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# Overview



Wouldn't it be great if, instead of collecting shields, HATs, PMODs, Clicks, Booster Packs, Props... you could have a cross-compatible platform? Something that doesn't force you into one chipset? and allows you to mix-and-match the microcontroller, wireless protocol, and functional extensions?

Yeah, me too! That's why I created Feather. Feather is a flexible and powerful family of microcontroller main-boards (Feathers) and daughter-boards (Wings) with a wide range of capabilities.

## Feathers!

Since we aren't tied to one chip manufacturer, we feature the best-of-the-market chipsets, including:

- Atmel ATmega32u4 and ATmega 328P - 8 bit AVR
- Atmel ATSAMD21 - 32 bit ARM Cortex M0+
- Atmel ATSAMD51 - 32-bit ARM Cortex M4
- Broadcom/Cypress WICED - STM32 with WiFi
- Espressif ESP8266 and ESP32 - Tensilica with WiFi/BT
- Freescale MK20 - ARM Cortex M4, as the Teensy 3.2 Feather Adapter
- Nordic nRF52832 and nRF32840 - ARM Cortex & Bluetooth LE
- Packet radio modules featuring SemTech SX1231
- LoRa radio modules featuring SemTech SX127x

and many more to come!

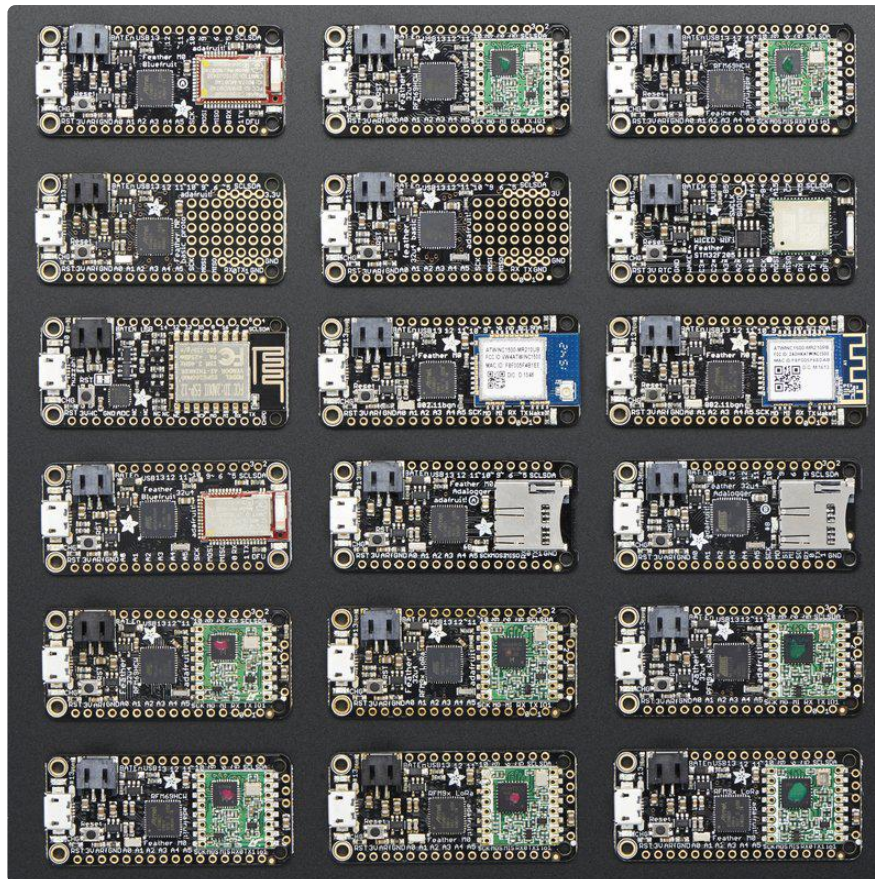
# Wings!

Once you've picked your main dish (the Feather mainboard) you can pick and choose from a wide wide variety of Wings. Wings are like little "shields" or "HATs" for Feathers. You can (in theory) add as many Wings as you like to a single Feather mainboard, as long as you don't run out of power, space or have pin collisions.

Best of all, we've tested all of our Wings against all of our Feathers. So, other than a few exceptions (mostly the GPS Featherwing), you can re-use, re-cycle, and upgrade your Feathers and Wings between projects and as need arises.

For example, start out with a Feather 32u4, then decide to upgrade to the Feather M0 or M4 for more Flash - the pin out is the same! Or, make an IoT project with the ESP8266 and then super-power it with an ESP32 just by swapping out the main Feather. Maybe build a project with a Feather M0 Bluefruit, then realize you need more range so you switch to a Feather M0 LoRa.

The Feathers and Wings all have example code written in Arduino C/C++ so as your projects adapt, all your wings and code will come along with you. Boards that have names with the Express suffix also support CircuitPython for fast and easy programming.



## Feather History



For the last decade or so I've been making projects with Arduinos and compatibles. And, an Arduino is a great way to start a project, but after many years I started seeing the same 'issues' crop up:

- Arduinos are big - sure they're smaller than a computer but they're still chunky enough to make them not-so-wearable or hand-held
- To do stuff, you can add shields, but stacking shields get really tall to get any significant technology stacked on
- There's no wireless technology built in: now that WiFi, BTLE and cellular is ubiquitous, just about any project can take advantage of a wireless connection!

- Making an Arduino portable is hard - you need a 7-12VDC power supply, not a common rechargeable Lithium Polymer battery, and no built-in recharging

## Some possibilities

There are a few boards that tried to address these issues, but none of them really seemed to 'scratch that itch'

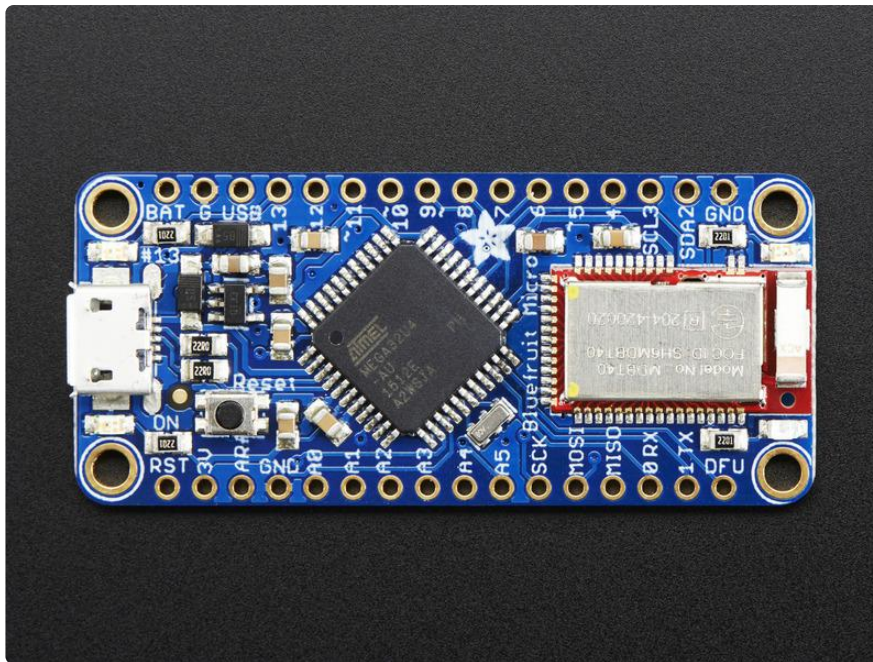
- Multi-stack compatibles like [Tinyduino](https://adafru.it/weI) (<https://adafru.it/weI>) are small, and extensible, but you have to stack 4 boards just to get the 'basics' going
- Small Arduino-compatibles like the [Pro Mini](https://adafru.it/weJ) (<https://adafru.it/weJ>) are inexpensive and small, but don't have USB built in so you need a separate cable to program them
- The [Fio](https://adafru.it/weK) (<https://adafru.it/weK>) has wireless add-on ability, and battery charging, but a non-standard pinout and requires expensive XBee modules.
- [Click boards are close](https://adafru.it/weL) (<https://adafru.it/weL>) but don't have an Arduino compatible baseboard.

## Beginning of a Feather

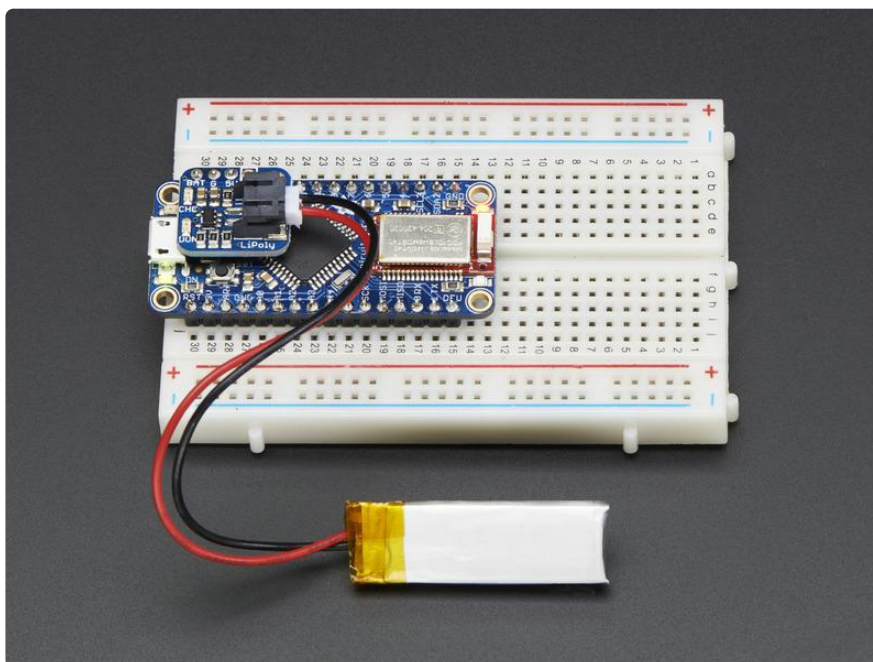
It was about when KTOWN had finished designing the SPI Bluefruit Friend when we [kept](https://adafru.it/weM) (<https://adafru.it/weM>) [seeing](https://adafru.it/weN) (<https://adafru.it/weN>) [crowdfunding](https://adafru.it/weO) (<https://adafru.it/weO>) campaigns that had an Arduino-compatible chip and a Bluetooth LE interface. We thought "it would be really cool and useful to have something that was breadboard friendly, with an Atmega32u4 so it has built in USB, and a Bluefruit module. We've already got the library code, it'll be an all-in-one!"

So we designed the [Bluefruit Micro](https://adafru.it/fQH) (<https://adafru.it/fQH>)

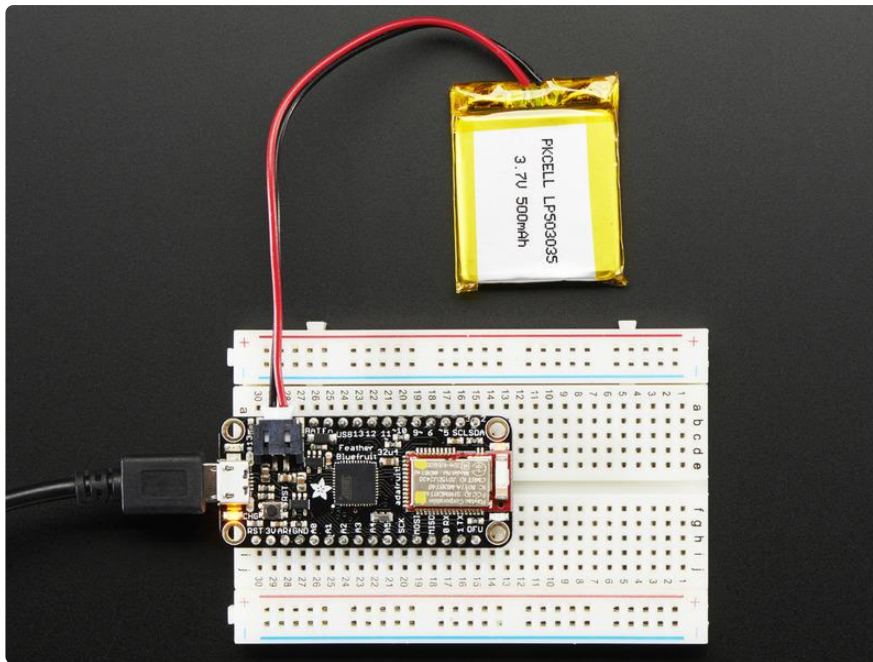




We designed it so you could use our little LiPoly backpack, soldered on top, to add LiPo power and recharging:

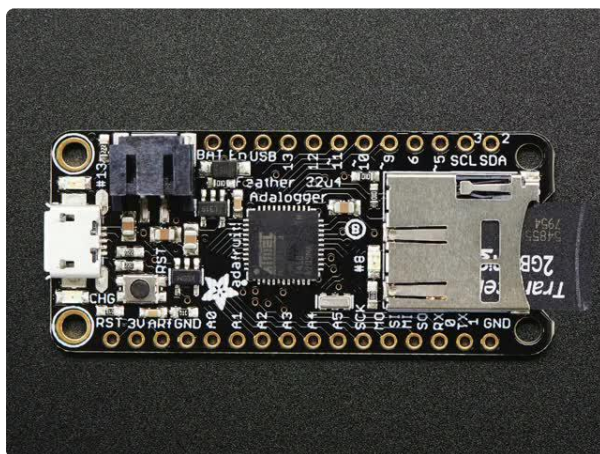


The Bluefruit Micro was incredibly popular. So much so that I realized we should probably do something better. So I shrank the chip from a QFP to a QFN and stuck the battery connector off the side:



As you can see, not much in the design really changed, just some parts got squished down and pushed to the right to make room for the LiPoly charge and connector.

I settled on a pinout configuration that exposed all the power pins, analog inputs, GPIO, I2C, SPI and UART. Once that was done I tried making a few different 'flavors' such as with a micro SD card holder to make a datalogger:



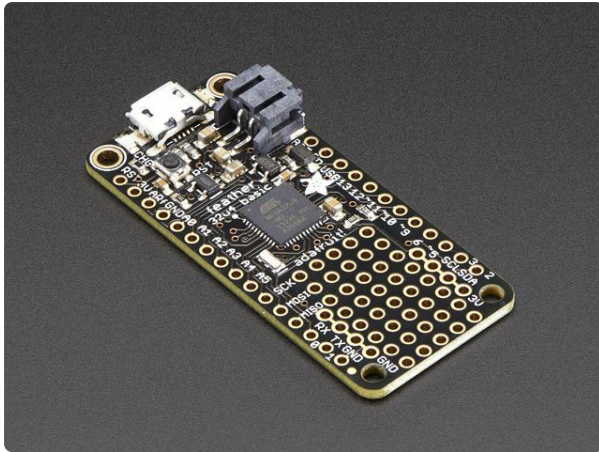
Or just a prototyping area:

### Adafruit Feather 32u4 Adalogger

Feather is the new development board from Adafruit, and like its namesake it is thin, light, and lets you fly! We designed Feather to be a new standard for portable microcontroller...

<https://www.adafruit.com/product/2795>





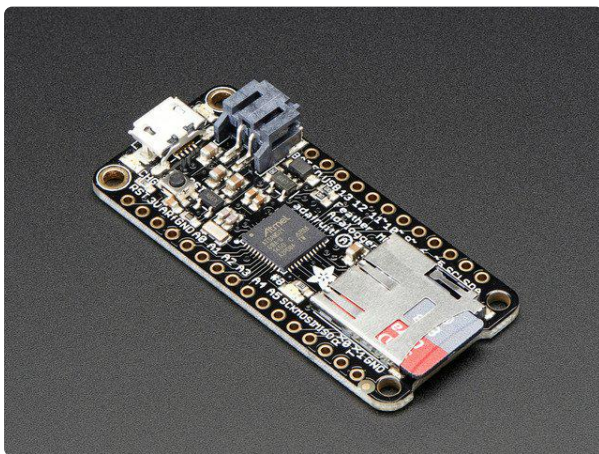
### Adafruit Feather 32u4 Basic Proto

Feather is the new development board from Adafruit, and like its namesake it is thin, light, and lets you fly! We designed Feather to be a new standard for portable...

<https://www.adafruit.com/product/2771>

## An M0 Challenger Appears!

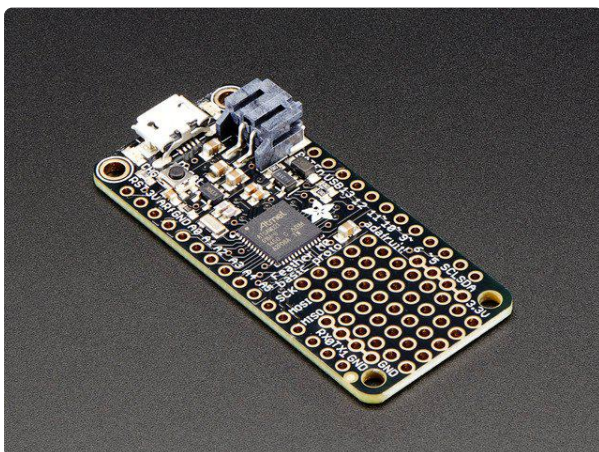
A new chip in the market at the time was the ATSAM21, used in the Arduino Zero. This chip is about the same price as the ATmega32u4 but has 8x as much FLASH, 8x as much RAM, is a full 32 bit ARM Cortex M0+, runs 6 times faster and has a bazillion more peripherals including a DAC! Feather turned out to be a great way to make a board using this nice new chip. So I designed versions of Adalogger, Basic and Bluefruit to match!



### Adafruit Feather M0 Adalogger

Feather is the new development board from Adafruit, and like its namesake it is thin, light, and lets you fly! We designed Feather to be a new standard for portable microcontroller...

<https://www.adafruit.com/product/2796>



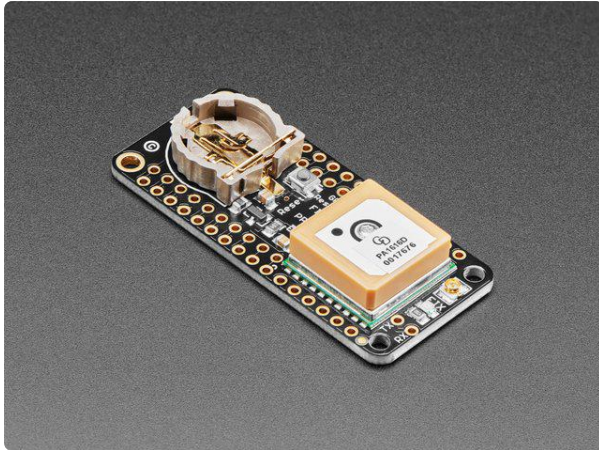
### Adafruit Feather M0 Basic Proto - ATSAM21 Cortex M0

Feather is the new development board from Adafruit, and like its namesake it is thin, light, and lets you fly! We designed Feather to be a new standard for portable microcontroller...

<https://www.adafruit.com/product/2772>

# Wing Friendz

Things were looking pretty good, I had a favorable view of the size, pinouts, and capabilities. So I started thinking about 'add ons' - little shields that could add capability. For example, I knew I'd need something to add GPS capability. So I designed a board that connected to the UART pins and would fit in the same shape as the feather. That managed to fit, and even had room for a battery backup:

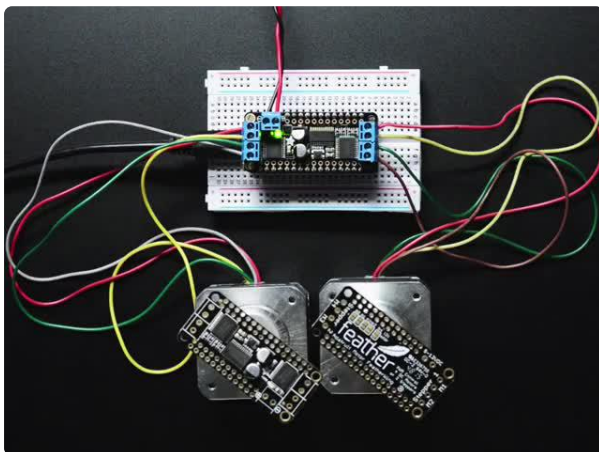


## Adafruit Ultimate GPS FeatherWing

Give your Feather a sense of place, with an Ultimate GPS FeatherWing. In 2013 we designed the Ultimate GPS...

<https://www.adafruit.com/product/3133>

Then, I took the most popular Arduino shield we have, the motor shield, and squeezed it down to a Wing. That fit fine too!



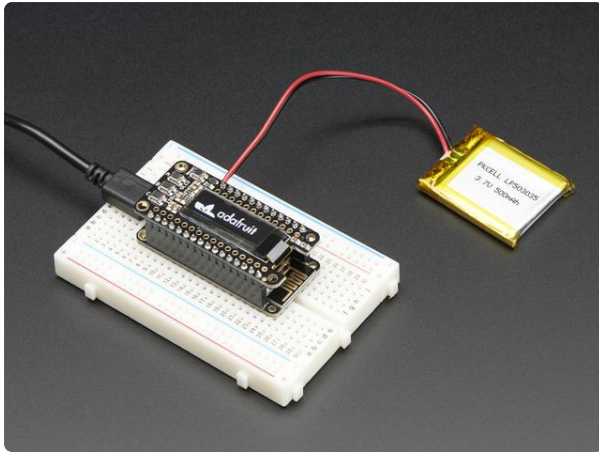
## DC Motor + Stepper FeatherWing Add-on For All Feather Boards

A Feather board without ambition is a Feather board without FeatherWings! This is the DC Motor + Stepper FeatherWing which will let you use 2 x bi-polar...

<https://www.adafruit.com/product/2927>

I tried designing a couple more FeatherWings, using I2C, SPI, GPIO etc. Like this OLED wing:





## Adafruit FeatherWing OLED - 128x32 OLED Add-on For Feather

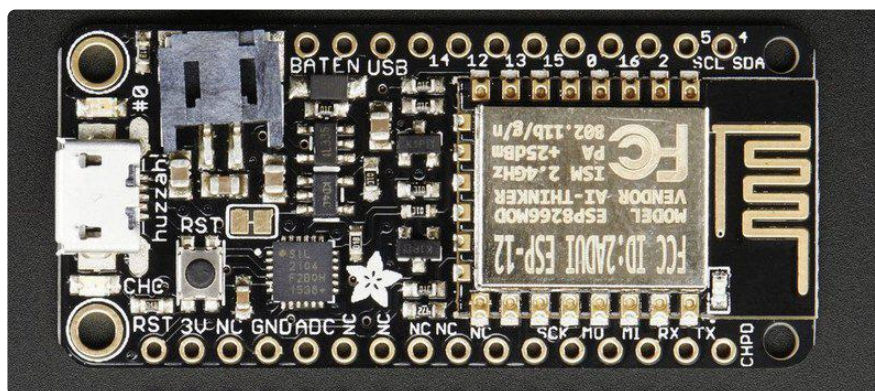
A Feather board without ambition is a Feather board without FeatherWings! This is the FeatherWing OLED: it adds a 128x32 monochrome OLED plus 3 user buttons to...

<https://www.adafruit.com/product/2900>

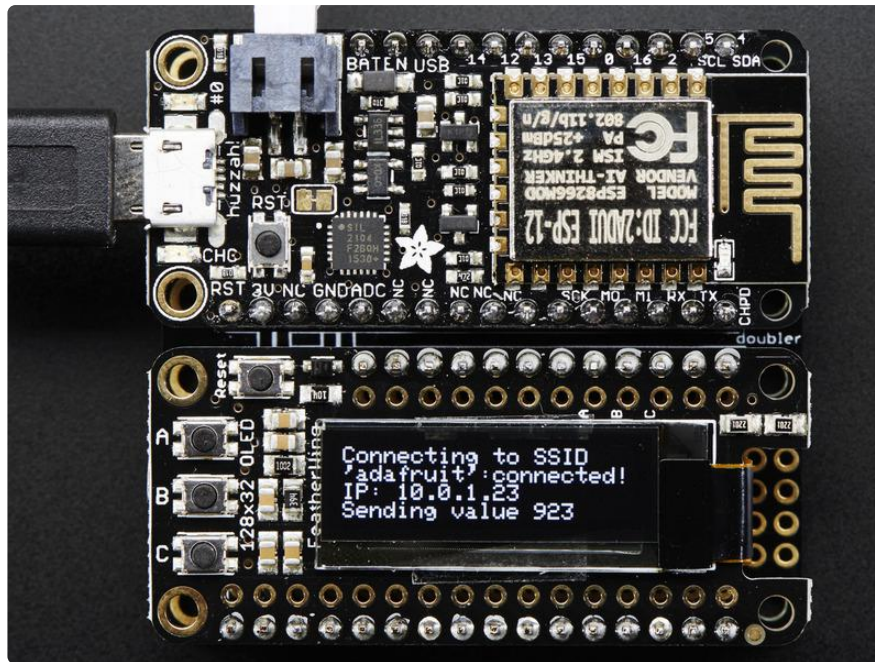
By this time I had maybe a dozen or so Feathers and Wings. So far I'd only been using the ATmega32u4 and ATSAM21. These chipsets are powerful and have plenty of capability. But to make the ecosystem really work I needed to make the most 'difficult' and 'minimal' Feather, to verify all my Wing designs would still work

## ESP8266 Feather

Once I had a prototype of this design I sort of realized that the basic idea could be extended to other modules, not just the nRF51 Bluefruit module. For example, at the time, the ESP8266 was gaining in popularity, and there was a module that had the chip, flash memory and antenna. We already had a breakout board but it didn't have a USB interface, or battery charger. Adding a USB to serial converter and a lipoly charger would make the board a little bigger, and with some arrangement, I fit everything in the same 0.9" by 2.0"



Since the ESP8266 was so constrained: only one 1.0V ADC, few pins, odd pullups and pulldowns, it was a perfect test bed for all the Wings I could create. I started cross-testing all the Wings with this chip. If I could get them working with this Feather and the 32u4 and the SAMD21 that covered 3 different architectures (Tensilica, 8-bit AVR, 32-bit ARM) for good functional coverage.



From then on, it was easy going. I just designed a Feather or Wing every single week for a full year. I always knew what I'd work on next because it was just a Feather or accessory. Each new Wing or Feather gets tested against all the other accessories to make sure they all work. It's a little tedious but that's the great thing about Feather, is the full cross-compatibility. Now, every time a new chip comes out, I don't have to "start all over from scratch". For example, designing the ESP32 Feather was a little constraining to make it all fit but once it fit, I knew that I didn't have to make an OLED add-on, terminal block add-on, LED matrix add-on, etc.

As of this writing, May 2017, there are 52 Wings and 26 main boards. Other companies and customers are also designing their own compatibles.

I fully expect to have 100 Wings and 50 main boards in the next year or two - Feather has been a great success!

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## Feather Specification

Are you interested in making something that works with the Adafruit Feather & FeatherWing system?

That's awesome! Adafruit encourages you to do so! Here's some guidelines to make it easy to make sure you can mix & match in the nearly-100-board ecosystem.

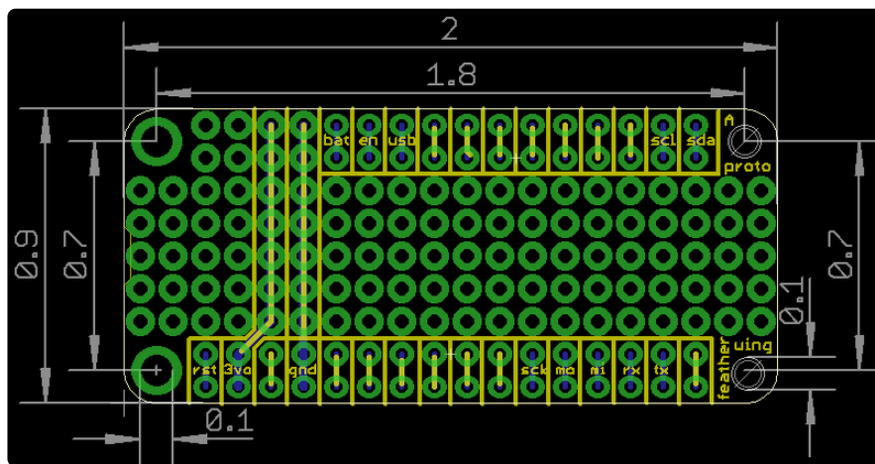
We will do our best to update this whenever we can!

## Feather & Wing Sizes

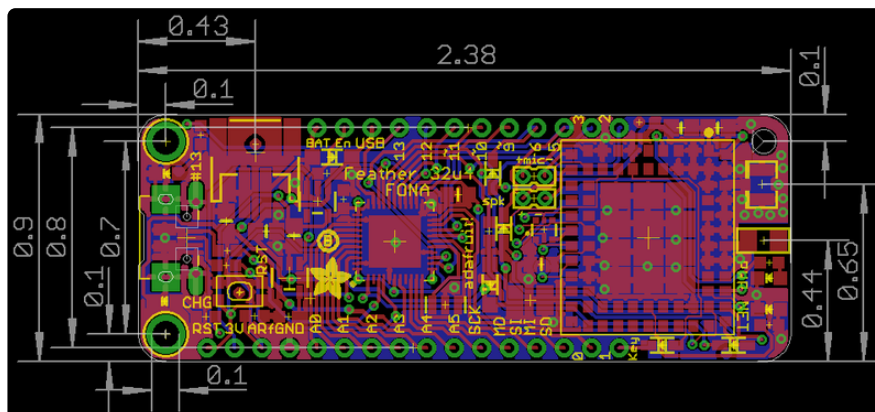
The 'classic' Feather and Wing size is 0.9" x 2.0" with 0.1" holes at each corner.

There is one 16-pin breakout strip on the bottom side, centered 1.0" from the left edge. There is one 12-pin breakout strip on the top side, 1.2" from the left side. The spacing between the two strips is 0.8" Don't change the GPIO spacing or location, or you will not maintain compatibility with Wings!

This Proto Featherwing shows off those dimensions:



If you need more space, you can, of course, go double-sided or you can go longer. For example, the 32u4 FONA Feather has the same width but is longer:



If you are making a Feather main-board, we don't recommend going any wider, or adding space on the 'left side' where the USB port is. If you do go wider, or add space, make the USB side (the left two holes, and the breakout pins with-respect-to bottom left corner) the same.

If you do go wider, it wont fit nicely in a breakout board.



[illegible]

A small, black FeatherWing microcontroller board is shown next to a US quarter coin for scale. The board features a 2.4-inch TFT display, a FeatherWing logo, and various electronic components like a microcontroller, capacitors, and a reset button. The text on the board includes "E336755", "GC-2 94V-0", "2.4" TFT", and "FeatherWing®". The coin is a US quarter, showing the profile of George Washington.



# Pins & GPIO

One of the goals of Feather was to unify the pinouts so that we only have to make one OLED display and have it work with all the mainboards.

If you maintain compatibility you can expect to be able to work with any current or future Wings! (Note, however, we only test our own boards for guaranteed compatibility)

## Power

All Feathers and Featherwings use 3.3V logic - so do not make anything that requires 5.0V logic. You must accept and emit 3.3V logic on any Feather/Wing (except for Analog inputs)

The power pins on all Feather mainboards must be the same:

### VBUS

This is the power that comes from the USB port. It should be 4.5-5.5V or so, 500mA. You can put a fuse on this pin if you like, but it is not required. This pin can be at approx the same voltage as VBAT if the USB power is removed (some of our older Feathers did this), or it can disconnect completely (our newer Feathers including the ESP32 do this with a transistor switch). FeatherWings can use this for powering larger items like servos or lots of LEDs, but they need to cope/understand that it can go away when the Feather is unplugged from USB

### VBAT

This is the power that comes from the 'optional' LiPoly battery. It should be 3.0-3.7V or so, with variable current capability.

If you are making a mainboard Feather you must have onboard LiPoly charging (its a core expectation) and the LiPo connection must be a JST 2-PH that matches Adafruit batteries. The connector must be in the same location, 0.425" from the left edge

Also, you must have some charge indication LED, we strongly recommend sticking a yellow CHG LED below the microUSB connector.

We tend to require no smaller than a 250mAh battery for WiFi/Radio Feathers. On the Cellular Feathers, its reasonable to require 750mAh or higher, and have the charge rate be 500mA. We don't recommend setting the charge rate below 100mA or above 500mA but as long as its well documented why you chose it, its fine.

