin Name                    | USBDATA-  |
| Description                 | USB Data- |
| Input is 5V Tolerant        | Yes       |

#### Module Pin 63 (RX)

|                            | P1                                     | P2                      |
|----------------------------|--|-------------------------|
| Pin Name                   | RX                                     | RX                      |
| Pin Alternate Name         | n/a                                    | D10                     |
| Description                | Serial1 RX (received data), GPIO, PWM. |                         |
| 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                      |

#### Module Pin 64 (TX)

|                      | P1  | P2  |
|----------------------|---|-----|
| Pin Name             | TX  | TX  |
| Pin Alternate Name   | n/a                                       | D9  |
| Description          | Serial1 TX (transmitted data), GPIO, PWM. |     |
| 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                      |

#### Module Pin 65 (GND)

##### Unchanged between P1 and P2

|             |   |
|-------------|---|
| Pin Name    | GND   |
| Description | Ground. Be sure you connect all P1 ground pins. |

#### Module Pin 66 (GND)

##### Unchanged between P1 and P2

|             |   |
|-------------|---|
| Pin Name    | GND   |
| Description | Ground. Be sure you connect all P1 ground pins. |

#### Module Pin 67 (GND)

##### Unchanged between P1 and P2

|             |   |
|-------------|---|
| Pin Name    | GND   |
| Description | Ground. Be sure you connect all P1 ground pins. |

#### Module Pin 68 (GND)

##### Unchanged between P1 and P2

|             |   |
|-------------|---|
| Pin Name    | GND   |
| Description | Ground. Be sure you connect all P1 ground pins. |

#### Module Pin 69 (GND)

##### Unchanged between P1 and P2

|             |   |
|-------------|---|
| Pin Name    | GND   |
| Description | Ground. Be sure you connect all P1 ground pins. |

#### Module Pin 70 (GND)

##### Unchanged between P1 and P2

|             |   |
|-------------|---|
| Pin Name    | GND   |
| Description | Ground. Be sure you connect all P1 ground pins. |

#### Module Pin 71 (GND)

##### Unchanged between P1 and P2

|             |   |
|-------------|---|
| Pin Name    | GND   |
| Description | Ground. Be sure you connect all P1 ground pins. |

#### Module Pin 72 (GND)

##### Unchanged between P1 and P2

|          |     |
|----------|-----|
| Pin Name | GND |
|----------|-----|

---

Description Ground. Be sure you connect all P1 ground pins.

# Software

## WI-FI CONFIGURATION

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The P2 and Argon utilize BLE 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            | ✓  |    | ✓     |

## THIRD-PARTY LIBRARIES

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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