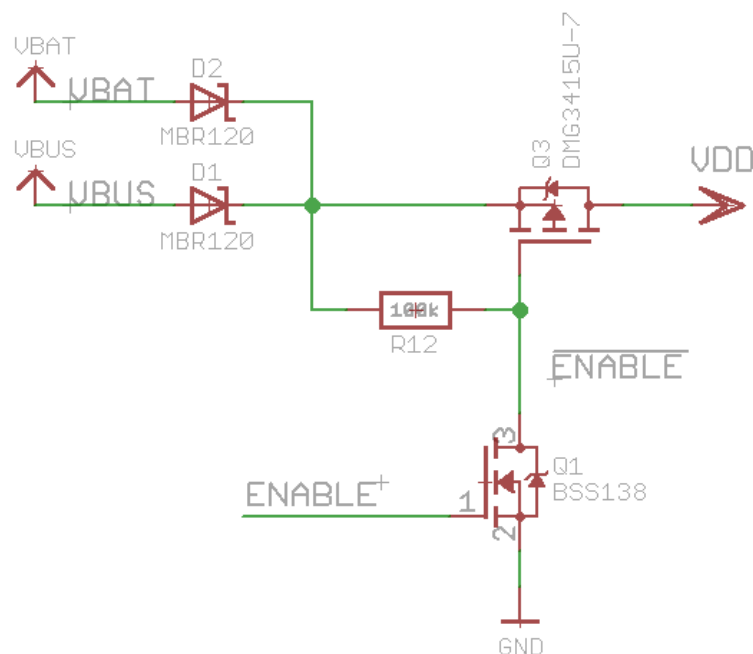
We strongly recommend you design your Feather and Wings to not require a LiPoly plugged in. For cellular, a LiPo is required but that is the one exception we've made so far!

FeatherWings can use this pin for powering larger items like servos or lots of LEDs, but they need to cope/understand that it can go away if the LiPo dies or if it is not unplugged.

## VBAT & VBUS Usage on Wings

We recommend that if your Wing does need high power, to use 2 x 1A Schottky diodes to give higher-of-either for your power input.

We also recommend that you use a simple invert+switch to disable the power source when ENable is low:



## 3.3V Output

The 3.3V pin is power from Feathers to Wings. You must have a regulator or buck converter on the Feather mainboard to take VUSB/VBAT to 3.3V. It is OK to have the 3.3V drop down to 3.0V when the battery is dead. We like the AP2112K-3.3 regulator, it's ultra low dropout, a good price, and has up to 500mA current output. If you pick something else, we recommend that after powering the Feather, you have at least 100mA remaining in the budget for Wings.

## ENable Input

The EN pin is an input to your Feather Mainboard and must be used to depower the 3.3V output. We tend to tie it to the Enable pin on the 3.3V regulator, with a 100K pullup. It does not disable VBAT/VUSB, see above for a circuit that will let you do that. It is OK if you decide to have EN de-power USB/BAT as well, but not required.

## Bus Pins

To make it easy to create add-ons, we have fixed inter-chip bus pins:

- RX & TX - these are UART pins. If your mainboard has a spare hardware UART, put these here. If your board uses the sole UART for bootloader/debug (e.g. ESP8266) then you can put those here as well. If designing a Feather, try to not use these as they are not always available. The pins names are relative to the Feather and not the Wing.
- SDA & SCL - this should be your main I2C bus. I2C pullups are put on the Wings, not on the mainboard. These are 3.3V logic, we strongly recommend avoiding clock-stretch I2C on Featherwings. Repeated start is OK! This is our recommended interface for sensors and Wings, try to stick to it.
- SCK/MOSI/MISO - this should be your main SPI bus. 3.3V logic. If you share these with devices on the main featherwing, keep the CS pin from being exposed so that you don't have SPI bus contentions.
- I2S - we don't fix the I2S pins! I2S is not as common and often are very restricted. We don't have any guarantees on where the I2S pins may lay.

# Analog Pins

There are 6 reserved spots for Analog pins between the power pins and SPI pins. You do not have to have the analog pins in order (e.g. A0 first, then A1) but it is considered in good taste to do so. We do our best to put any DAC pins on the first two pins (e.g. Feather M0 has the DAC on A0, ESP32 has the DACs on A0 and A1)

The ESP8266 only has one analog pin and its 1.0V max, so be aware that while every other Feather mainboard has 6 analog-ins, if you want your wing to work with the ESP8266 there are restrictions. We tend not to use the analog inputs on Wings for these reasons.

While we don't require all 6 pins to be analog inputs, it would be unusual if they were not. So please do your best to keep those pins analog!

# General Purpose Pins

Between BAT and I2C pins there are 7 GPIO pins you can break out. These are every day 3.3V GPIO pins. The vast majority of Feather boards have these pins available and with customizable pullups.

However, the ESP8266 is the one constrained board and shares 3 of the GPIO with SPI and the other 4 have some unusual pull up/down requirements. So if you make a Wing that uses these GPIO, please test it with the ESP8266 Feather as it is the most challenging, or make it clear that the ESP8266 Feather is not compatible.

We don't expect all FeatherWings that use these GPIO to be stackable with other GPIO-using Wings (only I2C is really stackable) so feel free to use these however you like.

# Other Pins

- AREF - this is the Analog Reference if there is one for the chip. If there is not, keep this pin not-connected. We recommend Wings don't require this pin as not all chips have external ARef's.
- RESET - this is the main feather board reset line. It must be active low - that is you tie it to ground to reset the main Feather. Nearly all our Wings have a reset button that can be used. You must have a reset tactile button on your Feather.

A reset button on Wings is not required but is strongly recommended as the Wing usually covers up the button!

- 'Free' Pin - This is the pin to the right of TX. You can use it for an extra GPIO or if you have some onboard module that has a useful breakout. Sometimes we tie it to ground. Do whatever you like! FeatherWings should not require or use this pin unless there's some really good reason.

## Pin Naming

Added May 26th, 2021

The pin naming on silkscreen and pinout cards impacts software written for the Feather ecosystem. Therefore, we strongly suggest following the numbering below and discourage any other D# or A# labeling. Silkscreen numbers without a letter prefix should follow the D# numbering because that is the existing expectation.

Other microcontroller names can be put on silkscreen if room allows or on a pinout card. For example, the Adafruit Feather RP2040 has the GP# numbering on the bottom of the Feather. This is OK because it does not conflict with the standard A# and D# numbering.

The pin labeled \* is the free pin and has no consistent functionality or name.

D24 and D25 can be used in place of A4 and A5 when the pins do not feature any analog capabilities.

The user led should be shared with the D13 pin. There is no consistent name for when the user LED is not shared. In CircuitPython, both versions should be made available as `board.LED`.

Naming is as follows, oriented with USB at the top.

Left	Right
Rst	
3.3V	
Aref	
GND	
A0	Bat
A1	En

A2	USB
A3	D13
A4 or D24	D12
A5 or D25	D11
SCK	D10
MO	D9
MI	D6
RX or D0	D5
TX or D1	SCL
*	SDA

The M in MI and MO names used to refer to the term "master" from the SPI specification. We recommend using the term "microcontroller" or "microprocessor" instead for clarity.

## Other Requirements

### USB

USB is used for debug, upload and battery charge. We use micro B USB but you can also use USB C if you like! USB B wont fit (too chunky) and Mini B is deprecated so please stay away from those two.

Feather mainboards must have USB debug upload with a micro USB connector in the center left of the board. If your mainboard has native USB debug/upload, use that! If you do not, use a USB-serial converter chip such as CP2104, FT23x, etc.

You do not need to have RX/TX USB activity LEDs, but they're nice if you can!

### Bootloader / User LED

There must be at least one USER LED, we recommend it also indicate when the bootloader is active. Put this LED above the microUSB connector. We recommend red but not required. You can share this with one of the general purpose 7 IO pins, but if you can have it be separate and not-exposed, that's best!



# Not Required!

- JTAG, ISP or SWD connector - if you can fit one, great! But it is not required if you have a bootloader.
- Bootloader - if your board for some reason cannot come with a bootloader (because, say it is an FPGA board) just make it super clear. For anything else, a USB bootloader is very, very strongly recommended. UF2 file update support is required for CircuitPython-compatible boards.
- Power LED - we don't include one in general, but a power-good LED is fine to add
- Additional Breakouts - if the 12+16 pins are not enough, you can add more breakout strips if you have space - but note that FeatherWings may not use them

---

## CircuitPython

All of our Feathers support Arduino and C/C++ using a gcc toolchain. But not everyone wants to write C/C++ code. Thanks to the bigger and faster chips available, it is now possible to run a full Python interpreter directly in the microcontroller itself!

\*mind blown\*

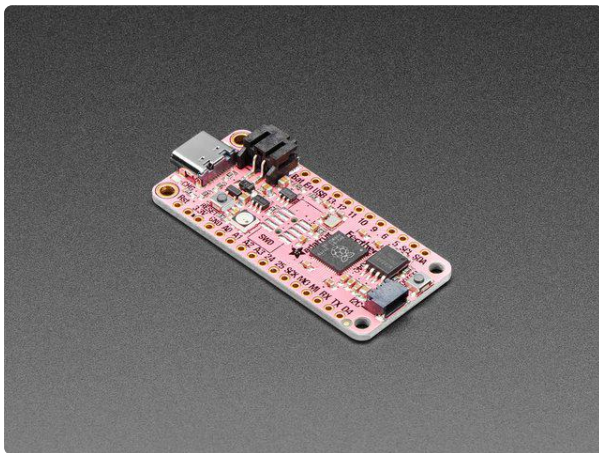


The original version of this embedded Python is called [MicroPython, written a feat of magic by Damien George](https://adafru.it/pF5) (<https://adafru.it/pF5>). Please help support him by [purchasing](#)

[g from his shop \(https://adafru.it/wf9\)](https://adafru.it/wf9)! We also stock [MicroPython boards, books and badges in the Adafruit shop \(https://adafru.it/wfa\)](https://adafru.it/wfa) all of which directly help Damien's efforts.

CircuitPython is a variant of MicroPython which is designed specifically for beginners, and use the chipsets on Adafruit boards, like the SAMD21 and SAMD51. They are 98% the same and use the same interpreter core, just some of the helper libraries vary in naming.

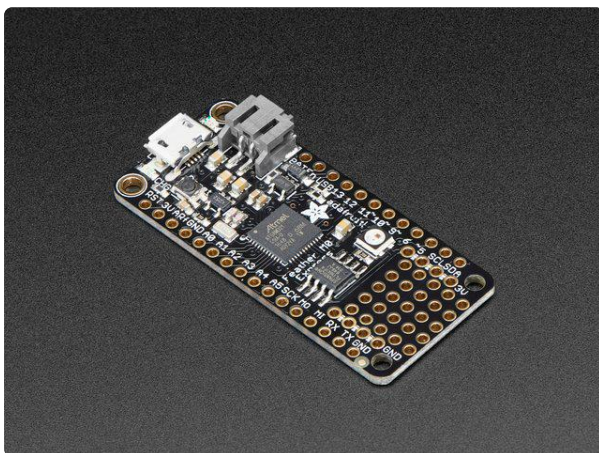
## Feathers designed for CircuitPython



### Adafruit Feather RP2040

A new chip means a new Feather, and the Raspberry Pi RP2040 is no exception. When we saw this chip we thought "this chip is going to be awesome when we give it the Feather..."

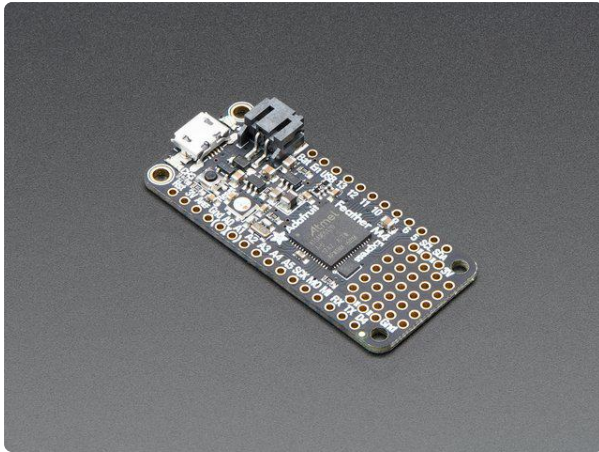
<https://www.adafruit.com/product/4884>



### Adafruit Feather M0 Express

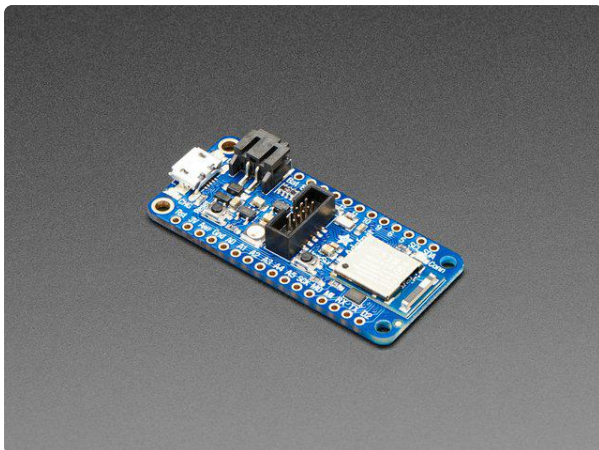
At the Feather M0's heart is an ATSAMD21G18 ARM Cortex M0+ processor, clocked at 48 MHz and at 3.3V logic, the same one used in the new

<https://www.adafruit.com/product/3403>



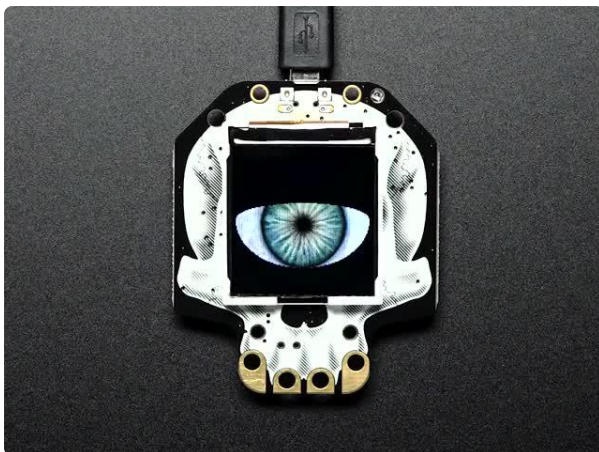
### Adafruit Feather M4 Express - Featuring ATSAMD51

It's what you've been waiting for, the Feather M4 Express featuring ATSAMD51. This Feather is fast like a swift, smart like an owl, strong like a ox-bird (it's half ox,... <https://www.adafruit.com/product/3857>



### Adafruit Feather nRF52840 Express

The Adafruit Feather nRF52840 Express is the new Feather family member with Bluetooth Low Energy and native USB support featuring the nRF52840! It's... <https://www.adafruit.com/product/4062>



### Adafruit HalloWing M0 Express

This is Halloween..this is Halloween... Halloween! Halloween! Are you the kind of person who doesn't... <https://www.adafruit.com/product/3900>

The Feather M0 Express and M4 express are the first in a line of products specifically designed for [CircuitPython](https://adafru.it/tBa) (<https://adafru.it/tBa>). The SAMD21 and SAMD51 microcontrollers are inexpensive while still being full featured with native USB, multi serial (I2C and SPI) engines called SERCOMs and a 10 bit DAC. Its 256k on board flash is supplemented with an external flash chip that gives a huge two megabytes for your code and [all of our CircuitPython libraries](https://adafru.it/uap) (<https://adafru.it/uap>). The status NeoPixel gives you information on the state of CircuitPython even when its unplugged from a computer. Its perfect for rapid prototyping of sensor driven projects.

The Feather nRF52840 Express is a newer board that leverages both a Cortex M4F processor and a Bluetooth radio.

Contrary to its name, the Adafruit HalloWing M0 Express is a Feather (not a FeatherWing) in a modified form factor with an LCD display. The closeness of HalloWing and Halloween was too good to pass up.

#### Pros

- UF2 bootloader for easy drag and drop flashing
- 2MB SPI Flash for storing all your code, libraries and data files
- Status NeoPixel for debugging in a pinch
- Built-in USB support enabling CIRCUITPY drive, USB HID (mouse and keyboard) and easy serial

#### Cons

- No built in radio on the SAMD boards. Bluetooth for the nRF52840. Additional radios are available on FeatherWings.
- Not compatible with MicroPython, only CircuitPython
- M0: CircuitPython interpreter uses half the 32KiB RAM — only 16KiB for the user

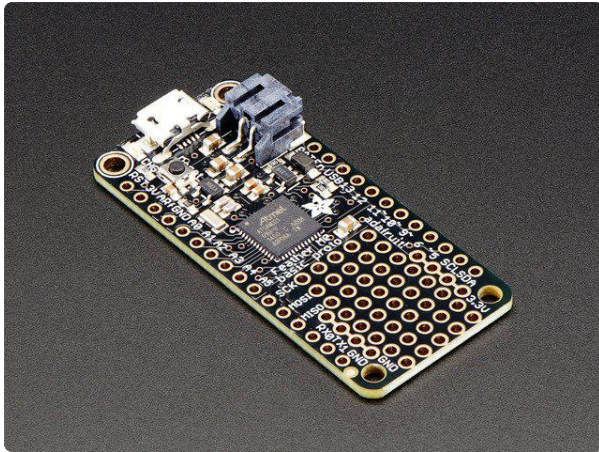
## CircuitPython-Compatible Feathers

These Feathers weren't designed for CircuitPython, but they work just fine!

The Huzzah does not have native USB so you don't get the nice "USB drive with source code on it". The non-Express M0's don't have a 2MB SPI Flash so the USB drive you get is quite small, and gets wiped if you update the firmware.

So if you really want to have an easy CircuitPython experience, we suggest the M0 Express, above!

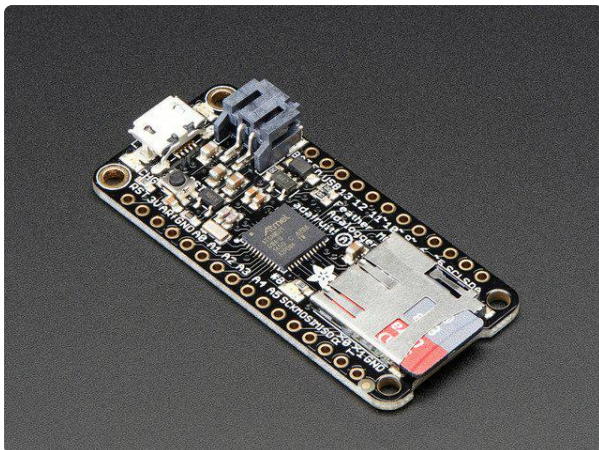




### Adafruit Feather M0 Basic Proto - ATSAM21 Cortex M0

Feather is the new development board from Adafruit, and like its namesake it is thin, light, and lets you fly! We designed Feather to be a new standard for portable microcontroller...

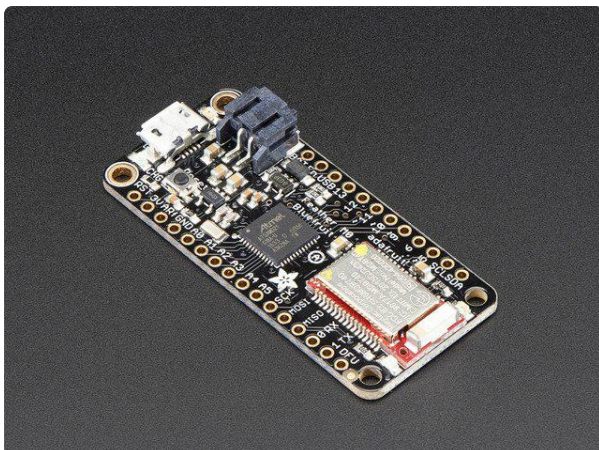
<https://www.adafruit.com/product/2772>



### Adafruit Feather M0 Adalogger

Feather is the new development board from Adafruit, and like its namesake it is thin, light, and lets you fly! We designed Feather to be a new standard for portable microcontroller...

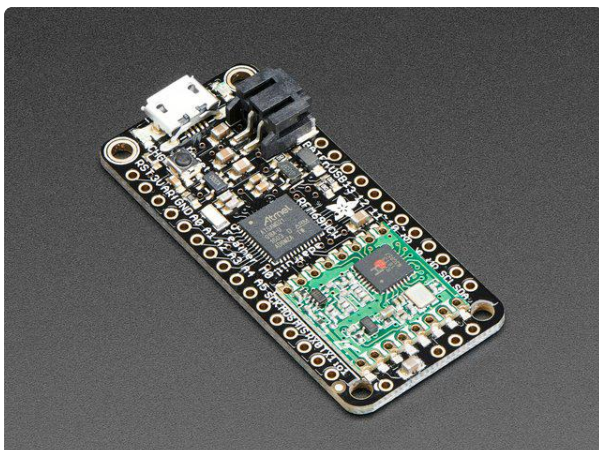
<https://www.adafruit.com/product/2796>



### Adafruit Feather M0 Bluefruit LE

Feather is the new development board from Adafruit, and like its namesake, it is thin, light, and lets you fly! We designed Feather to be a new standard for portable microcontroller...

<https://www.adafruit.com/product/2995>

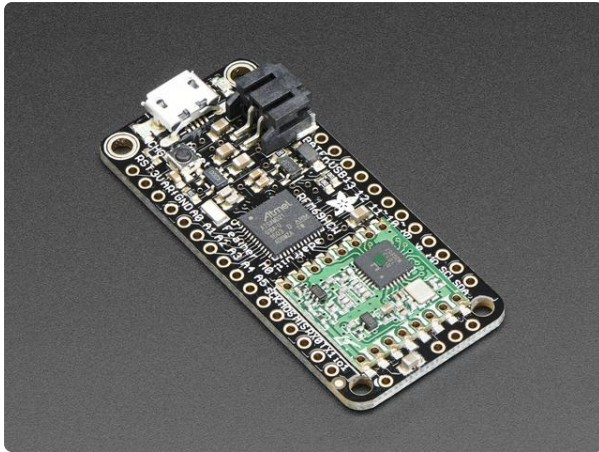


### Adafruit Feather M0 RFM69HCW Packet Radio - 433MHz

This is the Adafruit Feather M0 RFM69 Packet Radio (433 MHz). We call these RadioFruits, our take on an...

<https://www.adafruit.com/product/3177>

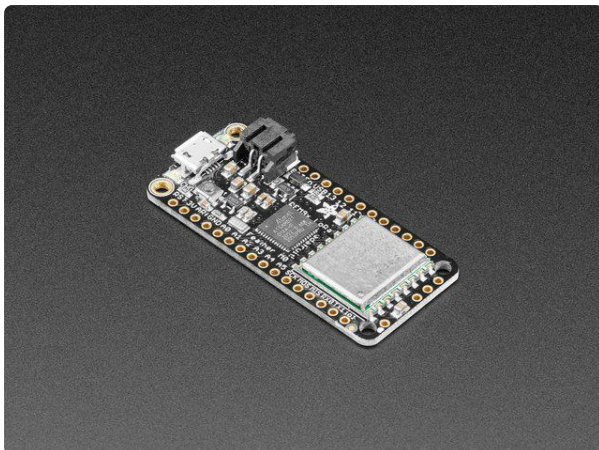




### Adafruit Feather M0 RFM69HCW Packet Radio - 868 or 915 MHz

This is the Adafruit Feather M0 RFM69 Packet Radio (868 or 915 MHz). We call these RadioFruits, our take on an...

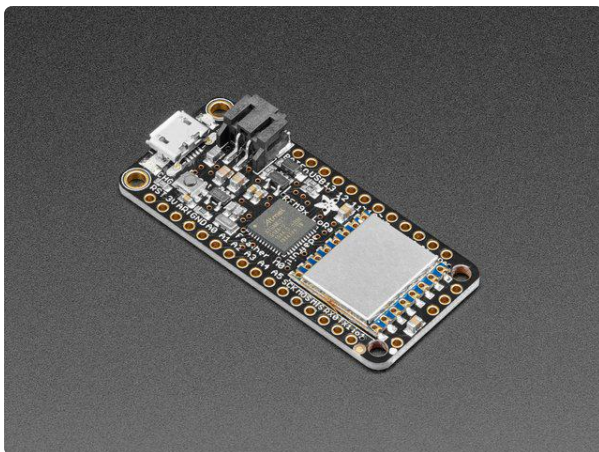
<https://www.adafruit.com/product/3176>



### Adafruit Feather M0 with RFM95 LoRa Radio - 900MHz

This is the Adafruit Feather M0 RFM95 LoRa Radio (900MHz). We call these RadioFruits, our take on an microcontroller with a...

<https://www.adafruit.com/product/3178>



### Adafruit Feather M0 RFM96 LoRa Radio - 433MHz

This is the Adafruit Feather M0 RFM96 LoRa Radio (433 MHz). We call these RadioFruits, our take on an microcontroller with a "

<https://www.adafruit.com/product/3179>

Prior to CircuitPython, the SAMD21 M0 microcontroller wasn't supported by MicroPython. However, it was supported by Arduino and that lead to a wide variety of M0 based feathers. Now, all of these can run CircuitPython but are more limited in the functionality available. They run the same speed as the Feather M0 Express but are missing the extra space for code on the SPI flash which also means that there is less room internally for functionality in the CircuitPython core.



So, if you already have one and want to try CircuitPython, then you can! They can do smaller code tasks just fine. Just beware that it won't be quite as easy as the Feather M0 Express.

Also note that the extra functionality on these boards, such as the SD card, radios and Bluetooth modules, is not yet supported in CircuitPython. Some of them will require additional core CircuitPython work while others will only require a new library or two.

#### Pros

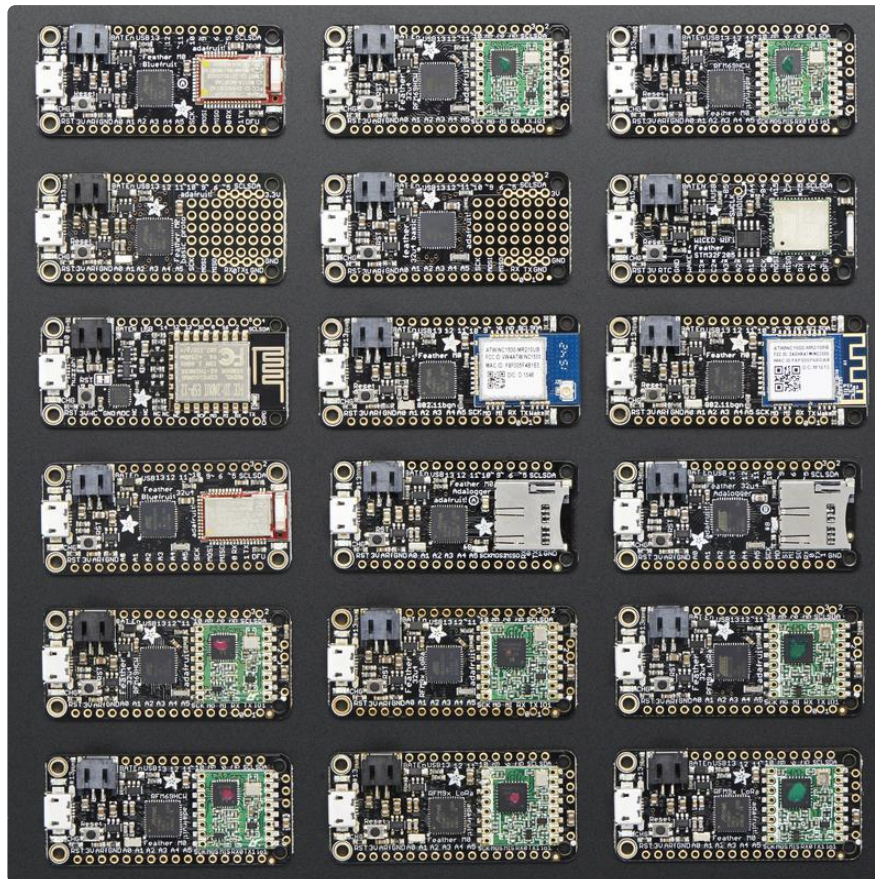
- Additional functionality on-board
- Built in USB support for CircuitPython drive
- If you already have one, you can try CircuitPython

#### Cons

- Very small file storage 64KiB max
- No UF2 bootloader
- No CircuitPython libraries for extra functionality
- CircuitPython version is reduced functionality to share flash with file storage

---

# Feathers



Feathers are the main/mother boards of the Feather platform.

You always need one Feather and can add zero or more FeatherWings to increase the capabilities.

For example:

- Feather Huzzah ESP8266 + Music Maker FeatherWing = MP3 streaming player
- Feather 32u4 Bluefruit + NeoPixel FeatherWing = Bluetooth LE controllable RGB lamp
- Feather 32u4 FONA + GPS FeatherWing = Cellular GPS locator with SMS control
- Feather nRF52 Bluefruit + Motor FeatherWing + Robot Chassis = Phone-controlled robot rover
- etc!

## All Feathers...

- All Feathers have a microcontroller that can be programmed by Arduino IDE

- All Feathers are 3.3V logic
- All Feathers come with a MicroUSB or USB-C connector that is used for data and power
- All Feathers have a bootloader, and do not require a separate programmer device
- All Feathers have USB Serial for debug (sometimes it is part of a native USB interface, sometimes via a USB-serial adapter chip)
- All Feathers are 0.9" wide, and fit in a breadboard with 1 row available on one side, and two rows on opposite side.
- Almost all are 2.0" long (M0 ATWINC Feathers, FONA Feathers, and Hallowing M0 Express are the exceptions)
- All Feathers have the same two mounting holes near the USB port
- All Feathers have Power, I2C, SPI, UART pins in the same location. Remaining pins try to be as similar as possible (but they may have different pin names/numbers)
- All Feathers can run from USB or LiPo battery, and have a LiPo charger built-in

## Most Feathers...

- Most of the Feathers have an Enable pin that will allow shutdown via logic level (Teensy and FONA Feathers are the exceptions)
- Most of the Feathers have a native USB connection (nRF52832 and ESP8266 are the exceptions)

## Some Feathers...

- Some Feathers have a wireless module built in. Those that do not most likely can have an added FeatherWing to provide a radio.
- Only Feathers with "Express" in their name are fully CircuitPython Compatible.
- Feathers with a SAMD21 "M0" processor but not an "Express" board may run CircuitPython but must share the onboard flash with CircuitPython, restricting the space available.

## No Feathers

- No feathers are guaranteed to be 5V-input compliant. Use 3.3V logic only please!

---

# Basic Feathers

Basic feathers are... basic. But they're not to be ignored! Their simplicity makes them a great base for Feather projects, when you don't need a wireless network, or built-in datalogging.

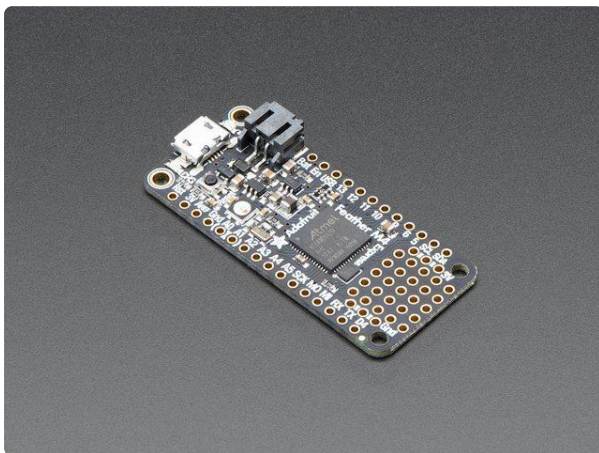
These were the First Feathers, as it were. They form the basis of later Feathers, so if you start here you can upgrade!

There's eight chipsets available:

- Atmel (now Microchip) ATmega328P
- Atmel (Microchip) ATmega32u4
- Atmel (Microchip) ATSAMD21 Cortex M0
- Atmel (Microchip) ATSAMD51 Cortex M4
- Atmel (Microchip) ATSAME51 Cortex M4
- Raspberry Pi RP2040
- STMicroelectronics STM32F405
- Freescale MK20DX256 - A.K.A Teensy 3.2, via an adapter

Note that there are ATSAMD21, ATSAMD51, and nRF52840 Express Feathers with extra flash onboard for CircuitPython use listed in the [CircuitPython page \(https://adafruit.it/DO1\)](https://adafruit.it/DO1).

## ARM ATSAMD51



### [Adafruit Feather M4 Express - Featuring ATSAMD51](#)

It's what you've been waiting for, the Feather M4 Express featuring ATSAMD51. This Feather is fast like a swift, smart like an owl, strong like a ox-bird (it's half ox,... <https://www.adafruit.com/product/3857>

Anything but basic, the Adafruit Feather M4 is the top of the line Feather for heavy lift.

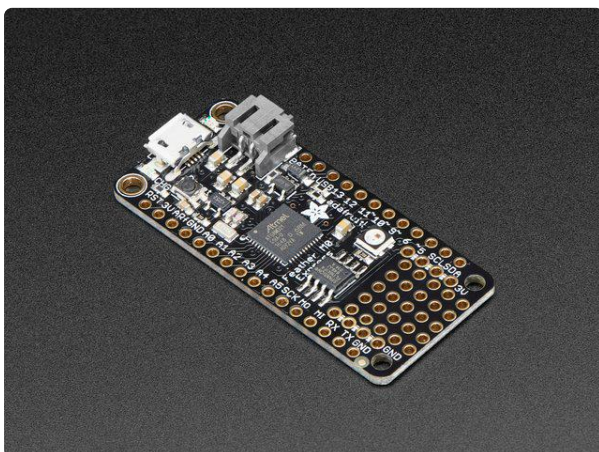
It is powered by our new favorite chip, the ATSAM51J19 - containing a 120 MHz Cortex M4 with floating point support, 512KB Flash and 192KB RAM. Your code will zig and zag and zoom, and with a bunch of extra peripherals for support, this will for sure be your favorite new chipset.

The most exciting part of the Feather M4 is that while you can use it with the Arduino IDE - and it's bonkers fast when you do, we are shipping it with CircuitPython on board. When you plug it in, it will show up as a very small disk drive with code.py on it. Edit code.py with your favorite text editor to build your project using Python, the most popular programming language. No installs, IDE or compiler needed, so you can use it on any computer, even ChromeBooks or computers you can't install software on. When you're done, unplug the Feather and your code will go with you.

## ARM ATSAM21

The ATSAM21 M0 is a 32-bit Cortex M0, with a ton more flash and RAM: 256KB and 32KB. It is also supported in Arduino but is a little newer (circa ~2015) and so does not have as many years of projects and example code already. It's also a completely different chipset than the AVR, so low level code will not work and must be re-written.

That said, its about the same price and you get a ton more speed (48 MHz and 32-bit processing), and peripherals. For example you can easily create multiple hardware UARTs or I2C ports, which is impossible on the AVR. Other stuff like I2S audio, 12-bit analog input, and true analog output (DAC) is only available on this chip. Especially if you're running low on Flash, RAM, or analog inputs, this is a nice upgrade.



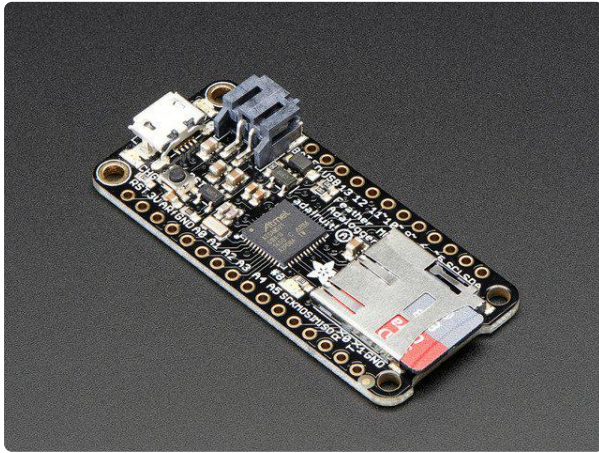
### Adafruit Feather M0 Express

At the Feather M0's heart is an ATSAM21G18 ARM Cortex M0+ processor, clocked at 48 MHz and at 3.3V logic, the same one used in the new <https://www.adafruit.com/product/3403>

The Feather M0 Express has added a Mini NeoPixel, 2 MB SPI Flash storage and a little prototyping space. Perfect for using with CircuitPython but also runs great with Arduino.



The Feather M0 Basic is a speedy chip mostly designed for Arduino programming. It can run CircuitPython but the board lacks the extra off-chip flash for extra storage space.



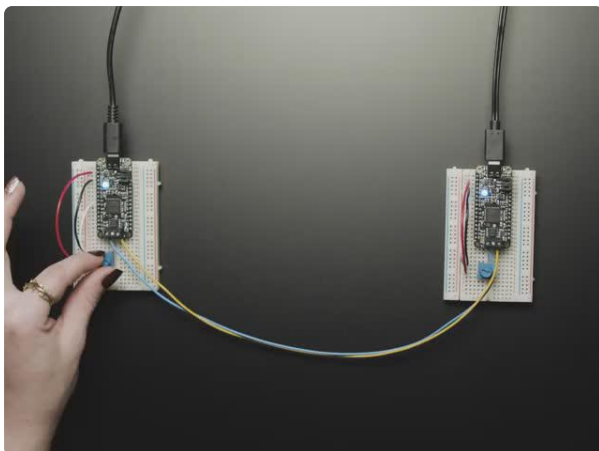
#### [Adafruit Feather M0 Adalogger](https://www.adafruit.com/product/2796)

Feather is the new development board from Adafruit, and like its namesake it is thin, light, and lets you fly! We designed Feather to be a new standard for portable microcontroller...

<https://www.adafruit.com/product/2796>

The Feather M0 Adalogger features a MicroSD card slot for adding as much storage as you could possibly want, for reading or writing.

## ARM ATSAME51



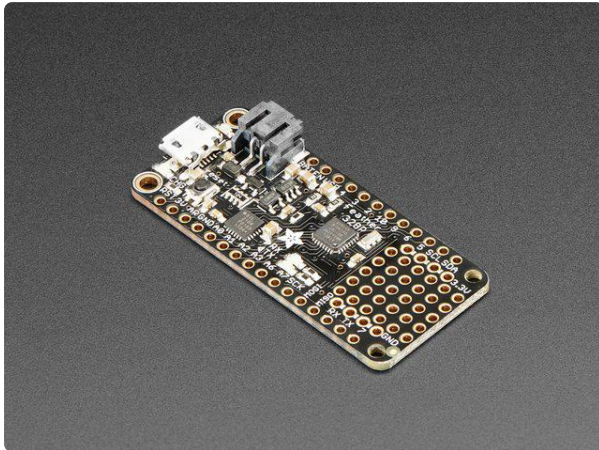
#### [Adafruit Feather M4 CAN Express with ATSAME51](https://www.adafruit.com/product/4759)

One of our favorite Feathers, the Feather M4 Express, gets a glow-up here with an upgrade to the SAME51 chipset which has built-in CAN bus support! Like its SAMD51 cousin, the...

<https://www.adafruit.com/product/4759>

One of our favorite Feathers, the Feather M4 Express, gets a glow-up here with an upgrade to the SAME51 chipset which has built-in CAN bus support! Like its SAMD51 cousin, the ATSAME51J19 comes with a 120MHz Cortex M4 with floating point support and 512KB Flash and 192KB RAM. Your code will zig and zag and zoom, and with a bunch of extra peripherals for support, this will for sure be your favorite new chipset for CAN interfacing projects.

# AVR ATmega 328P



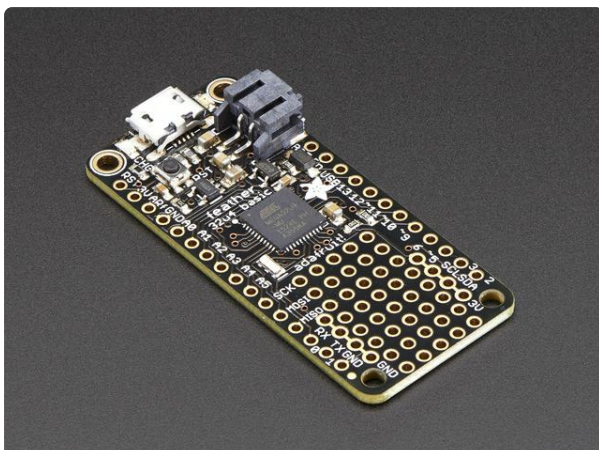
## Adafruit Feather 328P - Atmega328P 3.3V @ 8 MHz

With this Feather we're getting a little nostalgic for the ATmega328P - the classic 'Arduino' chip - with this Adafruit Feather 328P running a 3.3V and 8 MHz. Feather is...

<https://www.adafruit.com/product/3458>

The ATmega328P is nearly identical to the ATmega328 processor on the Arduino Uno and related boards. The Arduino core is rock solid. It still carries the same specs: 32 KB Flash and 2 KB of RAM. It runs at 8 MHz and uses a CP2104, a USB serial converter for USB bootloading and serial port debugging. There are 19 GPIO pins + 2 analog-in-only pins available on this tiny board.

# AVR ATmega32u4



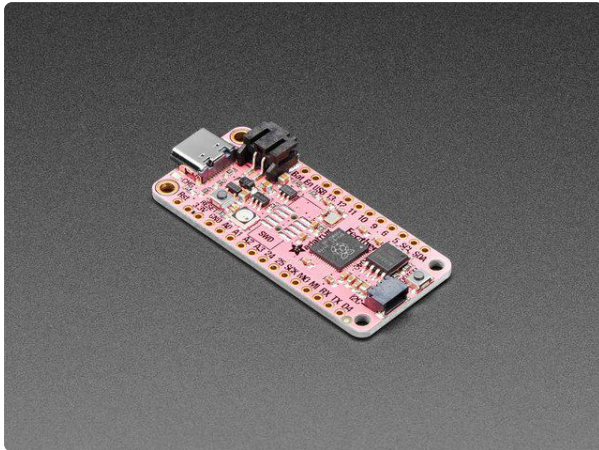
## Adafruit Feather 32u4 Basic Proto

Feather is the new development board from Adafruit, and like its namesake it is thin, light, and lets you fly! We designed Feather to be a new standard for portable...

<https://www.adafruit.com/product/2771>

ATmega32u4 is a well known 8-bit AVR processor, and may be more familiar to people who use the similar Arduino '328s. It's tried-and-true. The Arduino core for it was first developed in 2012 and so it's quite stable and well-known. Many low-level ATmega328 examples will work out of the box on the 32u4 (but not all!). It has 32KB of Flash and 2.5KB of RAM. It runs at 8 MHz and has native USB support

# ARM RP2040



## Adafruit Feather RP2040

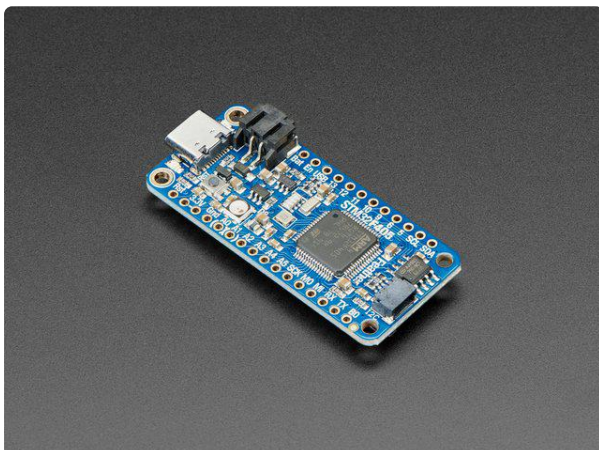
A new chip means a new Feather, and the Raspberry Pi RP2040 is no exception. When we saw this chip we thought "this chip is going to be awesome when we give it the Feather..."

<https://www.adafruit.com/product/4884>

The RP2040 is Raspberry Pi's powerful chip that features a 32-bit ARM Cortex-M0+ Dual core with a ton more RAM than the ATSAMD21.

The RP2040 is a powerful chip, which has the clock speed of our M4 (SAMD51), and two cores that are equivalent to an M0 (SAMD21). Since it is an M0 chip, it does not have a floating point unit, or DSP hardware support - so if you're doing something with heavy floating-point math, it will be done in software and thus not as fast as an M4. For many other computational tasks, you'll get close-to-M4 speeds!

# STM32F405



## Adafruit Feather STM32F405 Express

ST takes flight in this Feather board. The new STM32F405 Feather (video) that we designed runs CircuitPython at a blistering 168MHz —...

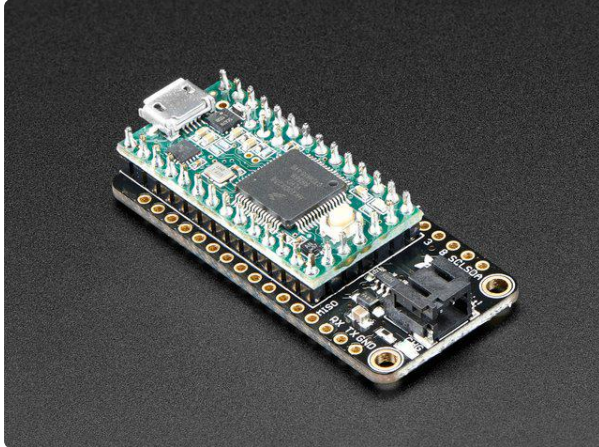
<https://www.adafruit.com/product/4382>

The STM32F405 Feather that we designed runs CircuitPython at a blistering 168MHz – our fastest CircuitPython board ever!



This feather features an STM32F405 Cortex M4 with 1MB Flash, 168MHz speed 3.3V logic, but almost all pins are 5V compliant! USB C power and data - our first USB C Feather!

## Teensy 3.2 Adapter



### Teensy 3.x Feather Adapter

Oh man, is this not the best thing ever? You can now use the awesome Teensy 3 with any and all of our FeatherWings or <https://www.adafruit.com/product/3200>

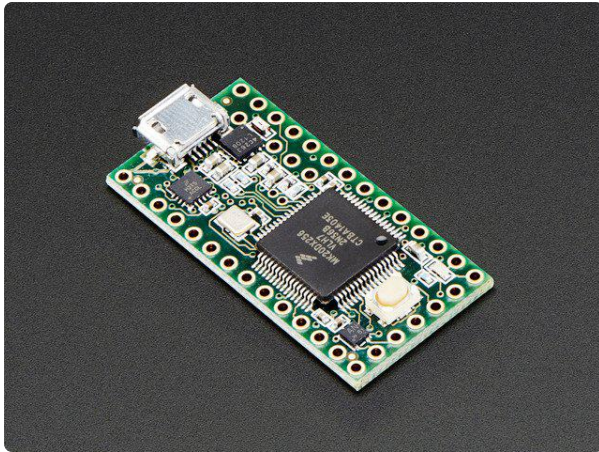
It turns out the Teensy 3.2 fits right between the headers of a Feather, so we thought - hey lets make this into an adapter!

You get the awesome power, speed, and projects of the Teensy 3, with the wings of a Feather.

It's a great way to take advantage of the Feather ecosystem. You don't get everything - for example the EN pin isn't connected. But we've tested our [FeatherWings \(https://adafru.it/vby\)](https://adafru.it/vby) so far and all are drop-in compatible.

With the space left over, we even added in a 500mA LiPoly charger that automatically charges over USB and will switch over to the LiPo when USB is unplugged. There's also a 100K resistor divider for monitoring the battery voltage connected to A7

Teensy not included, so be sure to pick one up, too!



### Teensy 3.2 + header

Teensy 3.2 is a small, breadboard-friendly development board designed by Paul Stoffregen and PJRC. Teensy 3.2 brings a...

<https://www.adafruit.com/product/2756>

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## WiFi Feathers

Around 2012, low cost WiFi embedded modules started appearing to makers. At first they were \$20 each but the introduction of the TI CC3000 broke the \$10/ea barrier (in large qty) and so embedded boards with WiFi started coming on the market. Then in 2014, Espressif released a \$2 WiFi-inclusive microcontroller called the ESP8266 and competition heated up. Now there's a lot of WiFi options available for makers to create IoT projects!

## About WiFi

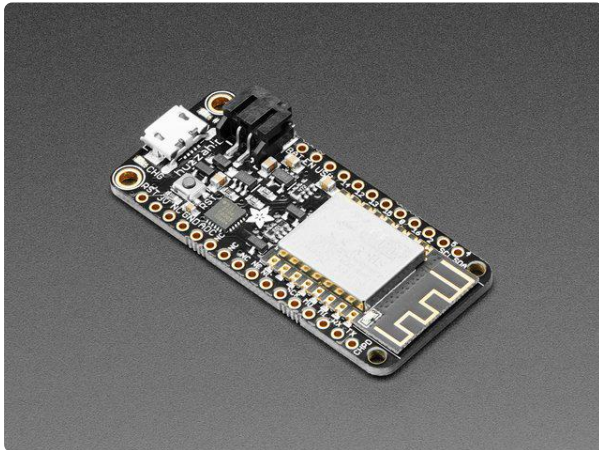
WiFi is just about everywhere but there's a few things to watch out for:

- Compared to Bluetooth, WiFi uses a ton of power, you can easily end up using 250mA during transmit and receive/listening. Try to use low power modes to reduce that if possible
- Compared to ZigBee, BTLE or LoRa/Packet radio, WiFi can transfer a lot more data a lot faster! You can easily stream compressed audio over WiFi.
- Compared to Ethernet, you may have connectivity problems, just like you do when your laptop has poor reception
- Compared to Cellular, WiFi tends to need a base-station nearby, so you can't use it in the middle of nowhere unless you have a WiFi hotspot
- Compared to just about any other wireless protocol, WiFi is strongly supported by every computer/tablet/phone, has strong encryption built-in, and can reach anywhere around the world!
- Like LoRa & packetized radio, you can create a WiFi ad-hoc network but this usually requires a little extra effort

All of our current WiFi Feather options support WPA PSK passcoding and SSL encryption. The full capabilities of SSL may vary, and you may have to do a little extra work for adding the SSL certificate to the module for true SSL checking.

## WiFi Feather Options

We have a few WiFi Feathers available



### [Adafruit Feather Huzzah with ESP8266 - Loose Headers](https://www.adafruit.com/product/2821)

Feather is the new development board from Adafruit, and like its namesake, it is thin, light, and lets you fly! We designed Feather to be a new standard for portable microcontroller...

<https://www.adafruit.com/product/2821>

The Feather Huzzah ESP8266 is a perennial favorite. It features an FCC/CE certified ESP-12 module that contains an ESP8266 chip, 4 MB of SPI flash and antenna.

#### Pros:

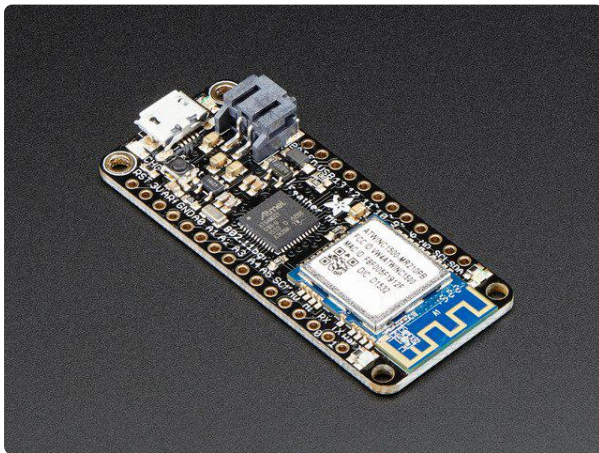
- The ESP8266 is super popular, has tons of projects, tutorials, guides
- Arduino support is very good, with a community/Espressif supported build that has been updated and maintained
- Can also be used with MicroPython or Lua
- Fast and reliable WiFi connectivity with SSL support
- Speedy chip at 80 MHz
- Very affordable, lower cost than other WiFi chipsets

#### Cons:

- High power draw, no easy-to-use sleep modes
- Single core design has a real time component that is not documented but required cycle time, so Arduino code needs to constantly yield() or the RTOS component will reset/crash
- Not a lot of GPIO pins, many have special functions so you can't use them for any purpose

- Only one analog input pin, 1.0V max
- No real datasheet or in-depth documentation. Most information is community-sourced or 'word-of-mouth'. Tech support is minimal.

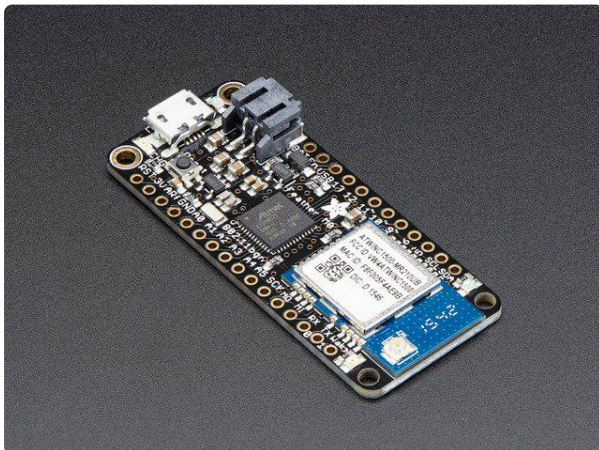
For the most part, the low cost of the ESP8266 has been enough incentive for people to overlook the drawbacks of the chip and figure out how to create projects with what they've got.



#### Adafruit Feather M0 WiFi - ATSAM21 + ATWINC1500

Feather is the new development board from Adafruit, and like its namesake it is thin, light, and lets you fly! We designed Feather to be a new standard for portable microcontroller...

<https://www.adafruit.com/product/3010>



#### Adafruit Feather M0 WiFi with uFL - ATSAM21 + ATWINC1500

Feather is the new development board from Adafruit, and like its namesake it is thin, light, and lets you fly! We designed Feather to be a new standard for portable microcontroller...

<https://www.adafruit.com/product/3061>

The Feather M0 + ATWINC1500 is a pairing of chips: there's a main processor (the Feather M0 part) and the wifi processor module (the ATWINC1500 part). As such, these Feathers are more expensive than all-in-one WiFi solutions. But, as a positive, they have a really powerful and well-documented main processor that runs separately from WiFi which can give you more control.

Pros:

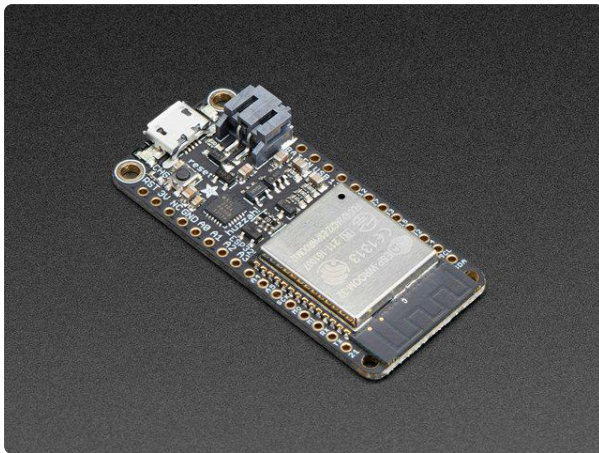
- Main chip is ATSAM21G18, which has solid official Arduino support
- Tons of GPIO and peripherals: analog inputs, I2S audio, DMA and even analog output support
- Proper sleep modes, can shut down WiFi module completely



- ATWINC1500 has some low-power mode support
- Fast and reliable WiFi
- Good SSL support, including SSL certificate uploading for fingerprinting
- Main processor is well-known and documented Cortex M0+ chip. WINC1500 has official support from Atmel/Microchip.
- Can use external antenna with the uFL version

#### Cons:

- More expensive than single-chip solutions
- Firmware on the module is opaque, no way to really debug or analyze beyond the firmware provided
- Not as popular as ESP8266 so fewer projects published
- No current MicroPython support for the ATWINC1500



#### Adafruit HUZZAH32 – ESP32 Feather Board

Aww yeah, it's the Feather you have been waiting for! The HUZZAH32 is our ESP32-based Feather, made with the official WROOM32 module. We packed everything you love...

<https://www.adafruit.com/product/3405>

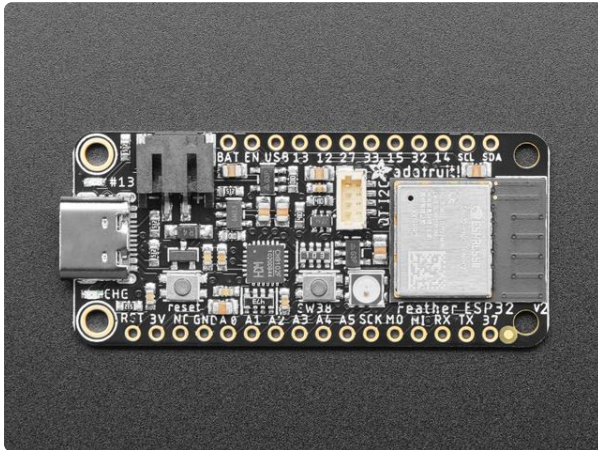
The ESP32 is the 'big sister' to the ESP8266. It has two cores, so that one can take care of the wireless management and data while the other one does processing

#### Pros:

- High speed dual chipset has tons of processing capabilities
- Lots of GPIO, analog inputs, two analog outputs, peripherals a-plenty!
- WiFi, Bluetooth LE and Bluetooth Classic all in one chipset, so you can do a wide range of IoT
- Plenty of example code support from Espressif, and they've hired skilled community members to write code, libraries, Arduino core support, and projects
- Low power sleep support
- MicroPython support

## Cons:

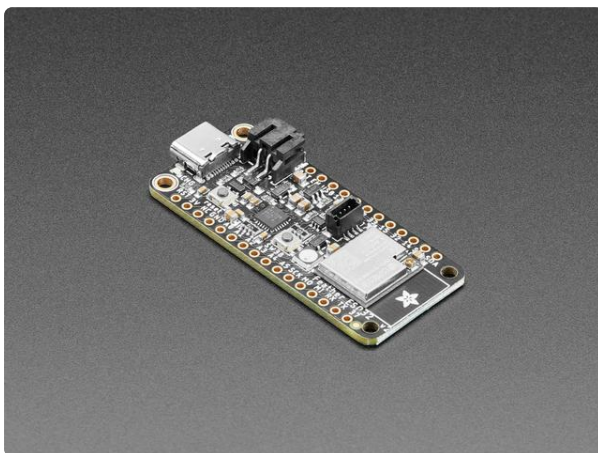
- Slow roll-out means not as many projects for this chipset yet, but it's gaining popularity
- No detailed documentation about peripherals. Support is offered as example code.
- As of mid-2017, core WiFi and BTLE functionality is supported but some capabilities like classic BT or dual-wireless projects are still in-the-works



### Adafruit ESP32 Feather V2 - 8MB Flash + 2 MB PSRAM

One of our star Feathers is the Adafruit HUZZAH32 ESP32 Feather - with the fabulous ESP32 WROOM module on there, it makes quick work...

<https://www.adafruit.com/product/5400>



### Adafruit ESP32 Feather V2 w.FL Antenna - 8MB Flash + 2 MB PSRAM

One of our star Feathers is the Adafruit HUZZAH32 ESP32 Feather - with the fabulous ESP32 WROOM module on there, it makes quick work...

<https://www.adafruit.com/product/5438>

The ESP32 v2 is the successor to the original ESP32. It has all the power of the original ESP32 plus extras. It is available with either a built-in antenna or a w.FL connector for an external antenna.

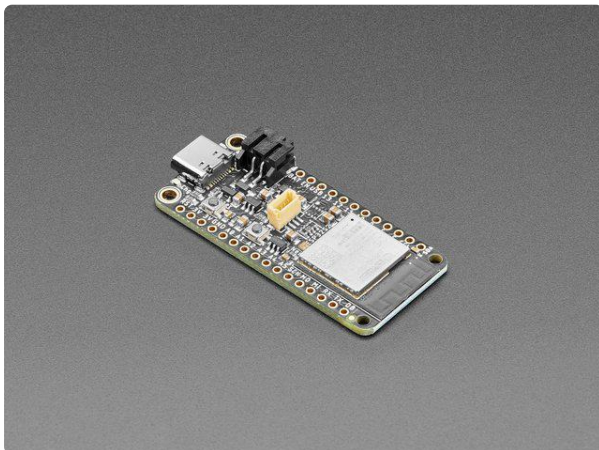
## Pros:

- Compared to the original Feather with 4 MB Flash and no PSRAM, the V2 has 8 MB Flash and 2 MB PSRAM
- Additional user button tactile switch on input pin 38
- Additional NeoPixel mini RGB LED with controllable power pin

- Additional STEMMA QT port for plug and play I2C connections
- USB Type C port instead of Micro B
- Designed for low power usage
- Upgraded the USB to serial converter from CP2102 to CH9102F which has no issues with uploading at 921600 bps for speedy firmware loading

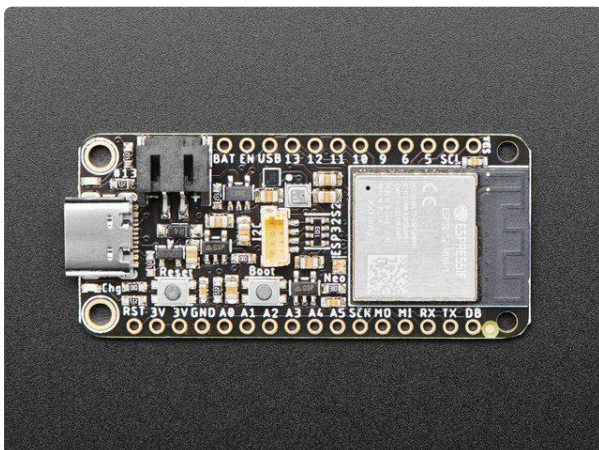
#### Cons:

- The pin numbers for the I2C port (SDA, SCL), hardware UART (RX, TX), and SPI (SCK, MOSI, MISO) have changed. If your code has hardcoded use for those pins, you'll want to replace them either with the new numbers or change the code to use the 'pretty' names like SDA or SCK.
- The 'corner' pin next to TX has changed from pin 21 to 37. This pin is not used in any FeatherWings because it's considered an 'extra pin'. It's also changed from a GPIO to input-only.



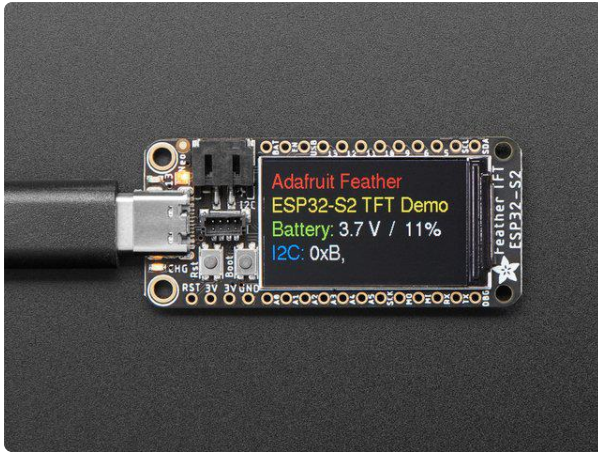
#### [Adafruit ESP32-S2 Feather - 4 MB Flash + 2 MB PSRAM](https://www.adafruit.com/product/5000)

What's Feather-shaped and has an ESP32-S2 WiFi module? What has a STEMMA QT connector for I2C devices? What has your favorite Espressif WiFi microcontroller and lots of Flash and...  
<https://www.adafruit.com/product/5000>



#### [Adafruit ESP32-S2 Feather with BME280 Sensor - STEMMA QT](https://www.adafruit.com/product/5303)

What's Feather-shaped and has an ESP32-S2 WiFi module? What has a STEMMA QT connector for I2C devices and a built in ambient sensor? What has your favorite Espressif WiFi...  
<https://www.adafruit.com/product/5303>



## Adafruit ESP32-S2 TFT Feather - 4MB Flash, 2MB PSRAM, STEMMA QT

We've got a new machine here at Adafruit, it can uncover your deepest desires. Don't believe me? I'll turn it on right now to prove it to you! What, you want unlimited...

<https://www.adafruit.com/product/5300>

In addition to WiFi, the ESP32-S2 includes native USB built in, which means it can run CircuitPython. There is an on-board STEMMA-QT connector and board options include a basic feather, one with the BME280 for temperature measurement, and one with a TFT display so you don't need a separate wing for that.

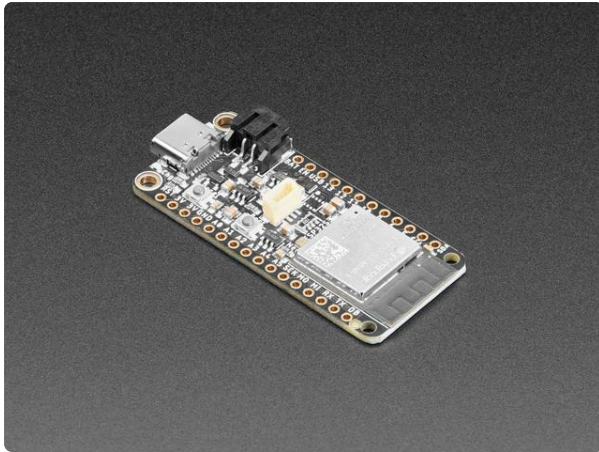
### Pros:

- The ESP32-S2 now has native USB, so it can act like a keyboard/mouse, MIDI device, or disk drive
- It comes with 4 MByte of Flash and 2 MByte of PSRAM so you can have huge data buffers
- It includes both Reset and DFU (BOOT0) buttons to get into the ROM bootloader
- Serial debug output pins
- STEMMA QT connector for I2C devices, with switchable power, so you can go into low power mode.
- Low Power friendly! In deep sleep mode we can get down to 80~100uA of current draw from the Lipoly connection.
- Works with Arduino or CircuitPython

### Cons:

- Feather ESP32-S2 has a single-core 240 MHz chip, so it won't be as fast as ESP32's with dual-core
- No Bluetooth support





### Adafruit ESP32-S3 Feather with STEMMA QT / Qwiic

The ESP32-S3 has arrived in Feather format - and what a great way to get started with this powerful new chip from Espressif! With dual 240 MHz cores, WiFi and BLE support, and native...

<https://www.adafruit.com/product/5323>

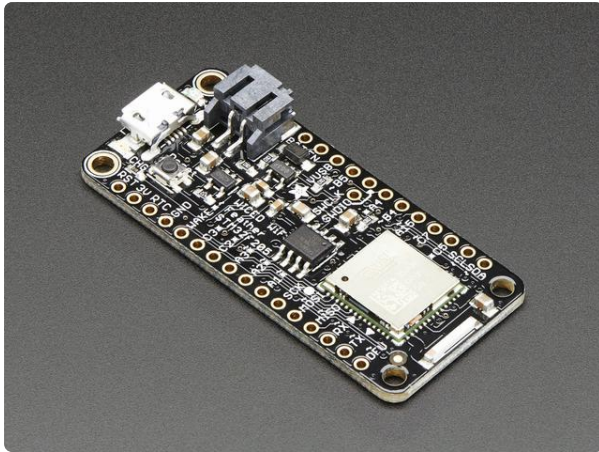
The ESP32-S3 brings back the second core, that the ESP32-S2 was missing, so it's faster. Along with the second core, Bluetooth Low Energy support was added.

#### Pros:

- The ESP32-S3 has native USB, so it can act like a keyboard/mouse, MIDI device, or disk drive
- The ESP32-S3 adds back the Dual Cores like the ESP32 has, so the speed is comparable.
- It includes Bluetooth LE support.
- It comes with 8 MByte of flash, which is double that of the ESP32-S2
- It includes both Reset and DFU (BOOT0) buttons to get into the ROM bootloader
- Serial debug output pins
- STEMMA QT connector for I2C devices, with switchable power, so you can go into low power mode.
- Low Power friendly! In deep sleep mode we can get down to 80~100uA of current draw from the Lipoly connection.
- Works with Arduino or CircuitPython

#### Cons:

- No PSRAM, so it can't handle large buffers
- No Bluetooth Classic support, only Bluetooth LE.



### Adafruit WICED WiFi Feather - STM32F205 with Cypress WICED WiFi

Discontinued - you can grab Adafruit  
HUZZAH32 – ESP32 Feather Board  
instead! Say...

<https://www.adafruit.com/product/3056>

The WICED Feather builds on a Broadcom (now Cypress) module, the same used in the Particle Photon. This chip combines an STM32 and BCM radio. Thanks to Thach's amazing software stack, we've taken a very complex and powerful chipset pair and made it trivially easy to get working within Arduino.

#### Pros:

- Powerful ARM Cortex M3 MCU (STM32F205) running at 120MHz
- Works directly from the Arduino IDE, generating native ARM code that runs directly on the target MCU.
- Plenty of GPIO and powerful peripherals, including native USB support with a custom USB DFU bootloader for programming from the Arduino IDE or from the command line.
- Fast throughput due to the efficient WiFi stack and fast multi-lane connection between the MCU and the Broadcom radio.
- Advanced features for various encryption modes, including TLS 1.2 (required for Amazon Web Services, etc.).

#### Cons:

- The WiFi stack and security libs are black box closed source solutions, meaning we have little influence over bug fixes and getting changes into the code. We're largely at the mercy of Broadcom (now Cypress) for any bug issues, and like any very complex stack there are known bugs in the security and wireless layers.
- No access to the low level source code since it is under very strict NDA, and we had to bend over backward to implement a layer that sits on top of the NDA code so that we have something we can expose.

---

# Bluetooth Feathers

## About Bluetooth

Bluetooth is a 2.4GHz wireless protocol that is popular for short range - about 10 meters max. It's very low power and simpler than WiFi. That low power and simplicity has made it the most popular point-to-point wireless transport - you now get a Bluetooth transceiver in every phone, tablet and laptop.

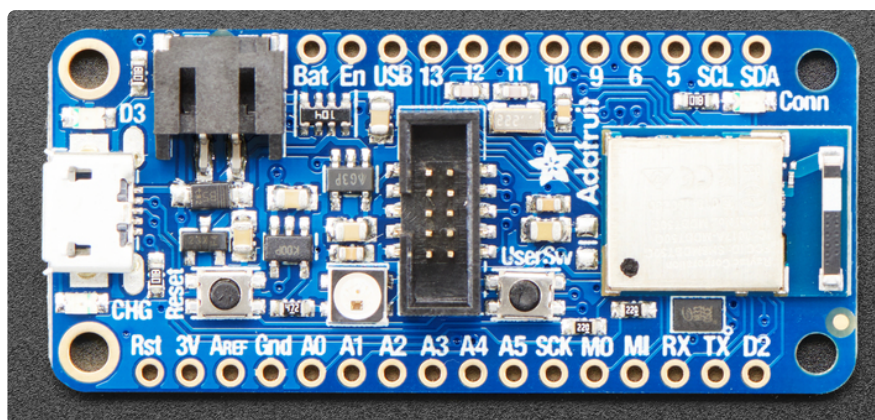
There are, annoyingly, two flavors of Bluetooth: BT Classic and BT Low Energy (introduced as part of the Bluetooth 4.0 standard). And, annoyingly, despite the similar names, they are completely different and not cross-compatible.

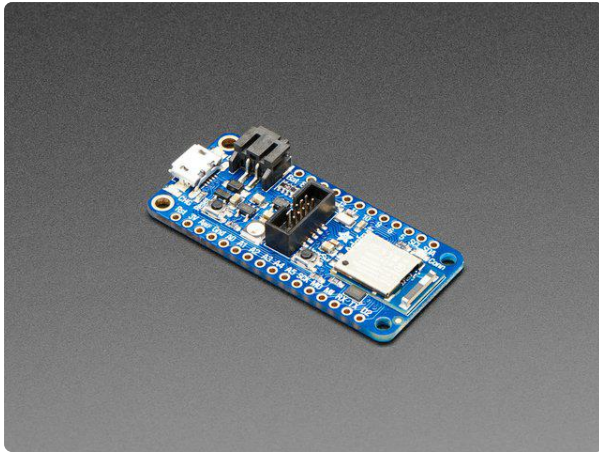
Bluetooth classic is used for unstructured serial data transfer (sometimes called SPP), keyboards and mice, and audio such as BT speakers or BT headsets

Bluetooth LE is used for structured data (organized by 'Services', which are made up of individual 'Characteristics'), beacons, keyboards and mice, MIDI, but not audio. It is also the only method exposed to the user in iOS.

Basically the thing to watch for is if you want to communicate with SPP devices or BT audio, you can't use LE. If you want to work with iOS, you can't use Classic. Keyboards/mice can be either.

## Feather nRF52840 Express (nRF52840)





### Adafruit Feather nRF52840 Express

The Adafruit Feather nRF52840 Express is the new Feather family member with Bluetooth Low Energy and native USB support featuring the nRF52840! It's... <https://www.adafruit.com/product/4062>

The Feather nRF52840 builds on the nRF52832, the core and peripherals are very similar. It adds 2x the FLASH and 4x the SRAM and also comes with a native USB client peripheral. Like the nRF52832 Feather, it has only one chip on it - and that chip is both the processor you program and also the Bluetooth Low Energy radio. What's nice about this is you can do more powerful stuff, and faster too, because you don't have to manage two chips. It's also lower price and lower power since there's only one processor, and easier to put into sleep modes.

The native USB means that it's great for Arduino or for CircuitPython support - no other BLE chipsets have USB!

#### Pros:

- Code runs natively on the nRF52840 MCU, so it's fast, efficient and less expensive than the two MCU based nRF51 boards
- Powerful ARM Cortex M4F processor with 1MB flash and 256KB SRAM
- Native USB! Can act like a keyboard, mouse, MIDI or disk drive. Bootloader can be mass-storage based.
- Supported by CircuitPython
- Hardware UART pins are available for communicating to other peripherals (unlike the nRF52832 which needed them for the bootloader chip)
- Better low power potential due to being a single chip solution
- Because everything runs natively, a lot of complexity can be hidden behind simple helper classes, making things like [ANCS \(https://adafru.it/wfj\)](https://adafru.it/wfj) possible and manageable compared to the nRF51.
- Supports both Central and Peripheral mode, Central mode meaning it can behave like a phone and initiate connections to other peripherals, although Central SW support is in the very early stages at this point

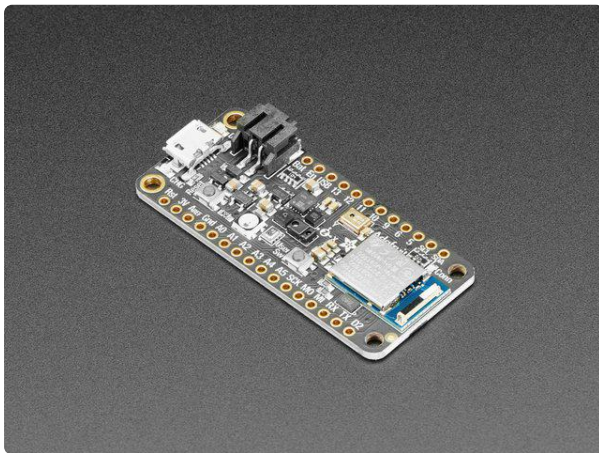


- Much more room to grow due to the MCU capabilities and flash/SRAM size compared to the earlier nRF51 or nRF52, and more advanced on board peripherals.

#### Cons:

- A new chipset that is not an ATmega328 or ATmega32u4, so some older low-level Arduino libraries and techniques are not compatible. This doesn't happen a lot but if you're porting a project over, you'll have to watch for it!
- Can not be used as a 'client' with your favorite MCU at the moment (unlike the nRF51), since code all runs natively (making this both a pro or a con depending on your needs).
- Examples from the nRF51 and nRF52 are not compatible with each other since they have entirely different programming models.
- Cannot use Bluetooth Classic

## Feather nRF52840 Sense (nRF52840)



#### Adafruit Feather nRF52840 Sense

The Adafruit Feather Bluefruit Sense takes our popular Feather nRF52840 Express and adds a smorgasbord of sensors...

<https://www.adafruit.com/product/4516>

Feather nRF52840 Sense takes our popular Feather nRF52840 Express and adds a smorgasbord of sensors to make a great wireless sensor platform. This Feather microcontroller comes with Bluetooth Low Energy and native USB support featuring the nRF52840! This Feather is an 'all-in-one' Arduino-compatible + Bluetooth Low Energy with built in USB plus battery charging. With native USB it works great with CircuitPython, too.

#### Pros:

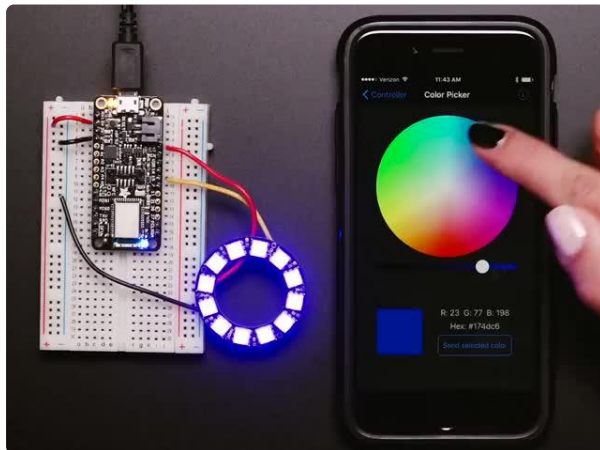
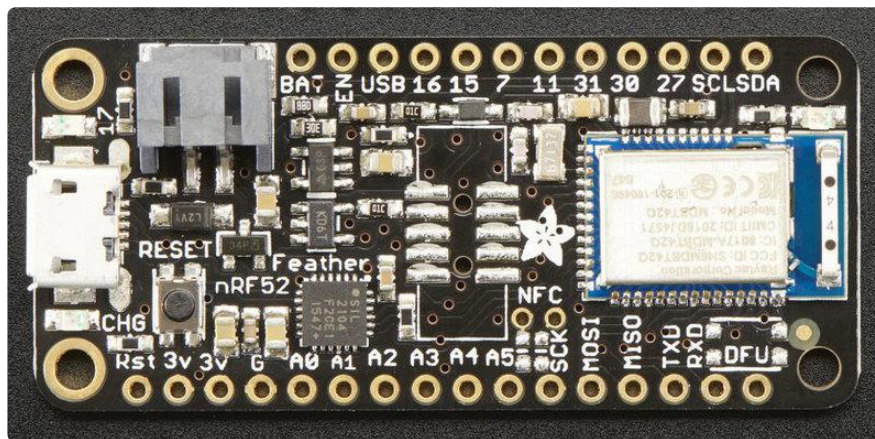
- Same pros as the Feather nRF52840 Express
- Includes LSM6DS33 Accel/Gyro + LIS3MDL magnetometer sensors

- Includes APDS9960 Proximity, Light, Color, and Gesture Sensor
- Includes PDM Microphone sound sensor
- Includes SHT Humidity sensor
- Includes BMP280 temperature and barometric pressure/altitude sensor

Cons:

- Same cons as the Feather nRF52840 Express
- Lacks a dedicated SWD connector, but has pads on the bottom

## Feather nRF52 (NRF52832)



### Adafruit Feather nRF52 Bluefruit LE

The Adafruit Feather nRF52 Bluefruit is another easy-to-use all-in-one Bluetooth Low Energy board, with a native-Bluetooth chip, the nRF52832! It's our take...

<https://www.adafruit.com/product/3406>

The Feather nRF52 is a new direction compared to our 32u4 or M0 Bluefruit boards. This Feather has only one chip on it - and that chip is both the processor you program and also the Bluetooth Low Energy radio. What's nice about this is you can do more powerful stuff, and faster too, because you don't have to manage two chips. It's also lower price and lower power since there's only one processor, and easier to put into sleep modes.

## Pros:

- Code runs natively on the nRF52832 MCU, so it's fast, efficient and less expensive than the two MCU based nRF51 boards
- Powerful ARM Cortex M4F processor with 512KB flash and 64KB SRAM
- Better low power potential due to being a single chip solution
- Because everything runs natively, a lot of complexity can be hidden behind simple helper classes, making things like [ANCS \(https://adafru.it/wfj\)](https://adafru.it/wfj) possible and manageable compared to the nRF51.
- Supports both Central and Peripheral mode, Central mode meaning it can behave like a phone and initiate connections to other peripherals, although Central SW support is in the very early stages at this point
- Much more room to grow due to the MCU capabilities and flash/SRAM size compared to the earlier nRF51832, and more advanced on board peripherals.

## Cons:

- A new chipset that is not an ATmega328 or ATmega32u4, so some older low-level Arduino libraries and techniques are not compatible. This doesn't happen a lot but if you're porting a project over, you'll have to watch for it!
- Can not be used as a 'client' with your favorite MCU at the moment (unlike the nRF51), since code all runs natively (making this both a pro or a con depending on your needs).
- Examples from the nRF51 and nRF52 are not compatible with each other since they have entirely different programming models.
- Cannot use Bluetooth Classic
- UART pins (RX/TX) are not available for connecting to sensors/wings, as they are used for programming and debug of the native chip.

We also carry a special Feather - unlike the rest of the Feather family, this board is not for use with Arduino IDE. Instead, it is for use with Mynewt only! We have programmed it with the Mynewt bootloader and updated the hardware to add an SWD connector and an additional DFU button. This Feather is for advanced users only, you will be interacting with the Mynewt RTOS rather than Arduino, and you cannot easily go back-and-forth without an SWD programmer.



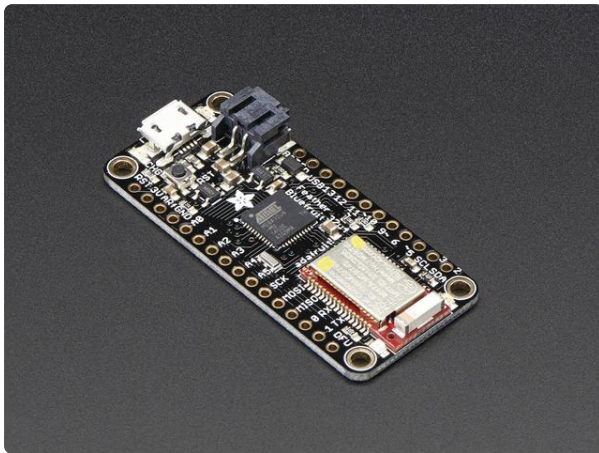


### [Adafruit Feather nRF52 Pro with myNewt Bootloader](https://www.adafruit.com/product/3574)

The Adafruit Feather nRF52 Pro is another Bluetooth Low Energy board for advanced projects and users who want to use a fully open-source Bluetooth Low Energy...

<https://www.adafruit.com/product/3574>

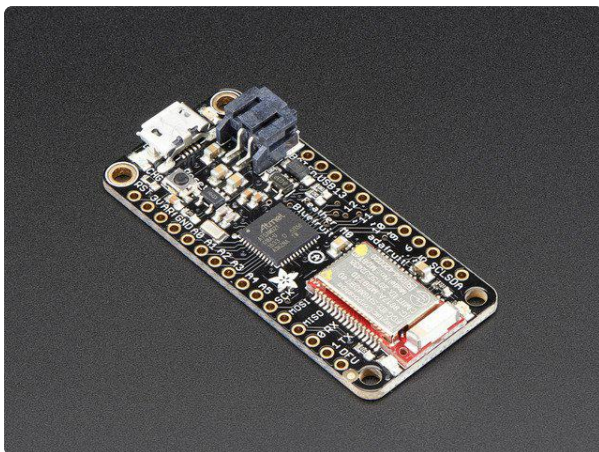
## Feather Bluefruit M0 and 32u4



### [Adafruit Feather 32u4 Bluefruit LE](https://www.adafruit.com/product/2829)

Feather is the new development board from Adafruit, and like its namesake it is thin, light, and lets you fly! We designed Feather to be a new standard for portable microcontroller...

<https://www.adafruit.com/product/2829>



### [Adafruit Feather M0 Bluefruit LE](https://www.adafruit.com/product/2995)

Feather is the new development board from Adafruit, and like its namesake, it is thin, light, and lets you fly! We designed Feather to be a new standard for portable microcontroller...

<https://www.adafruit.com/product/2995>

Our original Bluefruit Feathers are the 32u4 and M0-based. These pairs are very similar looking, and have the same basic idea behind them: there is a main processor which is an ATmega32u4 or ATSAMD21 and a co-processor module which is the red and silver rectangle, containing an nRF51 which can do Bluetooth Low Energy only.



The nRF51 is programmed with our Bluefruit firmware, and can be controlled with AT commands over SPI connection. When the main processor (32u4 or M0) wants to send or receive BLE data, it sends commands to the co-processor module. We decided to go this way because the nRF51 did not have as-good a programming setup as the nRF52, and we thought people would have a better experience if the main chip was not also doing the radio work.

That said, if you already have code for the 32u4 or M0 chips, this is an easy upgrade, you get all the peripherals you know and love. This may be easier for beginners who are not quite ready to work with the native nRF52

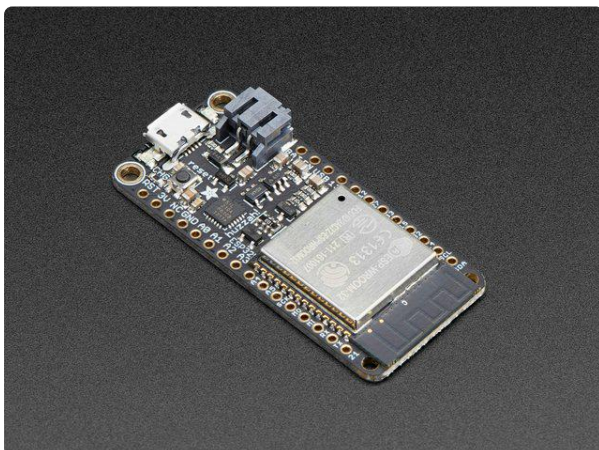
Pros:

- Familiar 32u4 and M0 chipsets
- No need to worry about the Nordic 'softdevice' radio thread interrupting timing-specific code since the radio is completely separate.
- Lots of existing code and projects

Cons:

- Can only act as Peripheral, not Central
- More expensive as it is a 2-chip solution
- Higher power draw
- Can't take advantage of new nRF52 capabilities as the firmware is updated and released by Nordic
- Cannot use Bluetooth Classic

## ESP32 Feather



### [Adafruit HUZZAH32 – ESP32 Feather Board](https://www.adafruit.com/product/3405)

Aww yeah, it's the Feather you have been waiting for! The HUZZAH32 is our ESP32-based Feather, made with the official WROOM32 module. We packed everything you love...

<https://www.adafruit.com/product/3405>

Even though this is primarily considered a WiFi Feather, the ESP32 does contain a BT LE and BT Classic radio! That's right this is the only Feather that can do BT classic. It's also the only one that can do WiFi and BT (altho, as of this writing, it cannot do both at once)

Sounds great, right? Well, there's some caveats. As of this writing, May 2017, the ESP32 Bluetooth core is still under development and there's only one basic beacon example for use with the Arduino IDE core. So we put this one at the bottom of the list. [You can check the ESP32 Arduino core and what has been added here, \(https://adafruit.it/wfk\)](https://adafruit.it/wfk) if there's an example for what you want to do, then you're in luck!

Once there's more working examples, we can fill out the pros and cons more. Right now we think it should only be used by bleeding-edge developers who are cool with running weekly regression tests on their project.

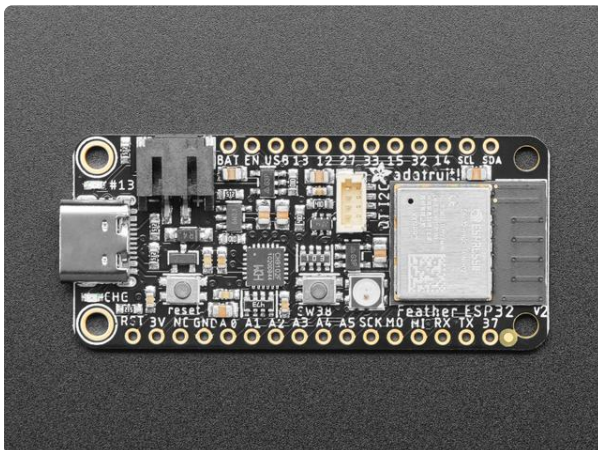
Pros:

- All-in-one Feather can do anything and everything (except make you a sandwich)
- Fast dual-core processor
- Low cost

Cons:

- Still waiting on integration and support for BT and BTLE radio

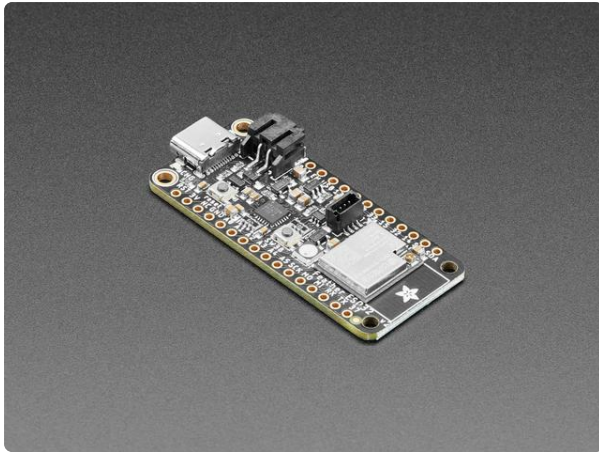
## ESP32 V2 Feather



### [Adafruit ESP32 Feather V2 - 8MB Flash + 2 MB PSRAM](https://www.adafruit.com/product/5400)

One of our star Feathers is the Adafruit HUZZAH32 ESP32 Feather - with the fabulous ESP32 WROOM module on there, it makes quick work...

<https://www.adafruit.com/product/5400>



### Adafruit ESP32 Feather V2 w.FL Antenna - 8MB Flash + 2 MB PSRAM

One of our star Feathers is the Adafruit HUZZAH32 ESP32 Feather - with the fabulous ESP32 WROOM module on there, it makes quick work...

<https://www.adafruit.com/product/5438>

Like the ESP32 Feather, the V2 also has Bluetooth Support.

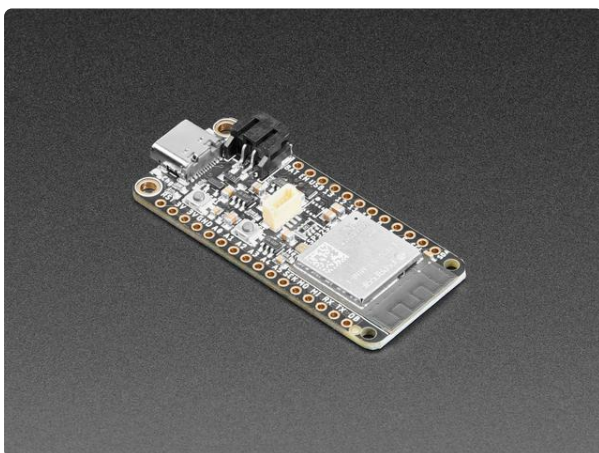
Pros:

- Same advantages as the original ESP32
- Compared to the original Feather with 4 MB Flash and no PSRAM, the V2 has 8 MB Flash and 2 MB PSRAM
- On-board STEMMA-QT connector

Cons:

- Some pins have moved from the original ESP32, so some examples may not work without modification

## ESP32-S3 Feather



### Adafruit ESP32-S3 Feather with STEMMA QT / Qwiic

The ESP32-S3 has arrived in Feather format - and what a great way to get started with this powerful new chip from Espressif! With dual 240 MHz cores, WiFi and BLE support, and native...

<https://www.adafruit.com/product/5323>

The ESP32-S3 has dual cores just like the ESP32 but adds native USB so it can run CircuitPython. It also has support for Bluetooth Low Energy.

## Pros:

- Native USB so it can run CircuitPython
- 240MHz Tensilica processor with dual cores
- Comes with 8 MByte of Flash
- Supports BLE
- Low-power friendly

## Cons

- No Bluetooth Classic Support
- No PSRAM

---

# Cellular Feathers

The cool thing about cellular connectivity is you can use it just about anywhere in the world. The FONA GSM module can be used anywhere that 2G GSM exists. In the USA this is provided by T-Mobile so if you have T-Mobile coverage, you have GSM.

We provide cellular connectivity via the SIM800H module. This module uses AT commands and the main processor, the ATmega32u4, communicates via a UART connection. The AT commands are somewhat standard and they are all documented pretty well, but if you want to do something special that isn't already written up in our library, it can be a little bit of an adventure.

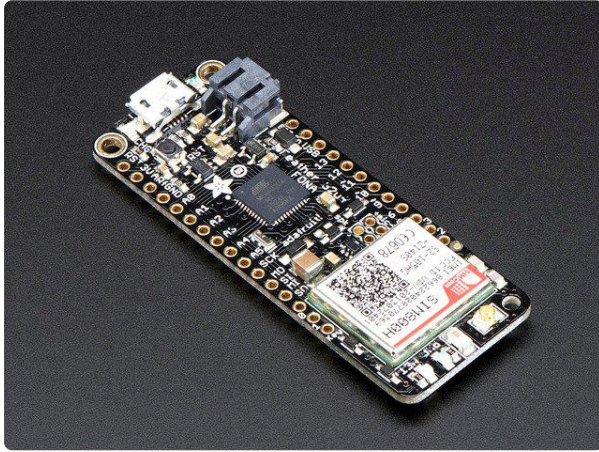
- Compared to WiFi, cellular requires much more power, and has lower data transfer rate. SSL support is not very clearly documented
- Compared to BTLE, data rate is about the same, but power requirement is waaaaay higher
- Compared to LoRa or Packet radio, the data rate is about the same, but the power requirements are much higher. That said, you don't need to create your own radio network, you can just use the cellular net that already exists. There's no inherent range limitation, as long as GSM coverage is present.

Often times, the only real alternatives to cellular are WiFi or LoRa. WiFi is a good alternative - but only if you can be sure that there's a WiFi base-station or hotspot nearby. LoRa can do long range communication, up to a few KM but you need to set up your own network/gateway.



# Cellular Feathers

This section is fairly short because there's only one cellular-capable Feather at this time, the 32u4 FONA



## Adafruit Feather 32u4 FONA

Feather is the new development board from Adafruit, and like its namesake it is thin, light, and lets you fly! We designed Feather to be a new standard for portable microcontroller...

<https://www.adafruit.com/product/3027>

### Pros:

- Can use (just about) anywhere in the world!
- Surprisingly low cost of entry
- Gain access to SMS network, phone calls, and Internet through GPRS
- Basic geo-location capability built-in via cell-tower triangulation (not as good as GPS but good to within ~1 mile)
- No need for a base-station or hotspot
- ATmega32u4 is well supported chip, with native USB and full Arduino core.

### Cons:

- You'll pay per message, call, text or megabyte. A SIM card and plan is required
- GSM is only supported by T-Mobile in the USA, and GSM will be supported until at least 2020 but after that, you'll want to upgrade to LTE
- High power requirements, a large battery is required to handle the 2 Amp power spikes when transmitting/connecting to the network
- Cellular connectivity can be spotty, especially when roaming. Code needs to be able to manage re-connection.
- AT commands can be a little clunky, require care and parsing.
- Extra large Feather to make space for the module
- Antenna placement often trips people up: if it's too close to the main processor it can reset the Feather, so you can't make it too compact.

- Cellular module runs directly off of LiPo battery so you cannot use only USB power
- 

## LoRa & Radio Feathers

WiFi, Bluetooth, ZigBee and Cellular are everyday wireless protocols you use every day - at home, at work, with friends. Sometimes, though, you need to leave the well-known and venture to the more exotic! The RFM69 and LoRa Feathers let you create a more flexible wireless network.

Instead of depending on a WiFi router, Bluetooth Central, ZigBee Master or Cellphone tower, LoRa and RFM69 work well in point-to-point or meshing configurations, with eye-popping ranges. They also don't need complex pairing or connection overhead, turn on the radio and transmit when you like, then turn it back off. They are the "rugged individuals" of wireless!

The trade-off is that you'll have to do a bit more work in the software to manage your packets, and re-transmission.

### Pros:

- No need for master or central router, you can use two radios or hundreds of radios, all talking to each other
- Long range: RFM69 can go 500 meters with a basic antenna, 5 km with directional antennas and care. LoRa can go 2 km with a basic antenna, 20 km with directional antennas. (Contrast with ZigBee & WiFi's ~100m max range, and BT ~10m range)
- Great for short burst packets, with ~10Kbps rate
- Best for outdoor usage
- RFM69 have low cost, LoRa are more expensive (but with longer range)
- Adjustable transmission power
- No link overhead, send packets without needing setup/teardown of connection
- RFM69 has built-in encryption capability

### Cons:

- Neither RFM69 nor LoRa are standardized, or built into laptops, so you need at least two of the radios to connect to a computer
- LoRa Feathers do not have LoRaWAN built in, must be added in software (which isn't hard)

- Link management and re-transmission is up to the user, so there's a little more work to do!
- LoRa radio does not have built-in encryption, must be added by hand by the user.
- Not good for audio/photo or video bandwidths, best for small data packets.
- Tweaking and tuning of antenna setup required to get the longest ranges.

## Which One???

There's a lot of options for these radio feathers, because each chipset (32u4 and M0) has two radio types (RFM69 and LoRa) and then two frequencies (433MHz and 900MHz). That's 8 total options.

The easiest decision is what frequency you need to use. If you are in ITU "Americas" you should go with the 900MHz radio. If you are in ITU "Europe" you should go with 433MHz radio. (If you are a HAM radio licensed operator you may be able to use either, check your country's available frequency bands, and restrictions)

If you are in a country that allows unlicensed usage of 868 MHz, pick the 900 MHz radio. Both RFM69 and LoRa are 'software tuned' - so just make sure you set the Arduino library code to 868 MHz when you upload it.

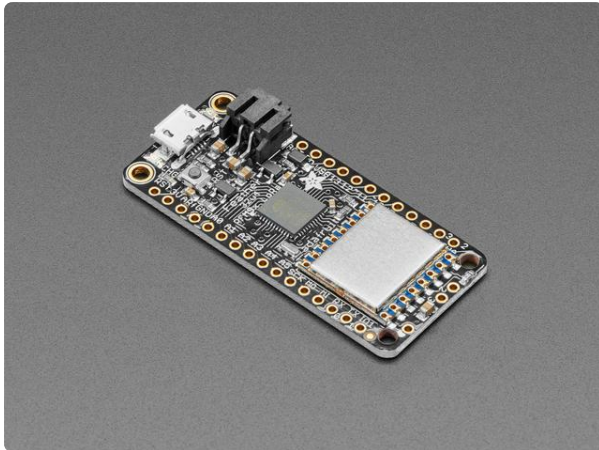
You can tell what frequency your radio is by the dot on top. Red dot means ~400 MHz, Green dot means ~900 MHz.

Then pick your radio type. The lower cost RFM69 doesn't go as far but has a lot of functionality and can do the job for most projects. LoRa has much better range, and can be used with LoRaWAN, but has additional cost. You cannot mix and match radios: RFM69 cannot 'speak' LoRa.

Both radio modules are identical shape and pinout, so we re-use the same Feather layout for both.

Finally, pick your chipset. ATmega32u4 is a well known 8-bit AVR processor, and may be more familiar to people who use the similar Arduino '328s. The ATSAM21 M0 is a 32-bit Cortex M0, with a ton more flash and RAM, and is also supported in Arduino but is a little newer and so does not have as many years of projects and example code already. If you want to use LoRaWAN firmware, we suggest M0 Feathers since you will need to store all that extra software

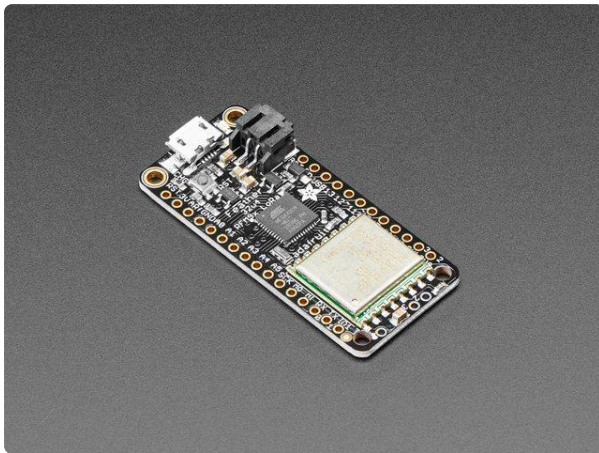
# LoRa Radio Feathers



## Adafruit Feather 32u4 RFM96 LoRa Radio - 433MHz

This is the Adafruit Feather 32u4 LoRa Radio (RFM9x). We call these RadioFruits, our take on an microcontroller with a...

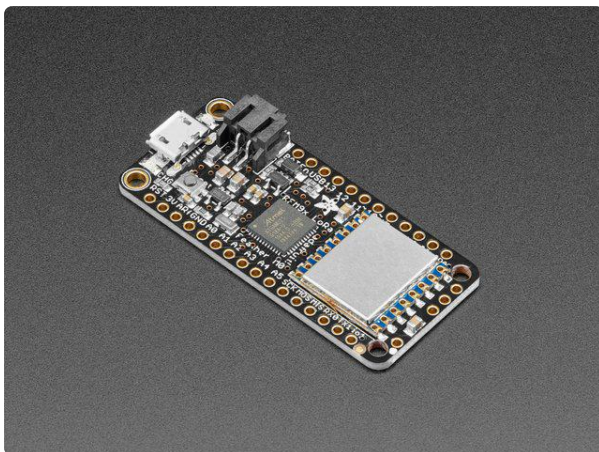
<https://www.adafruit.com/product/3079>



## Adafruit Feather 32u4 RFM95 LoRa Radio- 868 or 915 MHz

This is the Adafruit Feather 32u4 LoRa Radio (RFM9x). We call these RadioFruits, our take on an microcontroller with a...

<https://www.adafruit.com/product/3078>

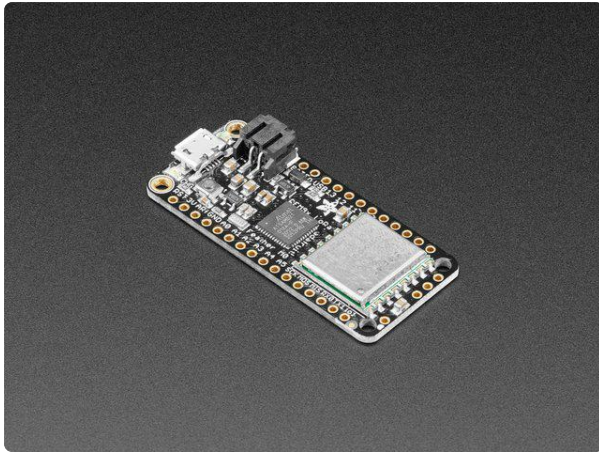


## Adafruit Feather M0 RFM96 LoRa Radio - 433MHz

This is the Adafruit Feather M0 RFM96 LoRa Radio (433 MHz). We call these RadioFruits, our take on an microcontroller with a "

<https://www.adafruit.com/product/3179>



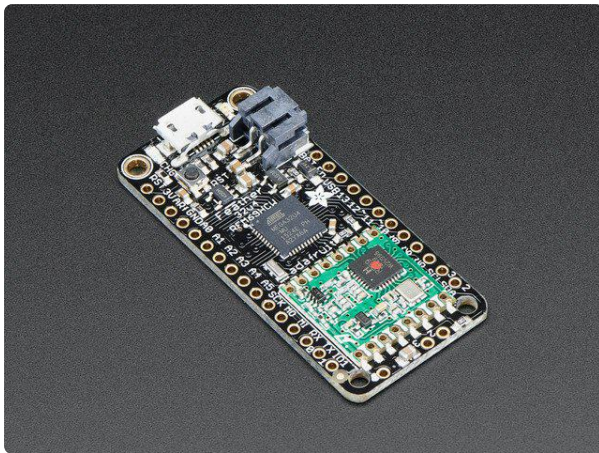


### Adafruit Feather M0 with RFM95 LoRa Radio - 900MHz

This is the Adafruit Feather M0 RFM95 LoRa Radio (900MHz). We call these RadioFruits, our take on an microcontroller with a...

<https://www.adafruit.com/product/3178>

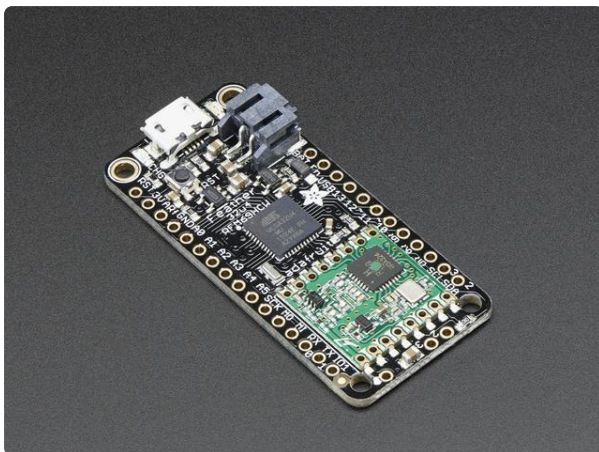
## RFM69 Radio Feathers



### Adafruit Feather 32u4 with RFM69HCW Packet Radio - 433MHz

This is the Adafruit Feather 32u4 Radio (RFM69HCW) 433MHz. We call these RadioFruits, our take on...

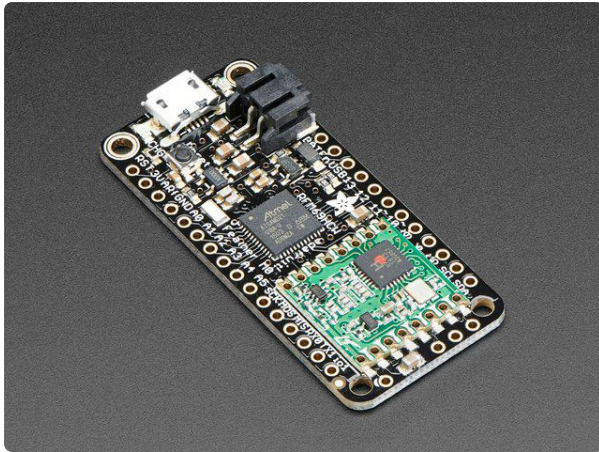
<https://www.adafruit.com/product/3077>



### Adafruit Feather 32u4 RFM69HCW Packet Radio - 868 or 915 MHz

This is the Adafruit Feather 32u4 Radio (RFM69HCW) 900MHz. We call these RadioFruits, our take on...

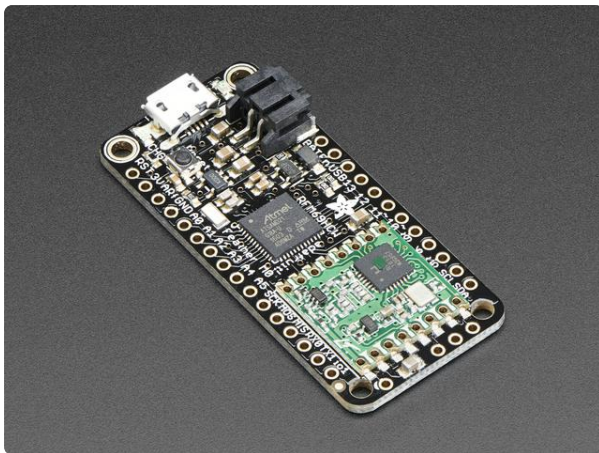
<https://www.adafruit.com/product/3076>



### Adafruit Feather M0 RFM69HCW Packet Radio - 433MHz

This is the Adafruit Feather M0 RFM69 Packet Radio (433 MHz). We call these RadioFruits, our take on an...

<https://www.adafruit.com/product/3177>



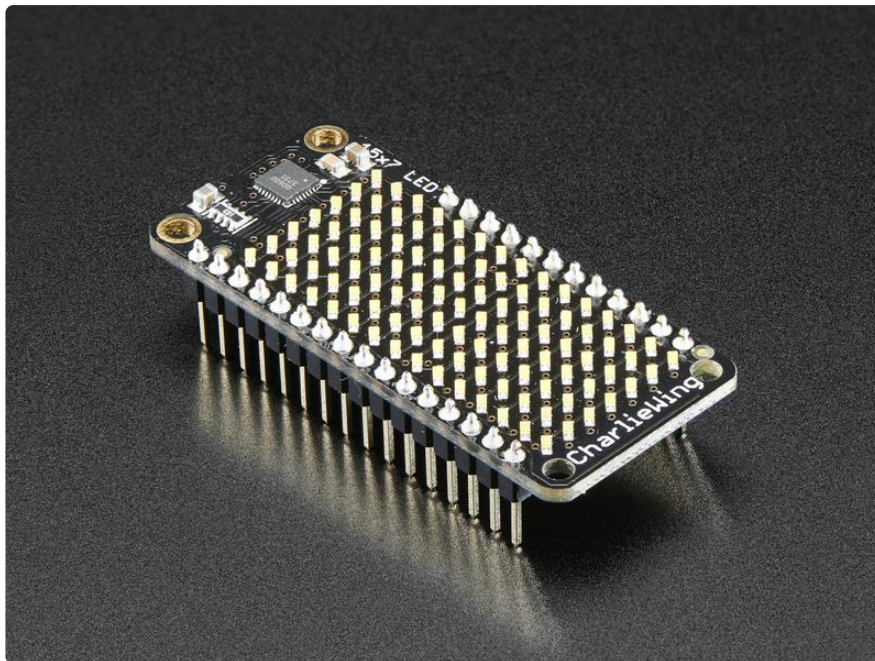
### Adafruit Feather M0 RFM69HCW Packet Radio - 868 or 915 MHz

This is the Adafruit Feather M0 RFM69 Packet Radio (868 or 915 MHz). We call these RadioFruits, our take on an...

<https://www.adafruit.com/product/3176>

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## FeatherWings



Giving your Feather a Wing lets it fly!



The best part about the Feather system is all the wings you can add on.

Start with a WiFi feather and add an TFT for a WiFi [Weather display \(https://adafruit.it/wfm\)](https://adafruit.it/wfm).

Or, take a LoRa feather and add an OLED display to make a [Remote Control Effects Box for theatrical control \(https://adafruit.it/wfn\)](https://adafruit.it/wfn)

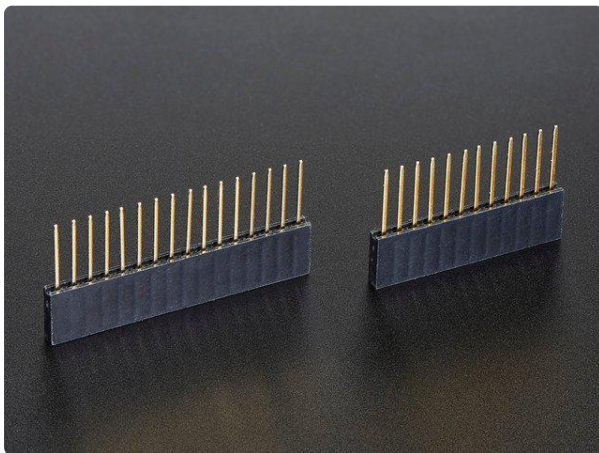
Pick and choose - you can even add multiple wings, short for FeatherWings, (as long as there are no pin or I2C address conflicts). We tried to use I2C for as many Wings as possible, so you can make fairly advanced projects just by plugging boards together.

## Accessories

Here are some accessories you may find handy as you add Wings to your Feather

Check the list on the left navbar, or just keep going through the guide, to see the wide variety of Wings we have for you

## Stacking Headers



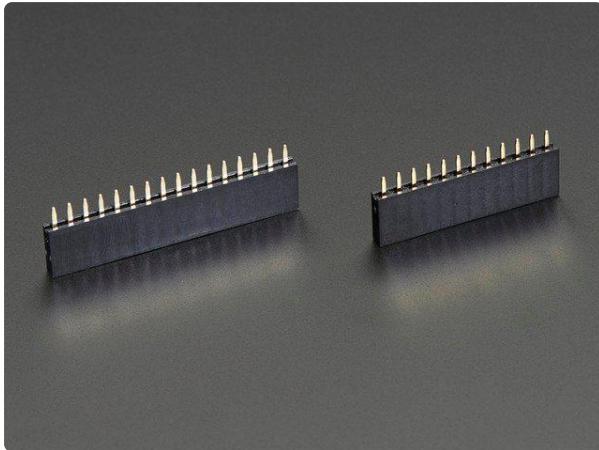
### Stacking Headers for Feather - 12-pin and 16-pin female headers

These two Female Stacking Headers alone are, well, lonely. But pair them with any of our Feather boards and...

<https://www.adafruit.com/product/2830>

You can either stack Feathers by soldering stackable headers onto the Feather and Wings, or you can have them side by side in a Multiplier Wing. [Check the Proto/Multiplier wing page for more details \(https://adafruit.it/wfo\)](https://adafruit.it/wfo)

## Female Headers

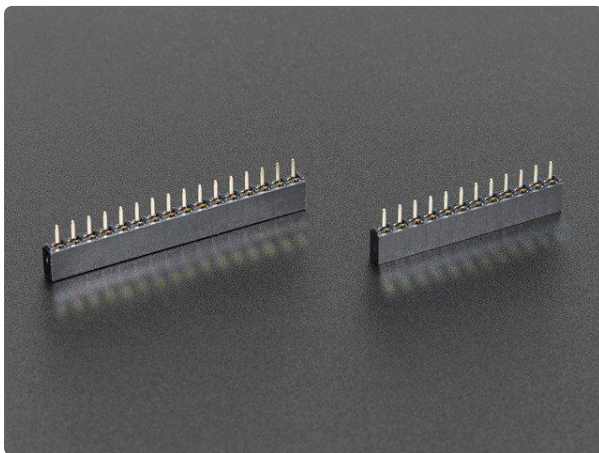


### [Header Kit for Feather - 12-pin and 16-pin Female Header Set](https://www.adafruit.com/product/2886)

These two Female Headers alone are, well, lonely. But pair them with any of our <https://www.adafruit.com/product/2886>

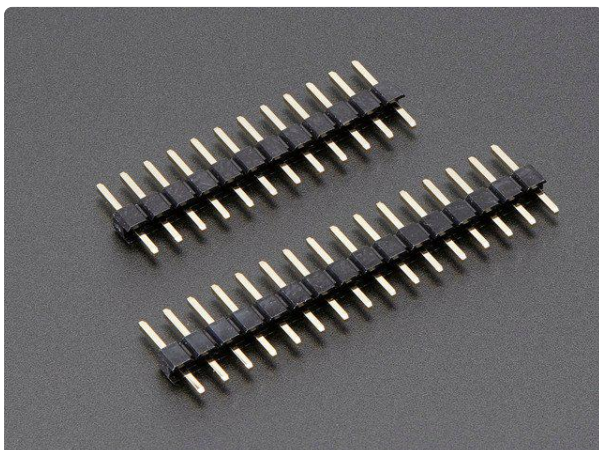
If you don't need to use your Feather in a breadboard, you can use these plain female headers along with plain male headers, to create a cute sandwich. Great for wearable or enclosed projects!

## Shorty Headers



### [Short Headers Kit for Feather - 12-pin + 16-pin Female Headers](https://www.adafruit.com/product/2940)

These two Short Female Headers alone are, well, lonely. But pair them with any of our <https://www.adafruit.com/product/2940>

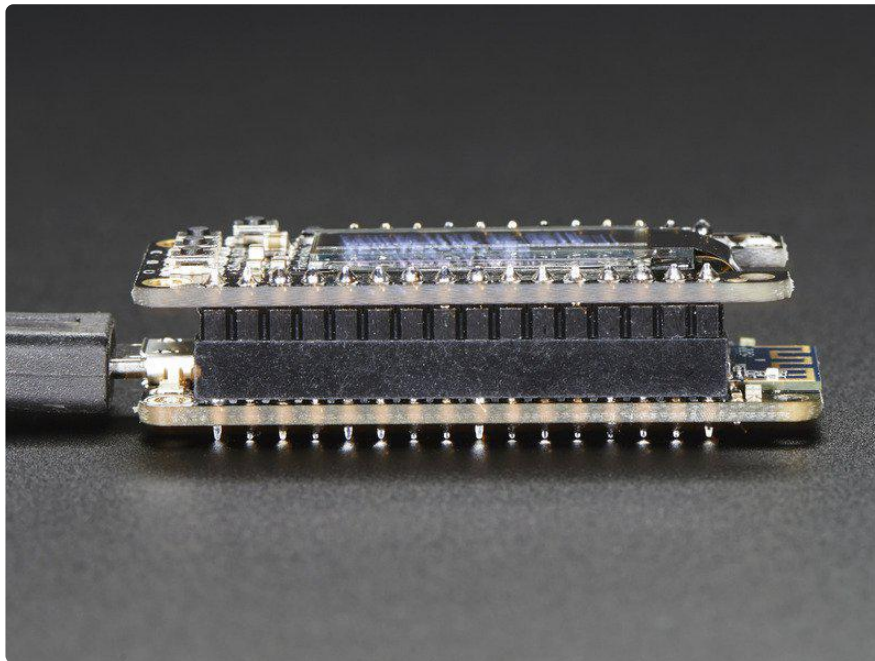


### [Short Feather Male Headers - 12-pin and 16-pin Male Header Set](https://www.adafruit.com/product/3002)

These two Short Male Headers alone are, well, lonely. But pair them with any of our <https://www.adafruit.com/product/3002>



If you want to make a very compact package of two Feathers, you can use short headers. These are good for when you need the very slimmest setup.



Just remember to pick these up before you start soldering stacking or 'standard' headers on!

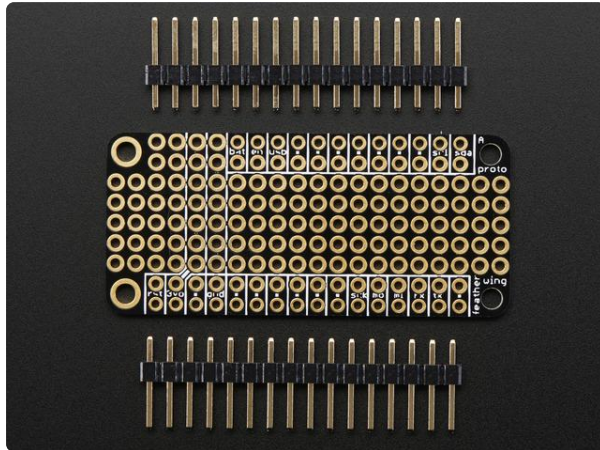
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## Proto & Multiplier Wings

Our most popular Wings are the simplest. These are perfect when you want to do something custom, taking it beyond just a Feather+Wing combo!

All of these Wings are compatible with all Feathers. Because they don't contain any active circuitry, they can also be used with any Wings

# Proto Wing

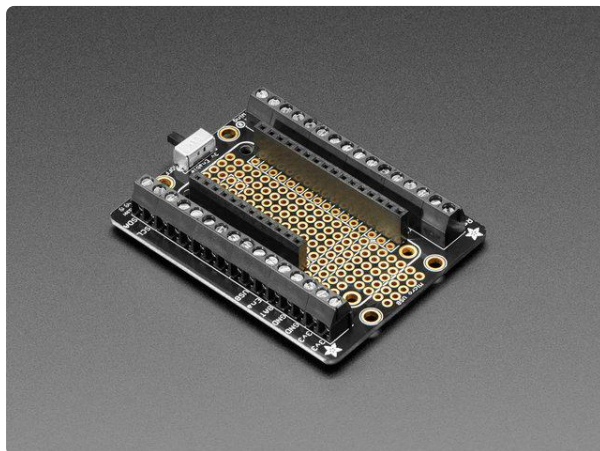


## [FeatherWing Proto - Prototyping Add-on For All Feather Boards](https://www.adafruit.com/product/2884)

A Feather board without ambition is a Feather board without FeatherWings! This is the FeatherWing Proto - a prototyping add-on for all Feather boards. Using our...  
<https://www.adafruit.com/product/2884>

Nice and simple, you get a 0.1" prototyping area and a breakout for each pin of your Feather. Add any chips or sensors you like! There's a bunch extra 3V and GND pins in a row as well.

# Terminal Block Proto Wing



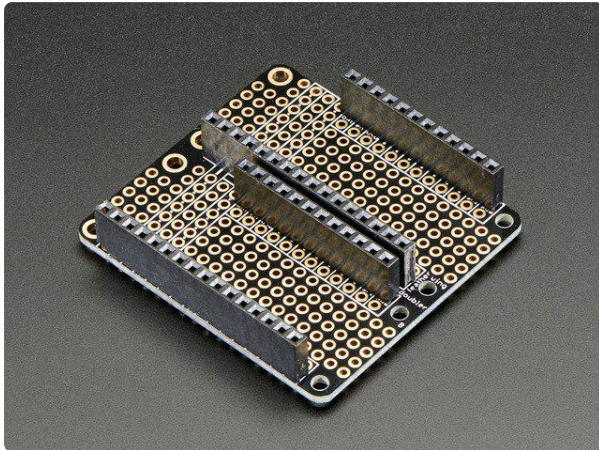
## [Assembled Terminal Block Breakout FeatherWing for all Feathers](https://www.adafruit.com/product/2926)

The Terminal Block Breakout FeatherWing kit is like the Golden Eagle of prototyping FeatherWings (eg. majestic, powerful, good-looking). To start, you get a nice prototyping area...  
<https://www.adafruit.com/product/2926>

This is like a super hard-core version of the proto wing. Not only do you get the same exact prototyping area as the proto wing, but you also get terminal block breakouts for all of the pins, and there's an on-off switch that will turn off the Feather with a flick.

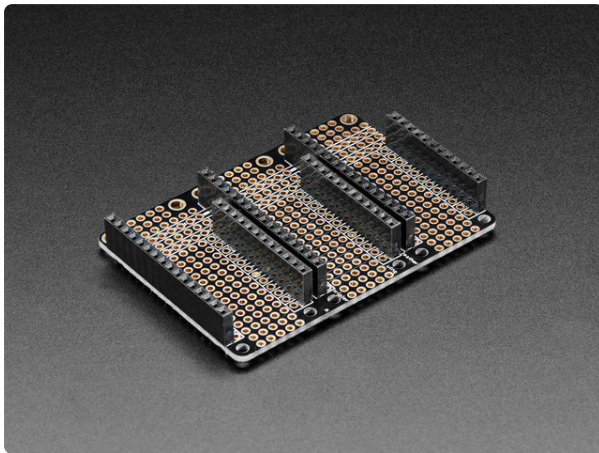
And, it comes fully assembled! No soldering is required, so you can wire up your project super fast.

# Doubler and Tripler



## [FeatherWing Doubler - Prototyping Add-on For All Feather Boards](https://www.adafruit.com/product/2890)

This is the FeatherWing Doubler - a prototyping add-on and more for all Feather boards. This is similar to our <https://www.adafruit.com/product/2890>

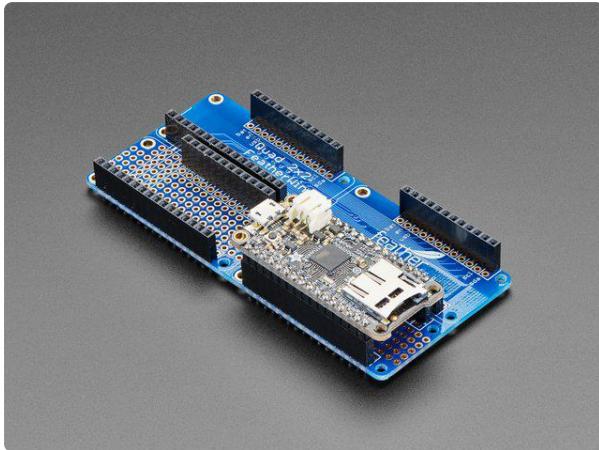


## [FeatherWing Tripler Mini Kit - Prototyping Add-on For Feathers](https://www.adafruit.com/product/3417)

This is the FeatherWing Tripler - a prototyping add-on and more for all Feather boards. This is similar to our <https://www.adafruit.com/product/3417>

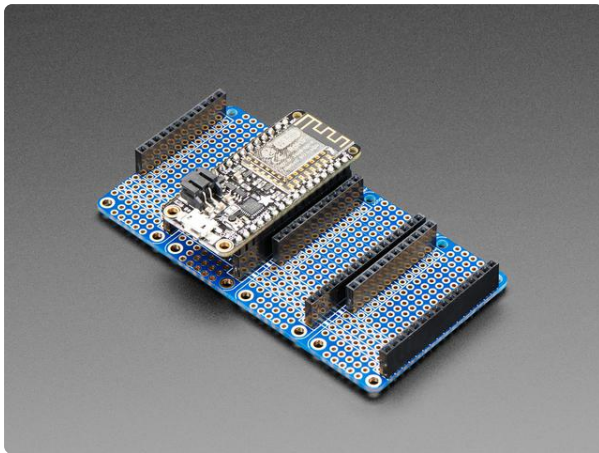
If you don't want to stack 'up' you can stack side-by-side. These two wings give you all that prototyping area you could possibly need, and 'duplicate' pinouts for two or three Feather boards. With the doubler you can have a Feather and Wing. With the tripler, you can have a Feather and two wings. Of course, you can also use stacking headers to grow up too, for lots of possibilities.

# Quad



## Adafruit Quad 2x2 FeatherWing Kit with Headers

This is the FeatherWing Quad 2x2 - a prototyping add-on and more for all Feather boards. This is similar to our <https://www.adafruit.com/product/4253>



## Adafruit Quad Side-By-Side FeatherWing Kit with Headers

This is the FeatherWing Quad Side-by-Side - a prototyping add-on and more for all Feather boards. This is similar to our <https://www.adafruit.com/product/4254>

Like the Doubler and Tripler, there is also a quad that comes in a couple of different configuration depending on your project needs. Of course, you can also use stacking headers to grow up too, for lots of possibilities.

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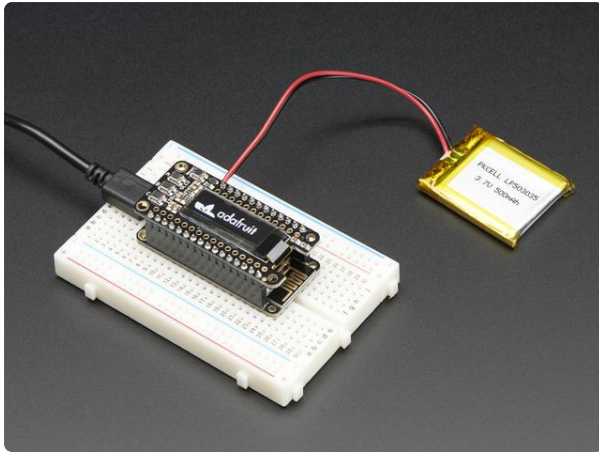
## Graphic Display Wings

Display Wings let you add a monochrome or color display for lots of data. These are very popular, as you can imagine, for adding a user interface.

These Wings work with all Feathers.

You can only really use one display at a time. The OLED Featherwing uses only I2C and works with any other Wings. The TFT 'wing uses a lot of pins, so works best with only I2C Wings.





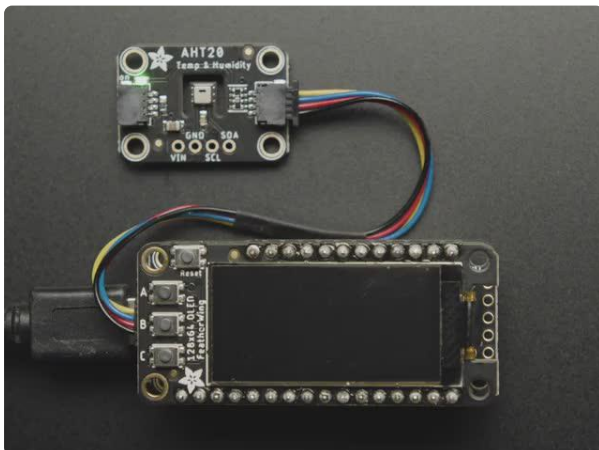
### Adafruit FeatherWing OLED - 128x32 OLED Add-on For Feather

A Feather board without ambition is a Feather board without FeatherWings! This is the FeatherWing OLED: it adds a 128x32 monochrome OLED plus 3 user buttons to...

<https://www.adafruit.com/product/2900>

This tiny Wing is so cute, and it has a 128x32 monochrome OLED display. OLEDs have a crisp and high-contrast look, so they are great for indoor and some outdoor use. There's no backlight so they use little power (only as much as the pixels that are lit).

The OLED is connected over I2C so it uses only two pins. In addition, there are 3 little buttons connected directly to three GPIO pins. You can use the buttons to add basic interactivity. Only one OLED FeatherWing can be used with a Feather board.



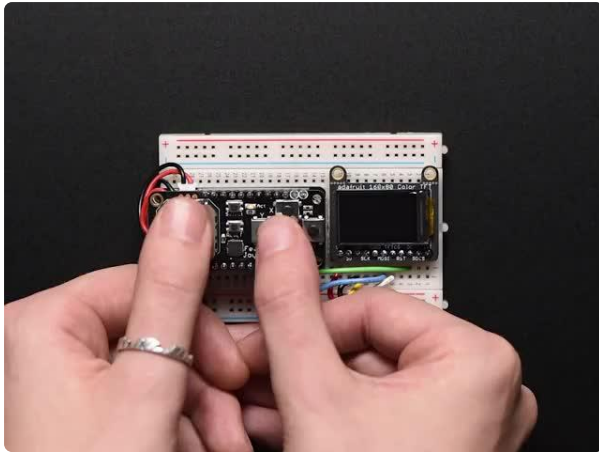
### Adafruit FeatherWing OLED - 128x64 OLED Add-on For Feather

A Feather board without ambition is a Feather board without FeatherWings! This is the FeatherWing 128x64 OLED: it adds a gorgeous 128x64 monochrome OLED plus 3...

<https://www.adafruit.com/product/4650>

This wing has a 128x64 monochrome SH1107 OLED display giving you twice as much room. Like its little sister, there's no backlight so they use little power (only as much as the pixels that are lit).

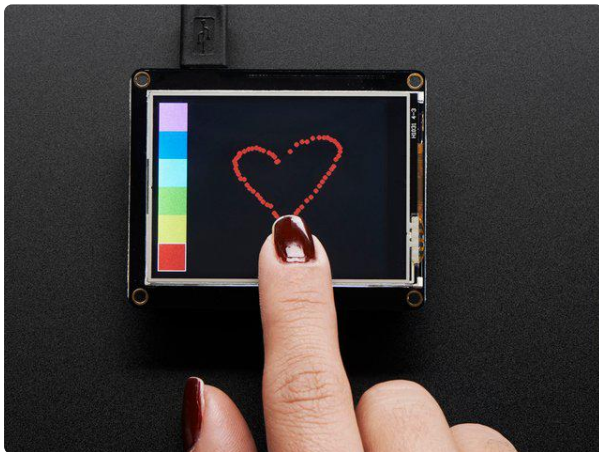
The OLED is also connected over I2C and there are 3 little buttons are pin compatible as well. Since you can change the address with soldering, it is possible to use this alongside one other OLED FeatherWing.



### [Adafruit Joy FeatherWing for all Feathers](https://www.adafruit.com/product/3632)

Make a game or robotic controller with this Joy-ful FeatherWing. This FeatherWing has a 2-axis joystick and 5 momentary buttons (4 large and 1 small)...  
<https://www.adafruit.com/product/3632>

This feather has a 0.96" 160x80 Color TFT Display with 16-bit full color capability. And, so you can make a proper UI, it has a 5-way navigation switch and two push buttons. The joystick can go left, right, up, down and 'in' for selection. Two buttons on the side can change modes or whatever you like.



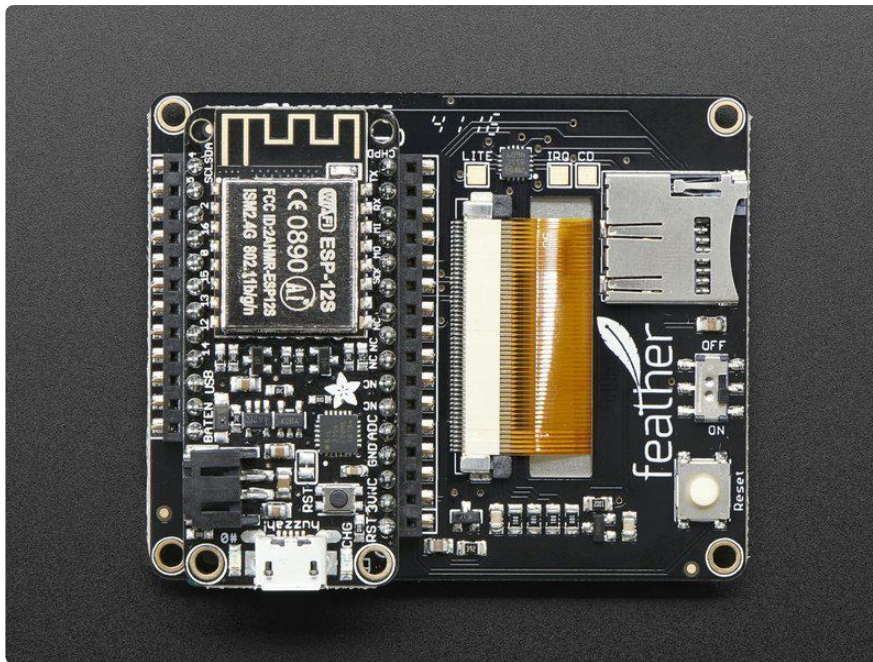
### [TFT FeatherWing - 2.4" 320x240 Touchscreen For All Feathers](https://www.adafruit.com/product/3315)

A Feather board without ambition is a Feather board without FeatherWings! Spice up your Feather project with a beautiful 2.4" touchscreen display shield with built in microSD card...  
<https://www.adafruit.com/product/3315>

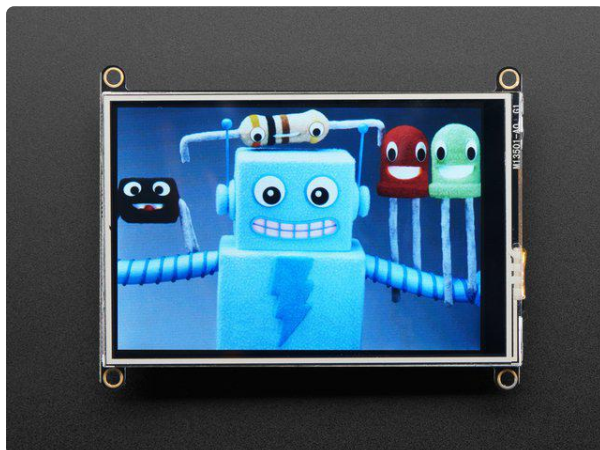
If you need a bigger and more colorful screen, the TFT FeatherWing has just about everything. There is a 320x240 full-color TFT display. There is also a resistive touchscreen on top, for interactivity. On the bottom is a microSD card holder so you can store images or data to be displayed. We also toss in an on-off switch.

The display is much bigger than the OLED, and uses the SPI port for communication with the TFT/touch/SD card.

The Wing requires an additional two pins for the TFT. One additional pin if you are using the touch screen, and one extra pin if using SD interface. (So, SPI + 4 GPIO pins max if using all three)



Unlike other wings, this one is fully assembled and the feather plugs into the bottom. If you want to stack Wings, you'll need to solder stacking headers to the Feather, then stack on top of that.



### Adafruit TFT FeatherWing - 3.5" 480x320 Touchscreen for Feathers

Spice up your Feather project with a beautiful 3.5" touchscreen display shield with built in microSD card socket. This TFT display is 3.5" diagonal with a bright 6 white-LED...

<https://www.adafruit.com/product/3651>

Spice up your Feather project with a beautiful 3.5" touchscreen display shield with built in microSD card socket. This TFT display is 3.5" diagonal with a bright 6 white-LED backlight. You get a massive 480x320 pixels with individual 16-bit color pixel control. It has way more resolution than a black and white 128x64 display, and twice as much as our 2.4" TFT FeatherWing. As a bonus, this display comes with a resistive touchscreen attached to it already, so you can detect finger presses anywhere on the screen

This FeatherWing uses a SPI display, touchscreen and SD card socket. It works with any and all Feathers but given the large display it works best with our faster boards like the nRF52, ESP8266, ESP32, M0, M4, WICED, and Teensy. We also include an SPI resistive touchscreen controller so you only need one additional pin to add a high



quality touchscreen controller. One more pin is used for an optional SD card that can be used for storing images for display.

This Wing comes fully assembled with dual sockets for your Feather to plug into. You get two sockets per pin so you can plug in wires if you want to connect to Feather pins. Alternatively, each pin has a large square pad on the PCB for direct soldering.

---

## eInk Wings

eInk or ePaper wings allow you to easily connect your Feather to add eInk/ePaper support. There are two different sizes and different color variations for each size. The larger sized eInks include 3 buttons connected directly to GPIOs on the feather.

eInk is a technology that works by attracting or repelling ink droplets towards or away from the screen inside of thousands of capsules. Normally, the white pigments and the colored pigments are opposite charges. When power is removed, the pigments tend to stay in their positions and thus the last thing displayed remains. Over time though, the pigments are bound to move and you get a loss of quality unless the display is periodically refreshed.

For tri-colored and grayscale displays, the different colored pigments are actually different sizes and so they move at different speeds. By timing the attracting and repelling of the pigments correctly, you can draw in different colors. This is why it takes longer to draw with more colors.



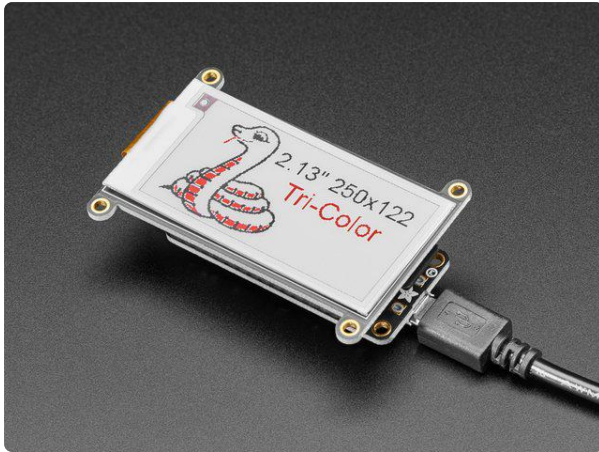
### [Adafruit 2.13" Monochrome eInk / ePaper Display FeatherWing](https://www.adafruit.com/product/4195)

Easy e-paper finally comes to your Feather, with this breakout that's designed to make it a breeze to add a monochrome eInk display. Chances are you've seen one of those...

<https://www.adafruit.com/product/4195>

The 2.13" monochrome eInk FeatherWing is your basic eInk display. It draws fast and works reliably. The resolution on this display is 250 pixels wide by 122 pixels high. The chip used to drive this display is the SSD1680. This is similar to the type of displays seen in Kindle or Nook.





### Adafruit 2.13" HD Tri-Color eInk / ePaper Display FeatherWing

Easy e-paper comes to your Feather, with this breakout that's designed to make it a breeze to add a tri-color eInk display. Chances are you've seen one of those new-fangled...

<https://www.adafruit.com/product/4814>

The 2.13" HD (or High Definition) Tri-Color eInk FeatherWing takes longer to draw, but you can display images or in red, black, or white. The resolution on this display is also 250 pixels wide by 122 pixels high. The chip used to drive this display is also the SSD1680.

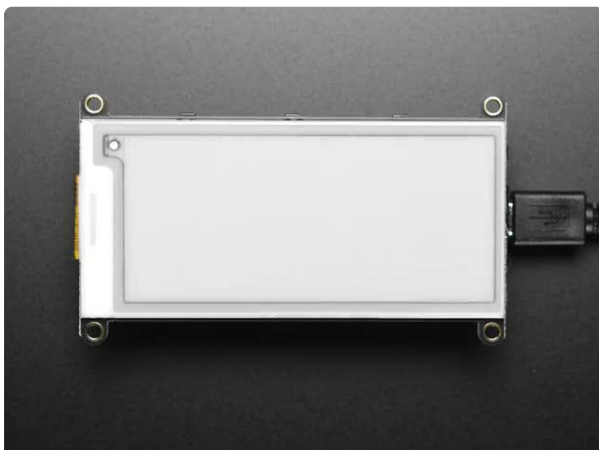


### Adafruit 2.9" Grayscale eInk / ePaper Display FeatherWing

Easy e-paper comes to your Feather with this breakout that's designed to make it a breeze to add a monochrome eInk display. Chances are you've seen one of those...

<https://www.adafruit.com/product/4777>

The 2.9" GrayScale eInk FeatherWing is a larger display and is able to display in 4 levels of gray. The resolution on this display is 296 pixels wide by 128 pixels high. The chip used to drive this display is the IL0373. There are 3 buttons on the back connected to GPIOs.

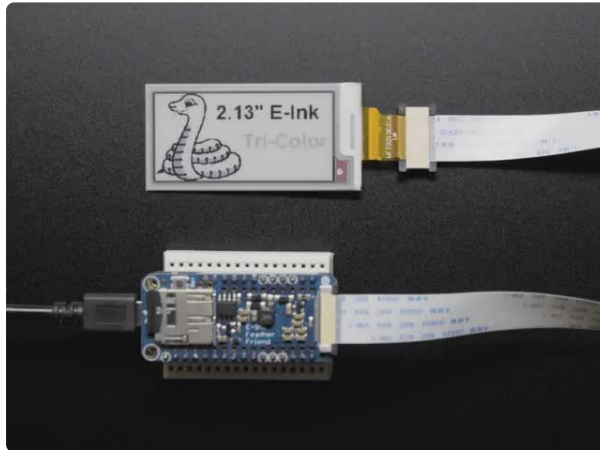


### Adafruit 2.9" Tri-Color eInk / ePaper Display FeatherWing

Easy e-paper comes to your Feather with this breakout that's designed to make it a breeze to add a tri-color eInk display. Chances are you've seen one of those...

<https://www.adafruit.com/product/4778>

The 2.9" Tri-Color eInk FeatherWing is able to display in red, black, and white. The resolution on this display is also 296 pixels wide by 128 pixels high. The chip used to drive this display is the SSD1675. There are 3 buttons on the back connected to GPIOs.



### Adafruit eInk Feather Friend with 32KB SRAM

Easy e-paper finally comes to your Feather with this Adafruit EInk Feather Friend that's designed to make it a breeze to add an eInk display. Chances are...

<https://www.adafruit.com/product/4446>

Just about every small-medium size eInk display made these days has a standard 24-pin connection. The eInk Feather Friend will add all the power supply support circuitry and level shifting so you can attach your favorite display (up to tri-color 4.2") and wire it up to your favorite development board.

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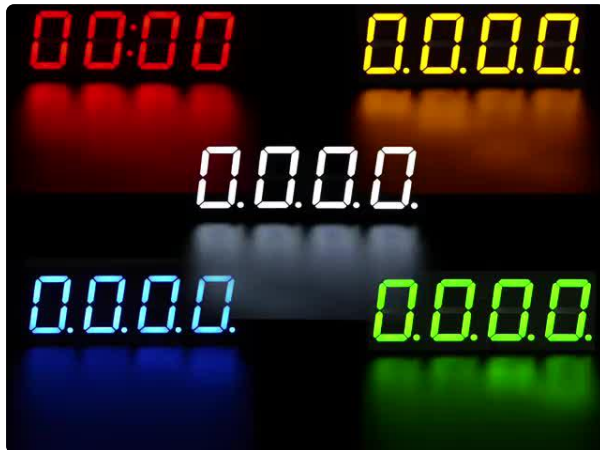
## LED Display Wings

If you don't need a full graphical display, you can use our LED matrix/segment Wings. These can be good for simplified displays where you don't need the complexity and pins of a graphical TFT or OLED. They all use I2C only, so they won't take up extra pins or interfere with other Wings if you want to stack them up or use them side-by-side.

We have a ton of options, with various displays and colors!

These Wings use I2C only for the interface, and work with all Feathers. You can change the addresses used to have multiple displays, and they can be used with other Feathers as well - just make sure there are no I2C address conflicts.

# Seven Segment Wing

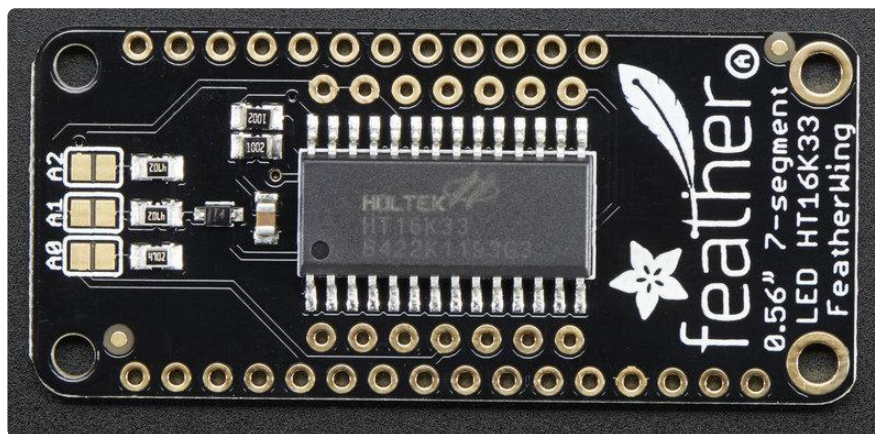


Adafruit 0.56" 4-Digit 7-Segment FeatherWing Display

One segment? No way dude! 7-Segments for life! This is the Adafruit 0.56" 4-Digit 7-Segment Display w/ FeatherWing Combo Pack! We have these combo...

<https://www.adafruit.com/product/3140>

Just want to display some numbers? The 7-Segment FeatherWing has 4 digits and looks nice and bright. Comes in 5 bright colors!



Each Wing has an HT16K33 chip, which does all the multiplexing for you. The address is 0x70 but can be changed to 0x70-0x77 so up to 8 displays can be used at once.

# Alphanumeric (14-segment) Wing

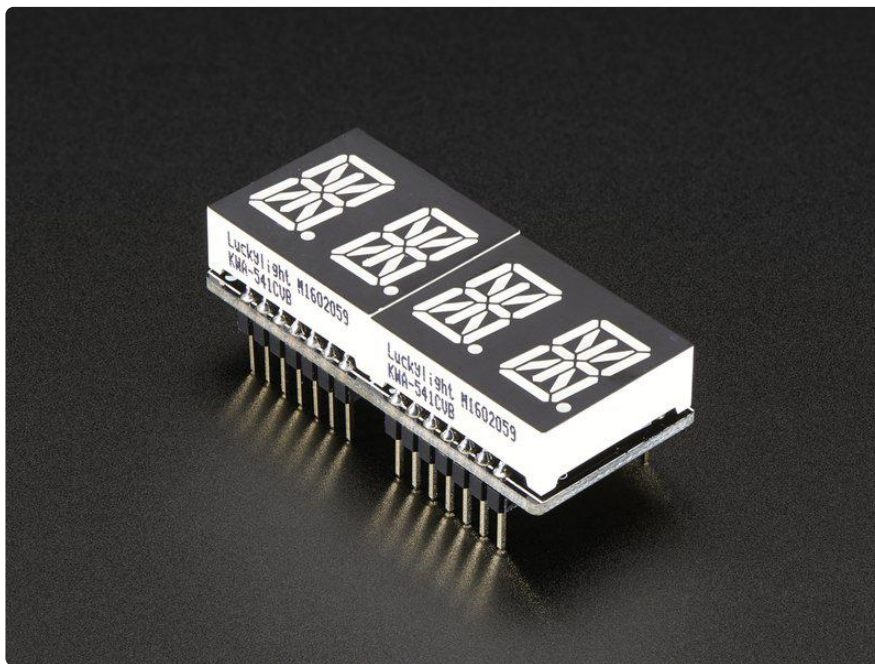


[Adafruit 0.54" Quad Alphanumeric FeatherWing Display - Various](#)

Display, elegantly, 012345678 or 9! Gaze, hypnotized, at ABCDEFGHIJKLM - well it can display the whole alphabet. You get the point. This is...

<https://www.adafruit.com/product/3139>

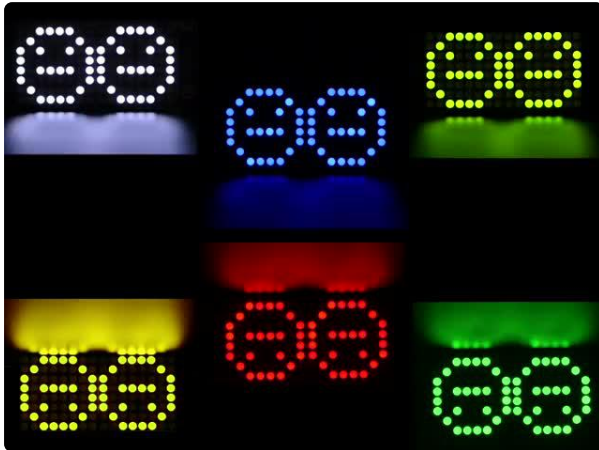
This Wing is a step up from just 7-segments. With 2x as many segments! You can have both letters and numbers displayed, with big bright digits. Comes in 6 different color varieties



Like the 7-segment, each Wing has an HT16K33 chip, which does all the multiplexing for you. The address is 0x70 but can be changed to 0x70-0x77 so up to 8 displays can be used at once.



# 8x16 Matrix FeatherWing



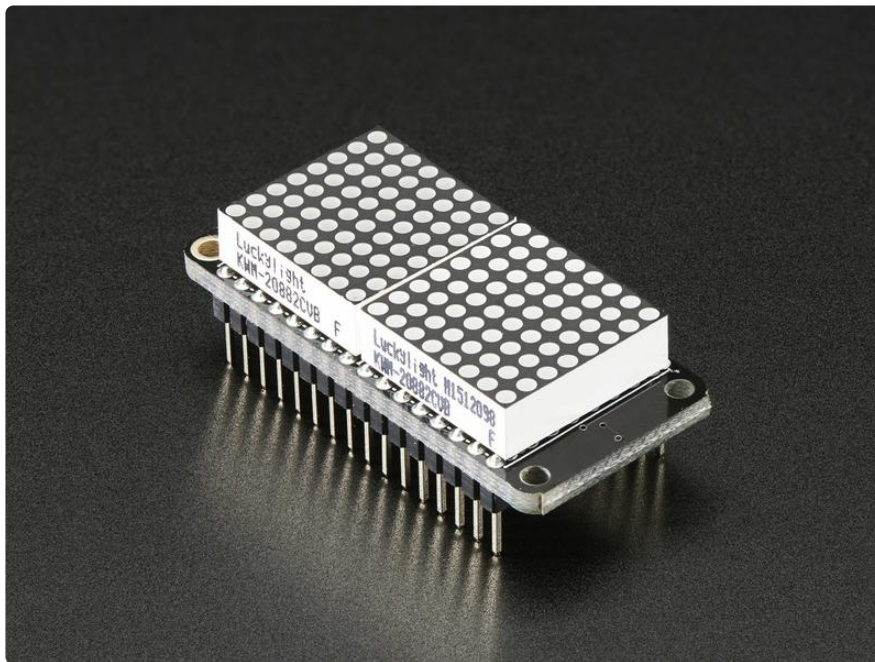
## Adafruit 0.8" 8x16 Matrix FeatherWing Display Kit Various Colors

You will chirp with delight when you see how easy it is to make your very own 8x16 LED matrix display for any Feather. This kit combines two of our adorable miniature LED matrices with...

<https://www.adafruit.com/product/3155>

The most segments possible! This Wing has two tiny 8x8 matrices side-by-side to make an 8x16 grid. Great for little scrolling displays. These have a nice diffusion for a lovely dotted look.

Comes in 6 colors.



Like the 7-segment and alphanumeric, each Wing has an HT16K33 chip, which does all the multiplexing for you. The address is 0x70 but can be changed to 0x70-0x77 so up to 8 displays can be used at once.

# Charlieplexed LED Matrices

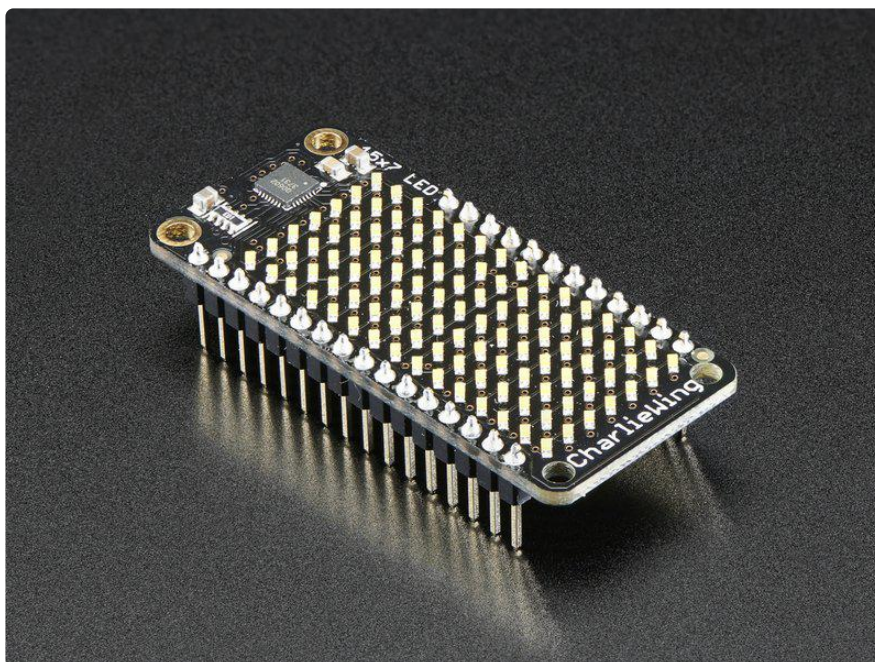


## Adafruit 15x7 CharliePlex LED Matrix Display FeatherWings

You won't be able to look away from the mesmerizing patterns created by these Adafruit 15x7 CharliePlex LED Matrix Display FeatherWings. These 15x7 LED...  
<https://www.adafruit.com/product/2965>

The Charlieplexed wings are similar to the 8x16 wings above, but use a different chipset. Instead of the HT16K33, we use the IS31FL3731. Now, you might be wondering, who cares what chipset is used? But there's some things you can do with the IS31FL3731 that you can't with the HT16K33.

Unlike the simple HT16K33, the IS31 can drive the individual LEDs in a grid at different brightnesses. This means you get a full 8-bit PWM individual brightness per pixel. This is great for when you want to make artistic LED displays that aren't just 'on and off'. But, the IS31 requires the LEDs to be in a certain arrangement, so we use individual 0603 LEDs rather than the 8x8 modules above



The tradeoff is you get individual LED control, and a sparkly look, but not the nice diffusion of the 8x16. Also, there's a smaller number of LEDs because we couldn't fit a

full 8x16 grid. These come in 6 colors (warm white isn't shown above). The I2C address can be set to 0x74 or 0x77 so you can, in theory, have two of these at a time.

---

## RGB Pixel Wings

The NeoPixel FeatherWing requires only one pin, and works with any Feather - although you may need to change the pin used by soldering the bottom jumper. You can use as many as you like, by assigning a different pin to each FeatherWing - just watch out for your power usage!



### NeoPixel FeatherWing - 4x8 RGB LED Add-on For All Feather Boards

A Feather board without ambition is a Feather board without FeatherWings! This is the NeoPixel FeatherWing, a 4x8 RGB LED Add-on For All Feather...

<https://www.adafruit.com/product/2945>

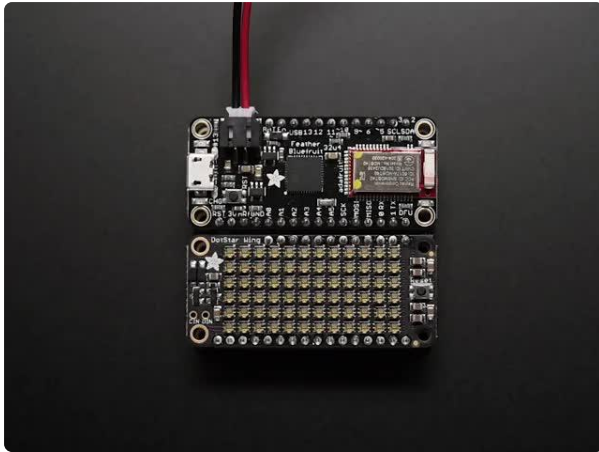
#### Pros:

- Blindingly bright RGB pixels! So much color!
- Familiar NeoPixels are well known, lots of example code available for all chips
- Uses only one pin for all of the LEDs

#### Cons:

- Somewhat low resolution display, 4x8 pixels
- Can be power hungry, up to 35mA per pixel at full white - so proper programming is essential
- LEDs are powered off of USB/LiPo, so disabling the Feather via the EN pin will not disable the NeoPixels.

Dotstar LEDs need two data pins, but they can be clocked faster than NeoPixels.



### Adafruit DotStar FeatherWing - 6 x 12 RGB LEDs

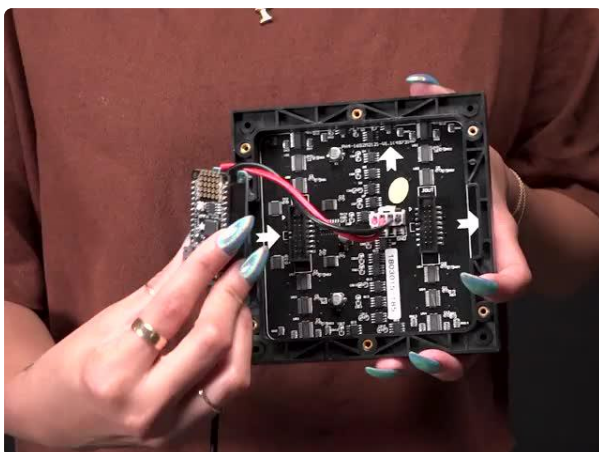
A Feather board without ambition is a Feather board without FeatherWings! This is the DotStar FeatherWing, a 6x12 RGB LED Add-on For All Feather Boards! Using...

<https://www.adafruit.com/product/3449>

This is the DotStar FeatherWing, a 6x12 RGB LED Add-on For All Feather Boards! Using our [Feather Stacking Headers](http://adafru.it/2830) (<http://adafru.it/2830>) or [Feather Female Headers](http://adafru.it/2886) (<http://adafru.it/2886>) you can connect a FeatherWing on top or bottom of your Feather board and make your Feather board strut like a peacock at a rave.

Put on your sunglasses before staring into these 72 configurable RGB LEDs, they are super bright! Arranged in a 6x12 matrix, each 2mm by 2mm sized RGB pixel is individually addressable. Only two pins are required to control all the LEDs. On the bottom we have jumpers for the Data and Clock lines so you can change them from the defaults. Works with any/all of our Feathers! You can cut the default jumper traces and use any pins you like

There are 2 different versions of the RGB Matrix FeatherWing kit. Make sure you get the correct one for the feather you will be pairing it with.



### Adafruit RGB Matrix Featherwing Kit

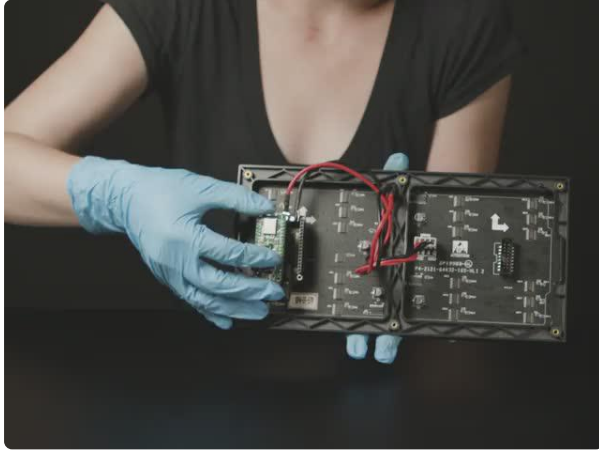
Ahoy! It's time to create a dazzling light up project with our new RGB Matrix FeatherWing. Now you can quickly and easily create...

<https://www.adafruit.com/product/3036>

Create a dazzling light up project with our new RGB Matrix FeatherWing. Now you can quickly and easily create projects featuring your favorite 16 or 32-pixel tall matrix boards. Using our RGB Matrix library is easy and works wonderfully with any of our M0, M4, or RP2040 based Feathers.



Please note: This wing is only tested/designed to work with the SAMD21 M0, SAMD51 M4, and RP2040 Feathers. It's not for use with any other Feathers at this time. (That said, if you'd like to add support, [we'd be happy to take a pull request \(https://adafru.it/aHj\)](https://adafru.it/aHj) on the library repo)



### [Adafruit RGB Matrix FeatherWing Kit - For nRF52840 Feathers](https://www.adafruit.com/product/4702)

Ahoy! It's time to create a dazzling light up project with our new RGB Matrix FeatherWing for nRF52840. Now you can quickly and...

<https://www.adafruit.com/product/4702>

This version of the RGB Matrix FeatherWing is only for nRF52840-based Feathers due to the way that the pins need to be lined up to work with the HUB75 displays.

These wings can be assembled in one of two ways. You can either solder in a 2x8 IDC shrouded header on the top, then plug in the IDC cable that came with your matrix. This makes it easy to stack on top of your Feather. Or, you can solder in the 2x10 socket header on the bottom of the Wing, and then stack your Feather on top. That way you can plug it directly into the back of the matrix \*mind blown\*

These FeatherWings will work great with any of our [16x32 \(https://adafru.it/CIE\)](https://adafru.it/CIE), [32x32 \(https://adafru.it/CIF\)](https://adafru.it/CIF) or [64x32 \(https://adafru.it/CIG\)](https://adafru.it/CIG) RGB matrices, and is definitely the easiest way to glow and go.

There are 2 different versions of the NeoPXL8 FeatherWing. Make sure you get the correct one for the feather you will be pairing it with.



### [Adafruit NeoPXL8 FeatherWing for Feather M0 - 8 x DMA NeoPixels!](https://www.adafruit.com/product/3249)

Since we first started carrying NeoPixels back in 2012, the chainable RGB LEDs have taken over the world. And a big part of that success is due to the simplicity of their wiring - just...

<https://www.adafruit.com/product/3249>



### [Adafruit NeoPXL8 FeatherWing for Feather M4 - 8 x DMA NeoPixels!](https://www.adafruit.com/product/4537)

Since we first started carrying NeoPixels back in 2012, the chainable RGB LEDs have taken over the world. And a big part of that success is due to the simplicity of their wiring - just...

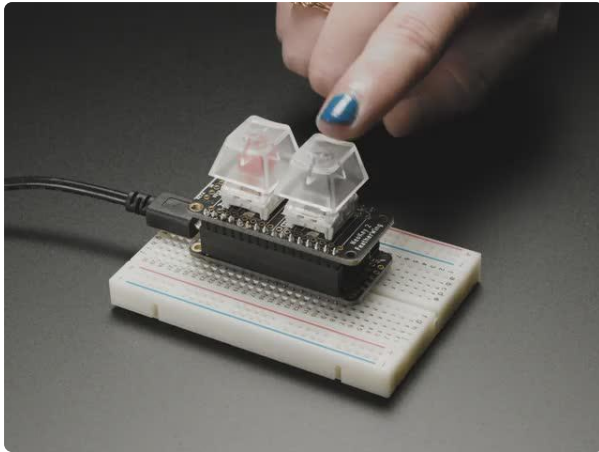
<https://www.adafruit.com/product/4537>

Since we first started carrying NeoPixels back in 2012, the chainable RGB LEDs have taken over the world. And a big part of that success is due to the simplicity of their wiring - just one data wire, no matter how many pixels you've got. So no surprise they're everywhere, blinking away in art exhibits, maker faire demos, DJ booths, decorations, and costumes.

But, at some point, every NeoPixel'er bumps into the constraints of that single-data-wire: the timing is very picky and often time your code has to stop completely so that it can burst out the data without any interruptions. This requirement makes it tough to create fast-update lighting effects, and limits the number of pixels you can drive before other hardware peripherals get attention.

Resident pixel-pro Paint Your Dragon (who coined the name NeoPixel dont-cha-know!) took on this challenge and has succeeded gloriously. By carefully examining the ATSA MD21 and ATSAMD51 datasheets, he noticed you could use the Timer 0 in 'waveform' mode, and create 8 unique waveforms over DMA that would handle all the pixel-pushing for you.

Thus were born the [NeoPXL8 Arduino library](https://adafru.it/Blw) (<https://adafru.it/Blw>) and NeoPXL8 FeatherWing! The library runs on our Feather M0 or Feather M4 and handles all the NeoPixeling for you, up to 8 strands of concurrent DMA output. For the Feather M4, each one can be 1750 RGB pixels long for a total of  $8 \times 1750 = 14000$  pixels. For the Feather M0, each one can be 250 RGB pixels long for a total of  $8 \times 250 = 2000$  pixels. That leaves you some RAM for your code to run in as well.



### NeoKey FeatherWing - Two Mechanical Key Switches with NeoPixels

The only thing better than a nice mechanical key, is two of them, and ones that also can glow any color of the rainbow - and that's what the Adafruit NeoKey FeatherWing...

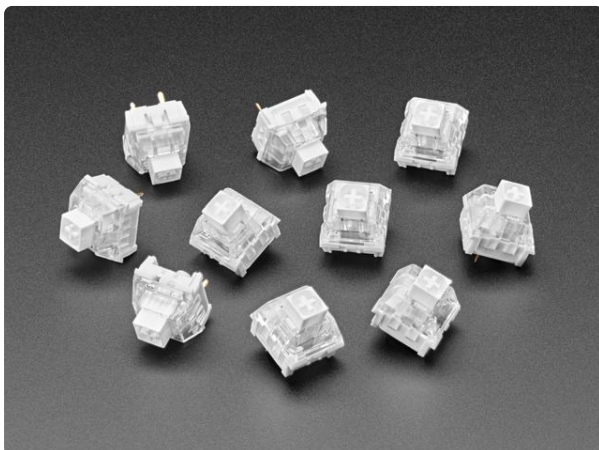
<https://www.adafruit.com/product/4979>

This Wing plugs into any/all Feather main boards and can fit two Cherry MX or compatible switches to turn your Feather into the lil'est macro keypad.

Each Wing has two Kailh sockets, which means you can plug in any MX-compatible switches instead of soldering them in. You may need a little glue to keep the switches in place: hot glue or a dot of epoxy worked fine for us.

Beneath each switch is a reverse-mount NeoPixel pointing up through the spot where many switches would have an LED to shine though. The two pixels are chained together so you can control them as one 2-pixel NeoPixel strand.

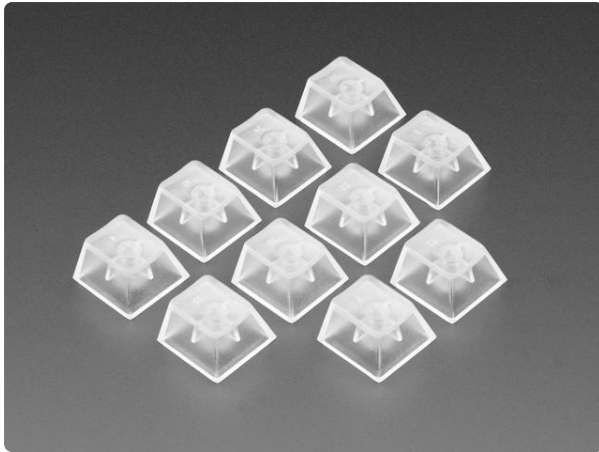
For this FeatherWing, you'll want to pick up some [key switches](https://adafru.it/-f6) (<https://adafru.it/-f6>) and [keycaps](https://adafru.it/-f7) (<https://adafru.it/-f7>).



### Kailh Mechanical Key Switches - Clicky White - 10 pack

For crafting your very own custom keyboard, these Kailh White Linear mechanical key switches are deeee-luxe! With smooth actuation and Cherry MX...

<https://www.adafruit.com/product/4955>



### [Translucent Keycaps for MX Compatible Switches - 10 pack](https://www.adafruit.com/product/4956)

Get ready to clacky to your heart's content. Here is a 10 pack of translucent keycaps for your next mechanical keyboard or

<https://www.adafruit.com/product/4956>

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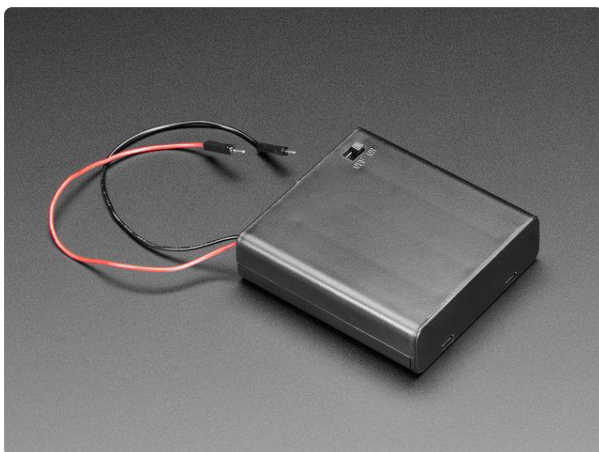
## Motor & Servo Wings

Feather can make a great base for your next robotic project. We've got three Wings that make easy work of adding motors.

Best of all, these FeatherWings only use I2C, so they work with all Feathers. The I2C address can be changed with a solder jumper, so you can add multiple Wings for lots of motors, or use them with any other Wings. (Just make sure you have each wing with a unique I2C address)

Both of these Wings are designed for driving fairly powerful motors, easily 1A draw each. For that reason, we do not run the motors off of USB or the LiPo battery - they are dedicated for running the Feather only. Instead, the 'loud and messy' power supply for the motors is provided via a terminal block.

We recommend something like our 4 x AA battery pack, with NiMH rechargeable batteries.



### [4 x AA Battery Holder with On/Off Switch](https://www.adafruit.com/product/830)

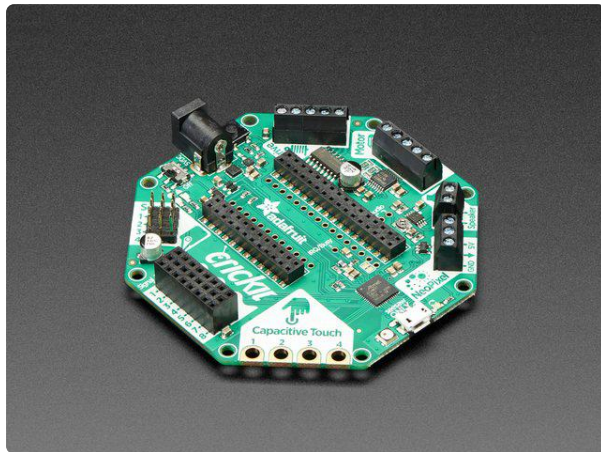
Make a nice portable power pack with this 4 x AA battery holder. It fits any alkaline or rechargeable AA batteries in series.

There's a snap on cover and an on/off switch which can...

<https://www.adafruit.com/product/830>



# Adafruit CRICKIT Controller



## Adafruit CRICKIT FeatherWing for any Feather

Sometimes we wonder if robotics engineers ever watch movies. If they did, they'd know that making robots into servants always ends up in a robot rebellion. Why even go down that...

<https://www.adafruit.com/product/3343>

Crickit is our Creative Robotics & Interactive Construction Kit. It's an add-on to the popular Feather ecosystem that lets you #MakeRobotFriend using CircuitPython, MakeCode, or Arduino.

Plug in any Feather mainboard you want into the center, and you're good to go! The Crickit is powered by seesaw, our I2C-to-whatever bridge firmware. So you only need to use two I2C data pins to control the huge number of inputs and outputs on the Crickit. All those timers, PWMs, sensors are offloaded to the co-processor.

The only thing that is not managed by seesaw is the audio output. We provide a small jumper you can solder to connect the audio amplifier to the first analog pin. On our Feather M0's this is a true analog output (DAC) and you can play audio clips with CircuitPython or Arduino. Other Feathers may not have a DAC! In that case, you can solder a wire to jumper the audio amp to a PWM pin.

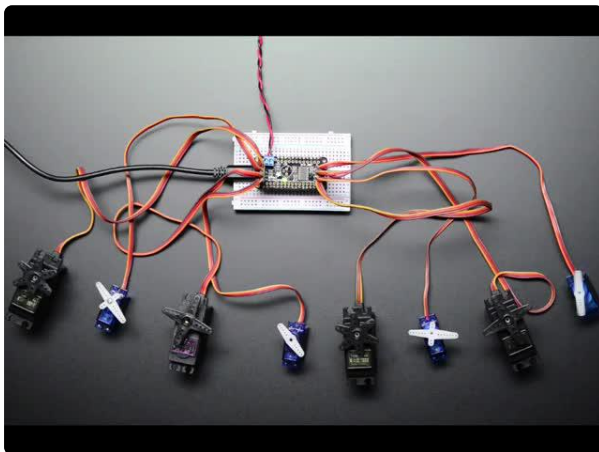
You get to use all the non-I2C signal pins on your feather and get a boat-load of extra in/out pins, motor controllers, capacitive touch sensors, a NeoPixel driver and amplified speaker output. It complements & extends your Feather so you can still use all the goodies, including stacking FeatherWings on top. But now you have a robotics playground as well.

You get:

- 4 x Analog or Digital Servo control, with precision 16-bit timers
- 2 x Bi-directional brushed DC motor control, 1 Amp current limited each, with 8-bit PWM speed control (or one stepper)
- 4 x High current "Darlington" 500mA drive outputs with kick-back diode protection. For solenoids, relays, large LEDs, or one uni-polar stepper

- 4 x Capacitive touch sensors with alligator-pads
- 8 x Signal pins, digital in/out or analog inputs
- 1 x NeoPixel driver with 5V level shifter - The NeoPixels are buffered and controlled by the seesaw chip
- 1 x Class D, 4-8 ohm speaker, 3W-max audio amplifier - the audio input pin is available as a solder-able pad for your configuration, you can connect it to your Feather's DAC or PWM output as you desire.

## Servo & PWM Control



### 8-Channel PWM or Servo FeatherWing Add-on For All Feather Boards

A Feather board without ambition is a Feather board without FeatherWings! This is the 8-Channel PWM or Servo

FeatherWing, you can add 8 x 12-bit PWM outputs to...

<https://www.adafruit.com/product/2928>

Most of our Feathers do have PWM/Servo outputs, but often they are shared or there's not enough of them. With this Wing you need not worry about jitter or timer allocation. The 8 x servo outputs are completely driven by a I2C-controlled chip. All the outputs have the same PWM rate, but have individually controlled duty cycles @ 12-bit resolution.

- There's an I2C-controlled PWM driver with a built in clock. That means that, unlike the TLC5940 family, you do not need to continuously send it signal tying up your microcontroller, its completely free running!
- It is 5V compliant, which means you can control it from a 3.3V Feather and still safely drive up to 6V outputs (this is good for when you want to control white or blue LEDs with 3.4+ forward voltages)
- 6 address select pins so you can stack up to 62 of these on a single i2c bus, a total of 992 outputs - that's a lot of servos or LEDs
- Adjustable frequency PWM up to about 1.6 KHz
- 12-bit resolution for each output - for servos, that means about 4us resolution at 60Hz update rate
- Configurable push-pull or open-drain output

If stacking these, we recommend using right-angle servo connectors:

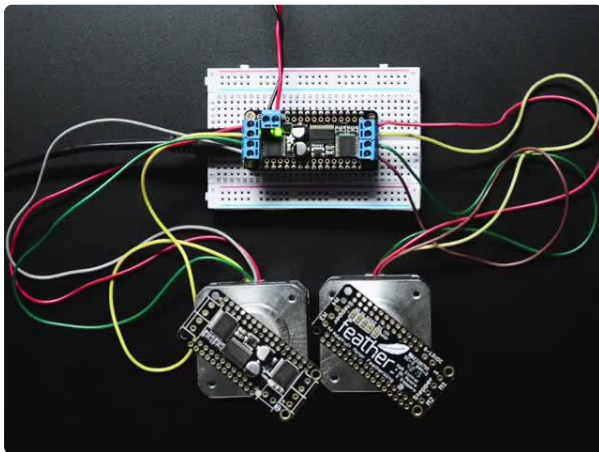


#### [3x4 Right Angle Male Header - 4 pack](https://www.adafruit.com/product/816)

Three rows in a right angle header!? Yes! These chunks of 0.1" header has yet-another-row - handy for when you want to connect cables that come in sets of three, like perhaps...

<https://www.adafruit.com/product/816>

## Brushed Motor and Stepper Controller



#### [DC Motor + Stepper FeatherWing Add-on For All Feather Boards](https://www.adafruit.com/product/2927)

A Feather board without ambition is a Feather board without FeatherWings! This is the DC Motor + Stepper FeatherWing which will let you use 2 x bi-polar...

<https://www.adafruit.com/product/2927>

Motors require both GPIO and PWMs, and they quickly start hogging all your pins up. With this Wing, you get 4 full H-bridges, so you can control up to 4 DC motors, 2 steppers, or 1 stepper and 2 motors.

Motor FeatherWing Specs:

- 4 full H-Bridges: the TB6612 chipset provides 1.2A per bridge with thermal shutdown protection, internal kickback protection diodes. Can run motors on 4.5VDC to 13.5VDC.
- Up to 4 bi-directional DC motors with individual 12-bit speed selection (so, about 0.02% resolution)
- Up to 2 stepper motors (unipolar or bipolar) with single coil, double coil, interleaved or micro-stepping.
- Motors automatically disabled on power-up

- Big 3.5mm terminal block connectors to easily hook up wires (18-26AWG) and power
- Polarity protected 2-pin terminal block and jumper to connect external power, for separate logic/motor supplies
- Completely stackable design: 5 address-select jumper pads means up to 32 stackable wings: that's 64 steppers or 128 DC motors! What on earth could you do with that many steppers? I have no idea but if you come up with something send us a photo because that would be a pretty glorious project.

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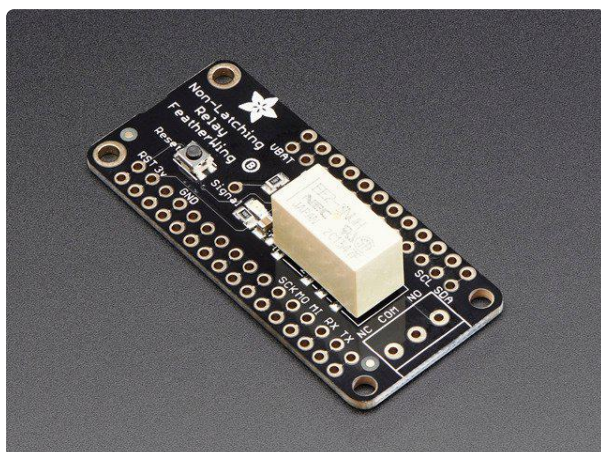
## Relay Wings

Click-clack! If you want to control devices or appliances with your Feather, you can do so with a Relay FeatherWing. These Wings have a single relay on them. We have a few different types, but all have similar functionality.

The relay is controlled by one or two pins. You'll need to solder a jumper wire or close a solder jumper to select the pin. Since they're simple, you can use them with any Feather and along-side any Wing, as long as the pins you select for relay-control are not already use.

You can also have multiple relays if you like, just make sure the pins selected are unique.

## Non-Latching Mini Relay



### [Adafruit Non-Latching Mini Relay FeatherWing](https://www.adafruit.com/product/2895)

A Feather board without ambition is a Feather board without FeatherWings! This is the Non-Latching Mini Relay FeatherWing. It gives you power to control, and...

<https://www.adafruit.com/product/2895>

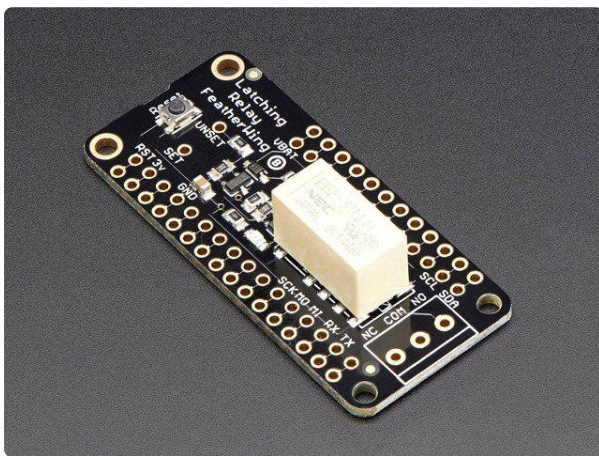
This is the simplest relay. Drive the pin high to set the relay, and drive the pin low to unset it.



You can switch up to 2A of resistive current at 30VDC or ~40VAC or lower. At 110VDC you can switch up to 0.3A, at 120VAC up to 0.5A, and at 250VAC you can switch up to 0.6A. Check the datasheet for the relay for the exact switching capacity, and of course, for reactive/inductive loads you will need to de-rate. This isn't a relay you can use to turn on and off your washer/dryer, stick to 60W or less.

50mA current is drawn when the relay is set. If power is lost, the relay will go back to being unset

## Latching Mini Relay



### [Adafruit Latching Mini Relay FeatherWing](https://www.adafruit.com/product/2923)

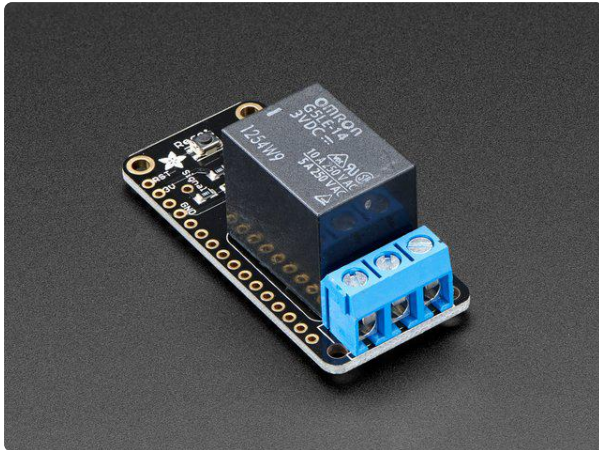
A Feather board without ambition is a Feather board without FeatherWings! This is the Latching Mini Relay FeatherWing. It gives you power to control, and...

<https://www.adafruit.com/product/2923>

This is the Latching version of the above relay. This one requires two pins, a SET and UNSET and instead of keeping the SET pin high, you only have to pulse each pin high for 10ms to latch the relay open or closed. You need two pins but save power. Note, if power is lost, the relay will stay in the last setting.

Both FeatherWings use the same family of relay. You can switch up to 2A of resistive current at 30VDC or ~40VAC or lower. At 110VDC you can switch up to 0.3A, at 120VAC up to 0.5A, and at 250VAC you can switch up to 0.6A.

# Power Relay



## Adafruit Power Relay FeatherWing

A Feather board without ambition is a Feather board without FeatherWings! This is the Power Relay FeatherWing. It gives you power to control, and control over power....

<https://www.adafruit.com/product/3191>

This Wing has a non-latching type relay. Compared to our smaller mini relay FeatherWings, this one can handle a beefy 1200 Watts!

You can switch up to 10A of resistive-load current at 120VAC, 5A at 240VAC. With inductive loads, about half that. Check the datasheet for the relay for the exact switching capacity, as it depends on type of load and voltage type and magnitude. This relay is good for handling fairly large devices, computers, TVs, small appliances and more.

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# Power Monitoring Wing



## Adafruit INA219 FeatherWing

The INA219 FeatherWing makes power-monitoring problems a thing of the past. Instead of struggling with two multimeters, you can just use the handy INA219B chip on this...

<https://www.adafruit.com/product/3650>

The INA219 FeatherWing makes power-monitoring problems a thing of the past. Instead of struggling with two multimeters, you can just use the handy INA219B chip on this breakout to both measure both the high side voltage and DC current draw over I2C with 1% precision. Works with any and all Feathers! Communicates over I2C so its super-simple to use, you can even change the I2C address to have up to 4 of

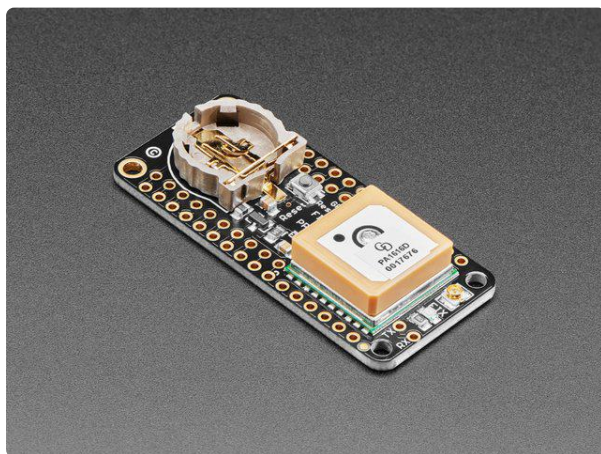
these Wings on one Feather.

Many current-measuring devices are only good for low side measuring. That means that unless you want to get a battery involved, you have to stick the measurement resistor between the target ground and true ground. This can cause problems with circuits since electronics tend to not like it when the ground references change and move with varying current draw. This chip is much smarter - it can handle high side current measuring, up to +26VDC, even though it is powered with 3.3V. It will also report back that high side voltage, which is great for tracking battery life or solar panels.

A precision amplifier measures the voltage across the 0.1 ohm, 1% sense resistor. Since the amplifier maximum input difference is  $\pm 320\text{mV}$  this means it can measure up to  $\pm 3.2$  Amps. With the internal 12 bit ADC, the resolution at  $\pm 3.2\text{A}$  range is 0.8mA. With the internal gain set at the minimum of div-8, the max current is  $\pm 400\text{mA}$  and the resolution is 0.1mA. Advanced hackers can remove the 0.1 ohm current sense resistor and replace it with their own to change the range (say a 0.01 ohm to measure up 32 Amps with a resolution of 8mA).

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## GPS Wing



### [Adafruit Ultimate GPS FeatherWing](https://www.adafruit.com/product/3133)

Give your Feather a sense of place, with an Ultimate GPS FeatherWing. In 2013 we designed the Ultimate GPS...

<https://www.adafruit.com/product/3133>

This Wing is our only GPS/GNSS capable wing. It's great for adding location or time awareness to your project.

That said, it is the Wing with the most compatibility issues. That's because it uses UART serial to send/receive data. And many microcontrollers have only one UART and it's used for programming and debugging.

These are the Feathers that are not compatible:

- ESP8266 Huzzah Feather
- nRF52 Bluefruit Feather

All other Feathers have a free UART (mostly because they have native USB for upload/debug) or multiple UARTs, like the ESP32.

You can only have one GPS, but it can be used with any other Wing (since it's the only UART-using wing)

## Antenna Reception

Like all GPS devices, the Wing needs a good antenna orientation to receive the tiny signals sent from space. The GPS Wing has a built in antenna, which can be used as long as the Feather is in a non-metallic enclosure and facing up.

You can use a uFL -> SMA and SMA antenna to add a big antenna for good reception when in an enclosure.



### [SMA to uFL/u.FL/IPX/IPEX RF Adapter Cable](https://www.adafruit.com/product/851)

This RF adapter cable is super handy for anyone doing RF work. Often times, small electronics save space by having a pick-and-placeable u.FL connector (also called uFL, IPEX, IPAX,...

<https://www.adafruit.com/product/851>



### [GPS Antenna - External Active Antenna - 3-5V 28dB 5 Meter SMA](https://www.adafruit.com/product/960)

Give your Ultimate GPS V3 a boost with this external active antenna. This GPS antenna draws about 10mA and will give you an additional 28 dB of gain. It's got a 5 meter long cable...

<https://www.adafruit.com/product/960>



For best reception and performance, adding a backup battery will keep the GPS from having to download the 'Almanac' every time the Feather is turned on. Pick up a CR1220 battery and install it!



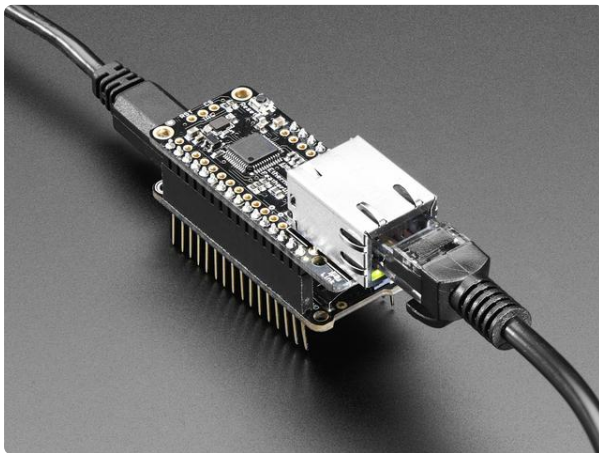
#### [CR1220 12mm Diameter - 3V Lithium Coin Cell Battery](https://www.adafruit.com/product/380)

These are the highest quality & capacity batteries, the same as shipped with the iCufflinks, iNecklace, Datalogging and GPS Shields, GPS HAT, etc. One battery per order...

<https://www.adafruit.com/product/380>

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## Networking Wings



#### [Adafruit Ethernet FeatherWing](https://www.adafruit.com/product/3201)

Wireless is wonderful, but sometimes you want the strong reliability of a wire. If your Feather board is going to be part of a permanent installation, this Ethernet...

<https://www.adafruit.com/product/3201>

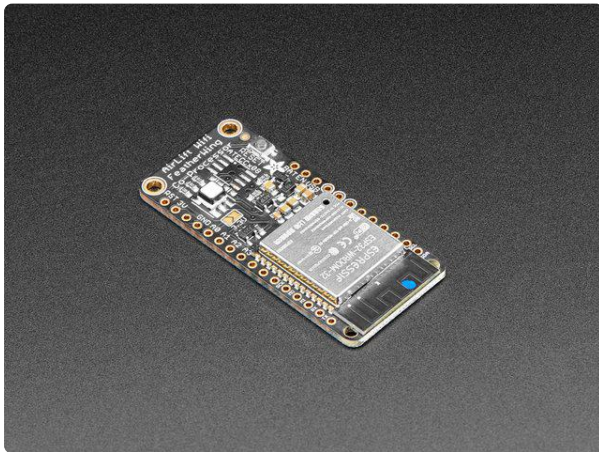
Ethernet is a reliable standard for Internet connectivity. If you don't need Wireless (and don't want the headache of wireless either), then Ethernet can be a very good option.

No antennas, no SSIDs, no passwords, plug it in and forget about it.

While there are a few Feathers that have built-in 'Ethernet support' they all need a PHY interface anyways and it's about the same price as the W5500 chipset we use. So we just went with this, which is a well-known (or, at least, infamous) chipset. And, yes, you can use it with our WiFi Feathers to create a Feather with dual-connectivity options (or a very slow and silly WiFi bridge)

This Wing uses the SPI pins and a CS pin, you can cut the jumper to re-assign the CS pin. You can use with other SPI-based wings (displays, music, radio, datalogging, etc) just make sure there's no pin conflict for the CS pin.

This Wing does not support active Power-over-Ethernet (PoE), but you can easily hook up a passive PoE configuration with a passive injector, a 5V power adapter, and a 2.1mm to MicroUSB cable. [See the tutorial page for more details \(https://adafru.it/wiC\)](https://adafru.it/wiC)



#### Adafruit AirLift FeatherWing – ESP32 WiFi Co-Processor

Give your Feather project a lift with the Adafruit AirLift FeatherWing - a FeatherWing that lets you use the powerful ESP32 as a WiFi co-processor. You probably have your...

<https://www.adafruit.com/product/4264>

Nowadays, many people have WiFi set up because they won't want a fat ethernet cable running to their project. This is a featherWing with an ESP32 co-processor on it for exchanging data via WiFi.

Give your Feather project a lift with the Adafruit AirLift FeatherWing - a FeatherWing that lets you use the powerful ESP32 as a WiFi co-processor. You probably have your favorite Feather ([like the Feather M4 \(https://adafru.it/Cmy\)](https://adafru.it/Cmy)) that comes with its own set of awesome peripherals and lots of libraries. But it doesn't have WiFi built in! So let's give that chip a best friend, the ESP32. This chip can handle all the heavy lifting of connecting to a WiFi network and transferring data from a site, even if its using the latest TLS/SSL encryption (it has root certificates pre-burned in).

Having WiFi managed by a separate chip means your code is simpler, you don't have to cache socket data, or compile in & debug an SSL library. Send basic but powerful socket-based commands over 8MHz SPI for high speed data transfer. You can use 3V or 5V Arduino, any chip from the ATmega328 or up, although the '328 will not be able to do very complex tasks or buffer a lot of data. It also works great with CircuitPython, a SAMD51/Cortex M4 minimum required since we need a bunch of RAM. All you need is an SPI bus and 2 control pins plus a power supply that can provide up to 250mA during WiFi usage.

We placed an ESP32 module on a FeatherWing with a separate 3.3V regulator, and a tri-state chip for MISO so you can share the SPI bus with other 'Wings. Comes fully

assembled and tested, pre-programmed with ESP32 SPI WiFi co-processor firmware that [you can use in CircuitPython to use this into WiFi co-processor over SPI + 2 pins](https://adafru.it/EvI) (<https://adafru.it/EvI>). We also toss in some headers so you can solder it in and plug into a doubler, but you can also pick up a set of stacking headers to stack above/below your Feather.

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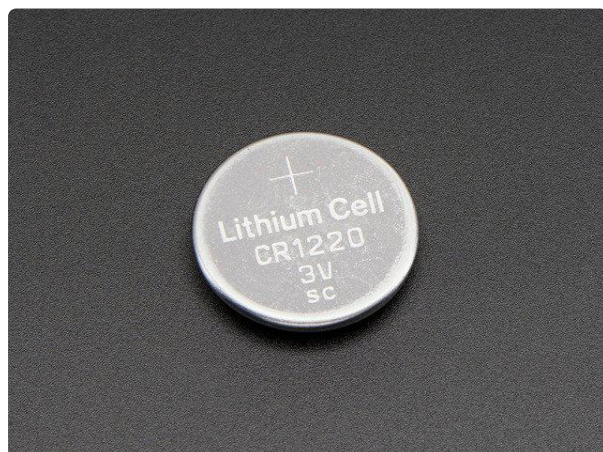
## RTC & Datalogging Wings

While all the Feathers have a LiPo battery backup capability, they don't always have a true "Real Time Clock" that can keep the correct time.

If you have a WiFi or Cellular Feather you may be able to get away with not having a true RTC because you can connect to the network (say, NTP) and query the time. But, even then, there's a chance you'll be off-grid and need to know the time and date.

Thus we have two options for adding an RTC. Both RTC's are I2C, and they share the same address. So you can only have one RTC, but you can match them up with any other Wings. If using the SD card on the Adalogger, just make sure the CS pin is not shared.

Both Wings work with all Feathers. A CR1220 coin cell is required and not included (to make air-shipping abroad easier they are sold separately)



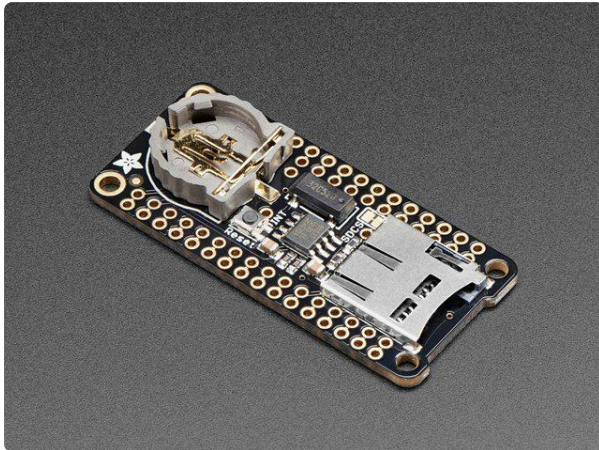
### [CR1220 12mm Diameter - 3V Lithium Coin Cell Battery](https://www.adafruit.com/product/380)

These are the highest quality & capacity batteries, the same as shipped with the iCufflinks, iNecklace, Datalogging and GPS Shields, GPS HAT, etc. One battery per order...

<https://www.adafruit.com/product/380>



# Adalogger + RTC Wing



## Adalogger FeatherWing - RTC + SD Add-on For All Feather Boards

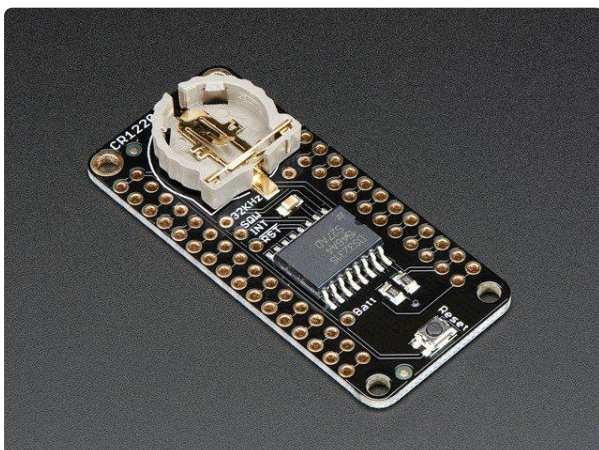
A Feather board without ambition is a Feather board without FeatherWings! This is the Adalogger FeatherWing: it adds both a battery-backed Real Time Clock and micro SD...

<https://www.adafruit.com/product/2922>

This FeatherWing will make it real easy to add datalogging to any of our existing Feathers. You get both an I2C real time clock (PCF8523) with 32KHz crystal and battery backup, and a microSD socket that connects to the SPI port pins (+ extra pin for CS).

If you don't need to use the SD card socket, leave it empty and the SPI + CS pins can be used for something else.

# Precision RTC Wing



## DS3231 Precision RTC FeatherWing - RTC Add-on For Feather Boards

A Feather board without ambition is a Feather board without FeatherWings! This is the DS3231 Precision RTC FeatherWing: it adds an extremely accurate I2C-integrated...

<https://www.adafruit.com/product/3028>

The PCF8523 used in the Adalogger has an external 32kHz timing crystal that is used to keep time with low current draw. And that's all well and good, but those crystals have slight drift, particularly when the temperature changes (the temperature changes the oscillation frequency very very very slightly but it does add up!)



The DS3231 RTC is in a beefy package because the crystal is inside the chip! And right next to the integrated crystal is a temperature sensor. That sensor compensates for the frequency changes by adding or removing clock ticks so that the timekeeping stays on schedule.

You'll get much higher precision with this RTC, at an additional cost. And there is no space for an SD card holder.

---

## Music Wings

If you'd like to create a music-playing project, adding a Music Maker Wing will make it easy. These feature the VS1053 chipset which can do MP3, Ogg Vorbis, WAVE playback. They also have a MIDI synth inside that can be controlled over UART.

Both Music Maker Wings have the same circuitry/code but one has a headphone jack and the other has a 2 Watt audio amplifier. If you want to connect speakers directly, go with the amp. If you want to use headphones or connect to a powered stereo, the headphone one will work fine.

### Main SPI Mode compatibility

There's a lot going on with these Wings, and they have some incompatibilities:

If you are only playing audio (MP3/Ogg/Wave), then these Wings are compatible with all Feathers.

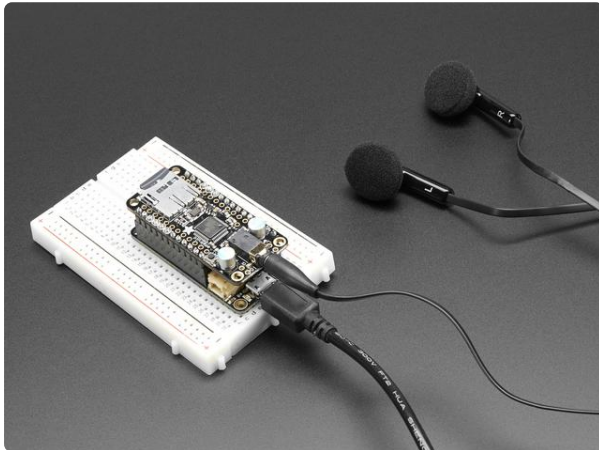
But there are a lot of pins used: SPI + 3 for the MP3 chip and +1 for the SD card. MP3 playing works best with an interrupt, so those pins can be used at any time. We don't even recommend using this with Feathers that want to access SPI at their leisure, such as the Adalogger, non-nRF52 Bluefruit, or Radio. It is possible but use care to make sure you aren't using the two SPI devices at once.

We only recommend using this Wing along-side I2C-based FeatherWings to make sure there are no conflicts

### MIDI Synth Mode compatibility

If you want to use the UART MIDI synth (which is not the same mode as the MP3/Ogg/Wave player), you'll need to use the UART TX pin. For the nRF52 or ESP8266

Feathers, you may need to remove the 'Wing during programming. And, you'll end up re-using the main Serial console for MIDI which can be confusing.



#### [Adafruit Music Maker FeatherWing - MP3 OGG WAV MIDI Synth Player](https://www.adafruit.com/product/3357)

Bend all audio files to your will with the Adafruit Music Maker FeatherWing! It's a fun-size version of our Music...

<https://www.adafruit.com/product/3357>

The Feather has the MP3 decoder chip and an SD card socket. You can stream MP3 directly to the chip if you like (say from a WiFi connection or SPI Flash if you have an Express) or read it from the SD card.

The headphone-out version has blocking capacitors so you can connect it to headphones or a powered stereo system.



#### [Music Maker FeatherWing w/ Amp - MP3 OGG WAV MIDI Synth Player](https://www.adafruit.com/product/3436)

Bend all audio files to your will with the Adafruit Music Maker FeatherWing + Amplifier! It's a fun-size version of our

<https://www.adafruit.com/product/3436>

The amplifier-out Wing is just like the headphone Wing but with a stereo Class D audio amplifier. This amp can draw quite a bit of current, 1A easily, if you're really bumping out some tunes! So make sure you have a beefy battery and/or 5V 2A wall adapter



### 5V 2.5A Switching Power Supply with 20AWG MicroUSB Cable

Our all-in-one 5V 2.5 Amp + MicroUSB cable power adapter is the perfect choice for powering single-board computers like Raspberry Pi, BeagleBone, or anything else that's...

<https://www.adafruit.com/product/1995>



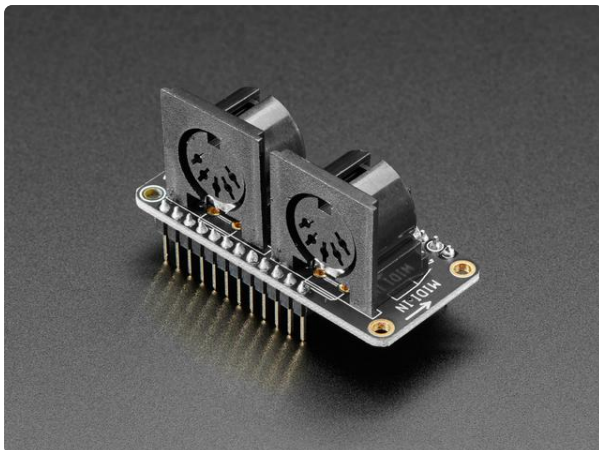
### 5V 2A Power Supply w/ 20AWG 6' MicroUSB Cable - International

Our all-in-one 5V 2A, MicroUSB cable, international power adapter is the perfect choice for powering single-board computers like Raspberry Pi or anything else...

<https://www.adafruit.com/product/2297>

## MIDI FeatherWing Kit

This FeatherWing is different than the other wings in that it doesn't directly produce any sound. However, it will allow you to use other MIDI devices with your project. Just like with the MIDI Synth wings above, if you are using the 328p, nRF52, or ESP8266 feather, you may need to remove the Wing during programming because we use the UART TX pin.



### Adafruit MIDI FeatherWing Kit

Turn your Feather into a song-bird with this musically-enabled FeatherWing that adds MIDI input and output jacks to just about any Feather. You get both input and output DIN-5 MIDI...

<https://www.adafruit.com/product/4740>

The FeatherWing adds MIDI input and output jacks to just about any Feather. You get both input and output DIN-5 MIDI jacks, a 3V optically isolator so you can interface with MIDI on 3.3V logic/power microcontrollers, and two blinky indicator LEDs underneath the jacks to help you know when data is sent and received.

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## Radio Wings

Feathers without integrated radios can often have a FeatherWing with the radio you want.

Add short-hop wireless to your Feather with these RadioFruit Featherwings. These add-ons for any Feather board will let you integrate packetized radio (with the RFM69 radio) or LoRa radio (with the RFM9x's). These radios are good options for kilometer-range radio, and paired with one of our WiFi, cellular or Bluetooth Feathers, will let you bridge from 433/900 MHz to the Internet or your mobile device.

These radio modules come in four variants (two modulation types and two frequencies) The RFM69's are easiest to work with, and are well known and understood. The LoRa radios are exciting, longer-range and more powerful but also more expensive.

All radios are sold individually and can only talk to radios of the same part number. E.g. RFM69 900 MHz can only talk to RFM69 900 MHz, LoRa 433 MHz can only talk to LoRa 433, etc.

## LoRa Radios

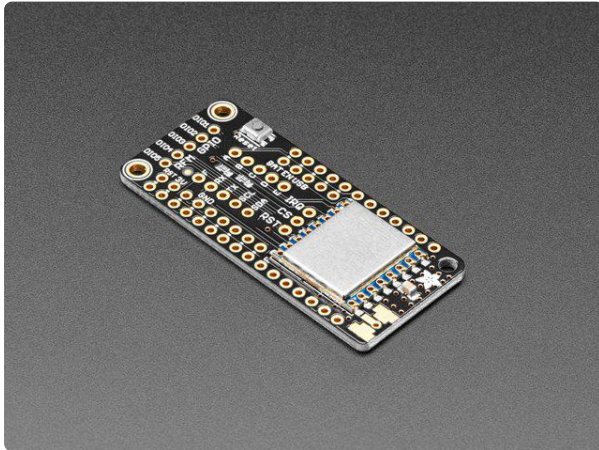
These are +20dBm LoRa packet radios that have a special radio modulation that is not compatible with the RFM69s but can go much much farther. They can easily go 2 Km line of sight using simple wire antennas, or up to 20Km with directional antennas and settings tweakings

- SX127x LoRa® based module with SPI interface
- Packet radio with ready-to-go Arduino libraries
- Uses the license-free ISM bands
- +5 to +20 dBm up to 100 mW Power Output Capability (power output selectable in software)
- ~300uA during full sleep, ~120mA peak during +20dBm transmit, ~40mA during active radio listening.



- Our initial tests with default library settings: over 1.2mi/2Km line-of-sight with wire quarter-wave antennas. ([With setting tweaking and directional antennas, 20Km is possible \(https://adafru.it/mGa\)](https://adafru.it/mGa)).

Currently tested to work with the Feather ESP8266, Teensy 3 Feather, Feather 32u4 and Feather M0 series, some wiring is required to configure the FeatherWing for the chipset you plan to use.

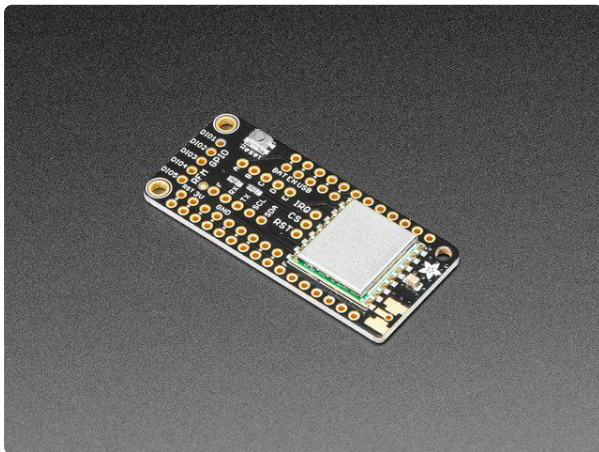


#### Adafruit LoRa Radio FeatherWing - RFM95W 433 MHz

Add short-hop wireless to your Feather with these RadioFruit Featherwings. These add-ons for any Feather board will let you integrate packetized radio (with the RFM69 radio) or LoRa...

<https://www.adafruit.com/product/3232>

LoRa capable radio at 433 MHz for use in Europe ITU 1 license-free ISM, or for amateur use with restrictions (check your local amateur regulations!)



#### Adafruit LoRa Radio FeatherWing - RFM95W 900 MHz

Add short-hop wireless to your Feather with these RadioFruit Featherwings. These add-ons for any Feather board will let you integrate packetized radio (with the RFM69 radio) or LoRa...

<https://www.adafruit.com/product/3231>

LoRa capable radio at 868 or 915 MHz for use in Americas ITU 2 license-free ISM, or for amateur use with restrictions (check your local amateur regulations!)

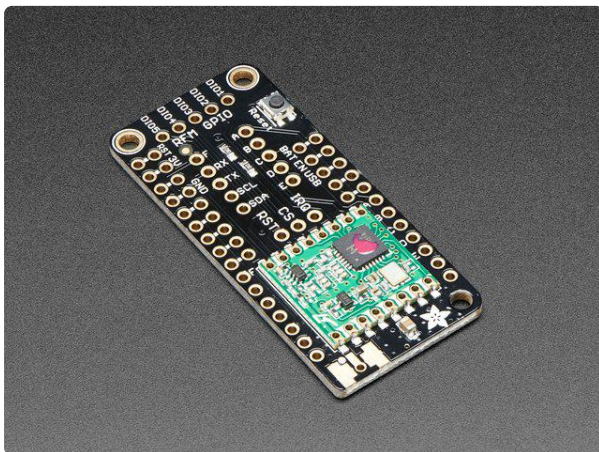
## Packet Radios

These are +20dBm FSK packet radios that have a lot of nice extras in them such as encryption and auto-retransmit. They can go at least 500 meters line of sight using

simple wire antennas, probably up to 5Km with directional antennas and settings tweakings

- SX1231 based module with SPI interface
- Packet radio with ready-to-go Arduino libraries
- Uses the license-free ISM bands
- +13 to +20 dBm up to 100 mW Power Output Capability (power output selectable in software)
- 50mA (+13 dBm) to 150mA (+20dBm) current draw for transmissions
- Range of approx. 350 meters, depending on obstructions, frequency, antenna and power output
- Create multipoint networks with individual node addresses
- Encrypted packet engine with AES-128

Currently tested to work with the Feather ESP8266, Teensy 3 Feather, WICED Feather, Feather 32u4 and Feather M0 series, some wiring is required to configure the FeatherWing for the chipset you plan to use.

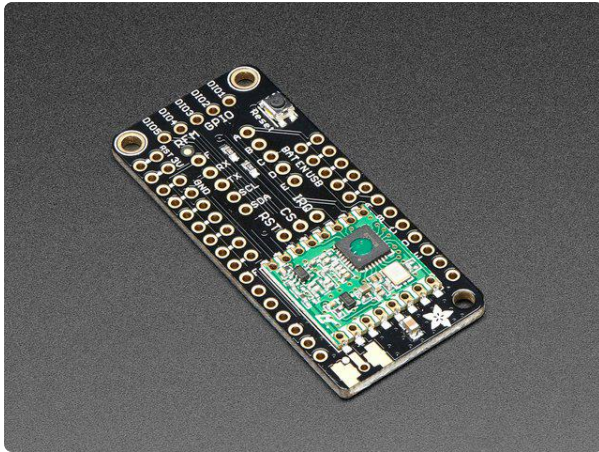


#### Adafruit Radio FeatherWing - RFM69HCW 433MHz

Add short-hop wireless to your Feather with these RadioFruit Featherwings. These add-ons for any Feather board will let you integrate packetized radio (with the RFM69 radio) or LoRa...

<https://www.adafruit.com/product/3230>

This is a basic packetized FSK/GFSK/MSK/GMSK/OOK radio at 433 MHz for use in Europe ITU 1 license-free ISM, or for amateur use with restrictions (check your local amateur regulations!)



### Adafruit Radio FeatherWing - RFM69HCW 900MHz

Add short-hop wireless to your Feather with these RadioFruit Featherwings. These add-ons for any Feather board will let you integrate packetized radio (with the RFM69 radio) or LoRa...  
<https://www.adafruit.com/product/3229>

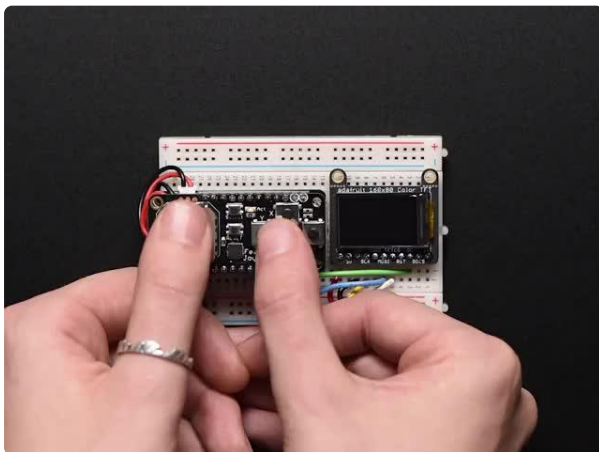
And this is a basic packetized FSK/GFSK/MSK/GMSK/OOK radio at 868 or 915 MHz for use in Americas ITU 2 license-free ISM, or for amateur use with restrictions (check your amateur regulations!)

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## Game and Prop Wings

Feather is a perfect form factor for handheld gaming, to put inside wearables and props.

Here are FeatherWings which may be added to a Feather to help your creative side.

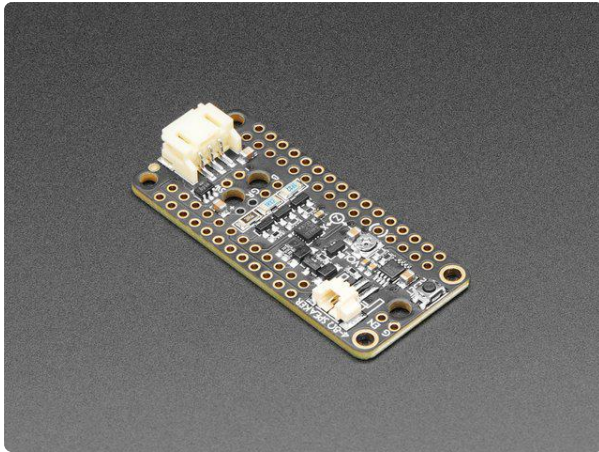


### Adafruit Joy FeatherWing for all Feathers

Make a game or robotic controller with this Joy-ful FeatherWing. This FeatherWing has a 2-axis joystick and 5 momentary buttons (4 large and 1 small)...  
<https://www.adafruit.com/product/3632>

Add a joystick and buttons with the cute Joy FeatherWing. This FeatherWing has a 2-axis joystick and 5 momentary buttons (4 large and 1 small) so you can turn your feather board into a tiny game controller. This wing communicates with your host microcontroller over I2C so it's easy to use and doesn't take up any of your precious analog or digital pins. There is also an optional interrupt pin that can alert your feather when a button has been pressed or released to free up processor time for other tasks.





### Adafruit Prop-Maker FeatherWing

The Adafruit Feather series gives you lots of options for a small, portable, rechargeable microcontroller board. Perfect for fitting into your next prop build! This FeatherWing will...

<https://www.adafruit.com/product/3988>

The Prop-Maker FeatherWing will unlock the prop-maker inside all of us, with tons of stuff packed in to make sabers & swords, props, toys, cosplay pieces, and more.

We looked at hundreds of prop builds, and thought about what would make for a great low-cost (but well-designed) add-on for our Feather boards. Here's what we came up with:

- Snap-in NeoPixel port - With a 3-pin JST connector, you can [plug in one of our JST-wired NeoPixel strips directly \(https://adafru.it/Cup\)](https://adafru.it/Cup), or [use a 3-pin JST connector to wire up your favorite shape of addressable NeoPixel LEDs \(https://adafru.it/DBh\)](https://adafru.it/DBh). This port provides high current drive from either the Feather Lipoly or USB port, whichever is higher. A level shifter gives you a clean voltage signal to reduce glitchiness no matter what chip you're using
- 3W RGB LED drivers - 3 high current MOSFETs will let you [connect a 3W RGB LED for powerful eye-blasting glory \(https://adafru.it/CXi\)](https://adafru.it/CXi). For most Feathers, the 3 pins are PWM capable so you can generate any color you like. Available as pin breakouts plus strain-relief holes
- Triple-Axis Accelerometer with Tap Detection - The LIS3DH is our favorite accelerometer, you can use this for detection motion, tilt or taps. [Here's an example of a light saber that makes sounds when swung or hit. \(https://adafru.it/DBi\)](https://adafru.it/DBi) We have code for this chip in both Arduino and CircuitPython.
- Class D Audio Amplifier - Drive a 8Ω 1 Watt speaker or 4Ω 3W speaker for sound effects. [Plug and play with our cute and slim oval speaker \(https://adafru.it/CEv\)](https://adafru.it/CEv), or [connect a picoblade cable \(https://adafru.it/CVi\)](https://adafru.it/CVi) for your favorite speaker. For use only with Feathers that have analog audio out such as the Feather M0 Express and M4 series.
- Low power mode! The power system for the RGB LED, NeoPixels and speaker amplifier can be controlled by a pin to cut power to them, so you have lower power usage when the prop is in sleep or off mode (but can wake up fast by listening to the button press or accelerometer data). When the power pin is set



low, the current draw for just the wing is under 1mA and no there's current draw from any attached NeoPixels - normally they're about 1mA even when not lit.

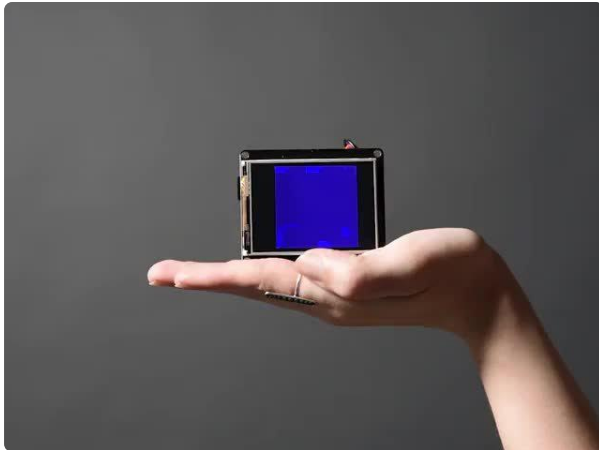
- Breakouts plus strain-relief hole for the enable pin and ground (for a mechanical switch that will power down the whole board)
- Breakouts plus strain-relief holes for an external switch pin and ground (for a mechanical mode button)

Please note: A few of the onboard hardware elements use PWM and analog output so we recommend the Feather M0 Express or Feather M4 series, they'll work best with this wing and let you make the most of it.

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## Camera Wing

The current FeatherWing lineup has one camera wing:



### [Adafruit AMG8833 IR Thermal Camera FeatherWing](#)

A Feather board without ambition is a Feather board without FeatherWings! This is the Thermal Camera FeatherWing: thanks to the Panasonic AMG8833 8x8 GridEYE sensor,...

<https://www.adafruit.com/product/3622>

Thermal Camera FeatherWing: thanks to the Panasonic AMG8833 8x8 GridEYE sensor, it adds heat-vision to any Feather main board. Using our [Feather Stacking Headers](http://adafru.it/2830) (<http://adafru.it/2830>) or [Feather Female Headers](http://adafru.it/2886) (<http://adafru.it/2886>) you can connect a FeatherWing on top of your Feather board and let the board take flight!

This sensor from Panasonic is an 8x8 array of IR thermal sensors. When connected to your Feather it will return an array of 64 individual infrared temperature readings over I2C. It's like those fancy thermal cameras, but compact and simple enough for easy integration.

This part will measure temperatures ranging from 0°C to 80°C (32°F to 176°F) with an accuracy of +/- 2.5°C (4.5°F). It can detect a human from a distance of up to 7 meters (23) feet. With a maximum frame rate of 10Hz, It's perfect for creating your own human detector or mini thermal camera. We have an easy-to use Arduino and CircuitPython code so you can get started fast. The sensor communicates over I2C. If you have a

fast Feather like the ESP8266, ESP32 or Teensy, you can interpolate the 8x8 grid and get some pretty nice results! (The video above shows a peace-sign finger demo using a Teensy Feather and 24x24 interpolation)

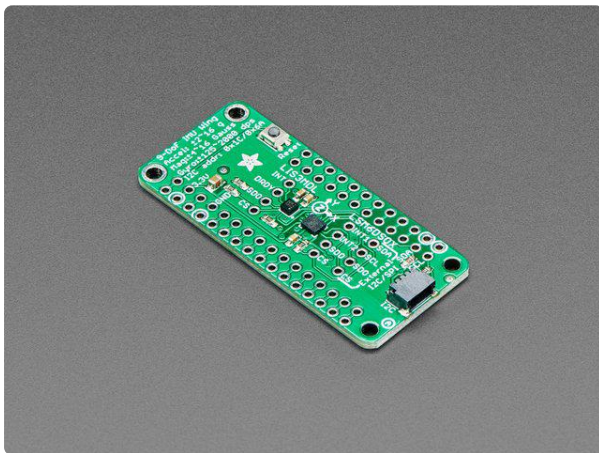
The AMG8833 is the next generation of 8x8 thermal IR sensors from Panasonic, and offers higher performance than its predecessor the AMG8831. The sensor only supports I2C, and has a configurable interrupt pin that can fire when any individual pixel goes above or below a threshold that you set.

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## Motion Sensing Wings

These motion sensing FeatherWings allow you to sense motion in 9 degrees of freedom. They work by incorporating two different, but complementary sensors. The LIS3MDL is a 3-axis magnetometer that can sense where the strongest magnetic force is coming from, generally used to detect magnetic north.

The other sensor on these boards has a 3-axis accelerometer and 3-axis gyroscope, which are used to detect linear acceleration and angular velocity. Adafruit has a couple of boards where this sensor differs.



### [Adafruit LSM6DSOX + LIS3MDL FeatherWing - Precision 9-DoF IMU](#)

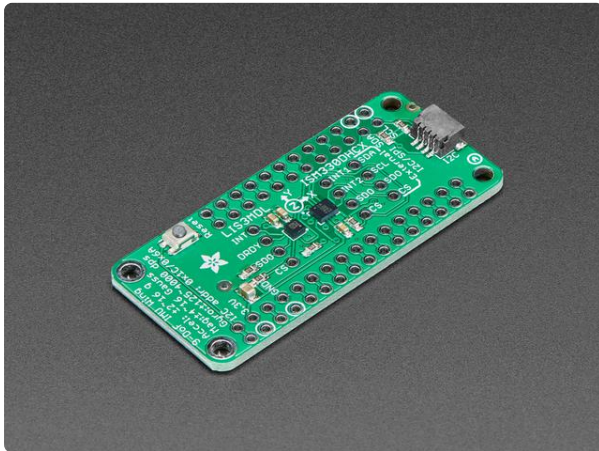
Upgrade any Feather board with precision motion sensing with the ST 9-DoF IMU, an all-in-one sensing 'Wing'. It sports two fantastic sensors from ST...

<https://www.adafruit.com/product/4565>

For the accelerometer + gyro, this board includes the LSM6DSOX, a 6-DoF IMU. The 3-axis accelerometer can tell you which direction is down towards the Earth (by measuring gravity) or how fast the board is accelerating in 3D space. The 3-axis gyroscope can measure spin and twist. [This new sensor from ST has very low gyro zero rate and noise \(https://adafru.it/LGc\)](https://adafru.it/LGc), compared to the MPU6050 or even LSM6DS33 so it's excellent for orientation fusion usage: you'll get less drift and faster responses.

The LSM6DSOX has flexible data rates and ranges. For the accelerometer:  $\pm 2/\pm 4/\pm 8/\pm 16$  g at 1.6 Hz to 6.7KHz update rate. For the gyroscope:  $\pm 125/\pm 250/\pm 500/\pm 1000/\pm 2000$

0 dps at 12.5 Hz to 6.7 KHz. There are also some nice extras, such as built-in tap detection, activity detection, pedometer/step counter, and a programmable finite state machine / machine learning core that can perform some basic gesture recognition.



### Adafruit ISM330DHCX + LIS3MDL FeatherWing

Upgrade any Feather board with precision motion sensing with the ST 9-DoF IMU, an all-in-one sensing 'Wing. It sports two fantastic sensors from...

<https://www.adafruit.com/product/4569>

For the accelerometer + gyro, this board includes the ST ISM330DHCX, which is an industrial quality Accelerometer+Gyroscope 6-DOF IMUs (inertial measurement unit). This IMU sensor has 6 degrees of freedom - 3 degrees each of linear acceleration and angular velocity at varying rates within a respectable range. For the accelerometer:  $\pm 2/\pm 4/\pm 8/\pm 16$  g at 1.6 Hz to 6.7 KHz update rate. For the gyroscope:  $\pm 125/\pm 250/\pm 500/\pm 1000/\pm 2000/\pm 4000$  dps at 12.5 Hz to 6.7 KHz. In particular, this is one of the few gyro's we stock with 4000 dps range, usually they top out at 2000. This sensor has extra calibration and compensation circuits to give it excellent performance in a wide environmental range from -40 to +105°C. Most other IMU sensors don't have industrial temperature ranges or have wide accuracy variation as the temperature changes. The accelerometer and gyroscope also are on the same silicon die, which will keep the 6 measurements synchronized better than when the two sensors are on separate dies.

There are also some nice extras, such as built-in tap detection, activity detection, pedometer/step counter and a programmable finite state machine / machine learning core that can perform some basic gesture recognition.

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## Community Feathers & Wings

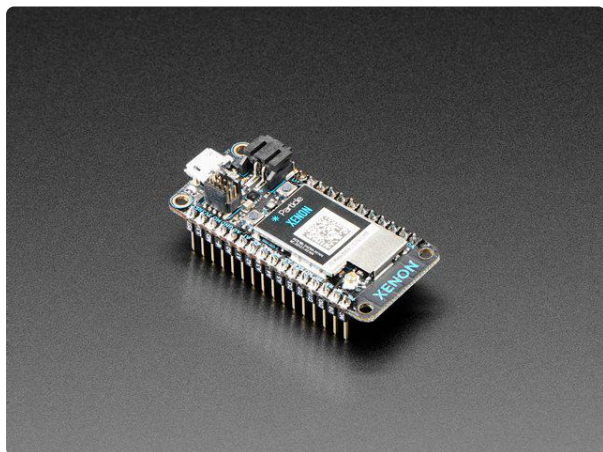
Adafruit has created dozens and dozens of Feathers and Wings, but there's a chance we haven't made the exact Wing you want. And that's totally fine! We've specifically designed the Feather system so that you can create your own custom circuitry, and move it from Feather to Feather.

Here are just a few examples of Feathers and Wings created by the community.

If you'd like to make your own Feather or Wing, [check out our GitHub account and search for Feather and PCB to get open source designs that you can use to base your own design on \(https://adafru.it/woC\)](#)

## Community Feathers

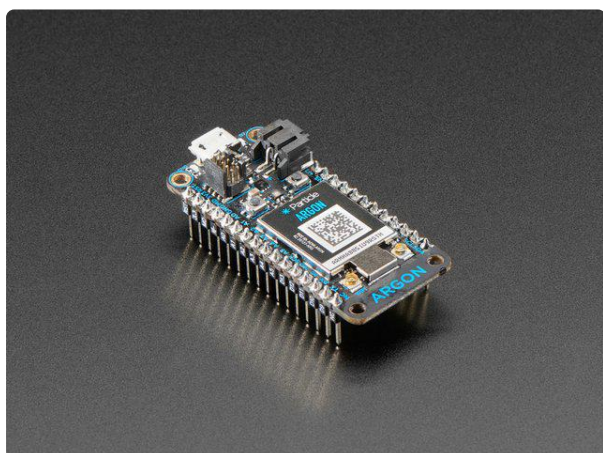
Particle has introduced three processor boards with built-in communications:



Particle Xenon - nRF52840 with BLE and Mesh

Warning: Particle is deprecating a Xenon / Mesh support.

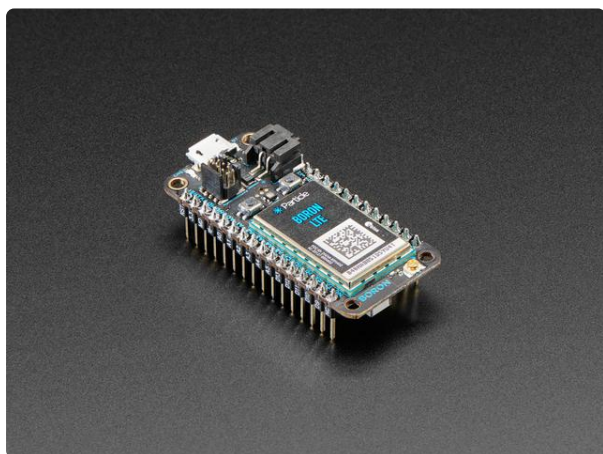
<https://www.adafruit.com/product/3999>



Particle Argon - nRF52840 with Mesh and WiFi

Woohoo, it's time for a Particle Mesh party! And the Particle Argon is bringing it with a mix of Mesh networking and and Wi-Fi, your...

<https://www.adafruit.com/product/3997>



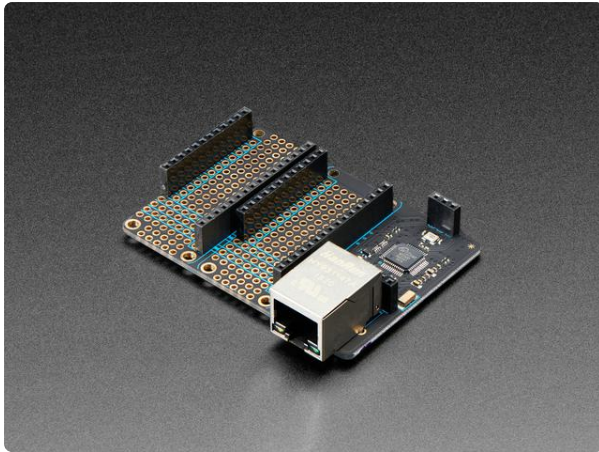
Particle Boron LTE - nRF52840 with Mesh and LTE Cellular Modem

Woohoo, it's time for a Particle Mesh party! And the Particle Boron LTE is bringing it with a double-dose of Mesh...

<https://www.adafruit.com/product/3998>







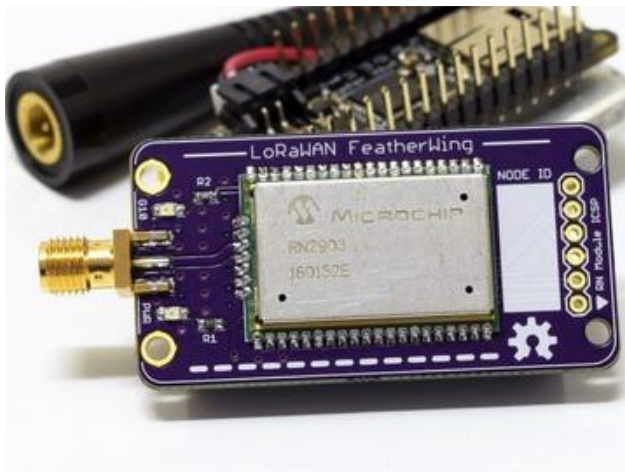
### Particle Ethernet FeatherWing

This three-in-one Particle Ethernet Feather is a mix of our Ethernet 'wing and the

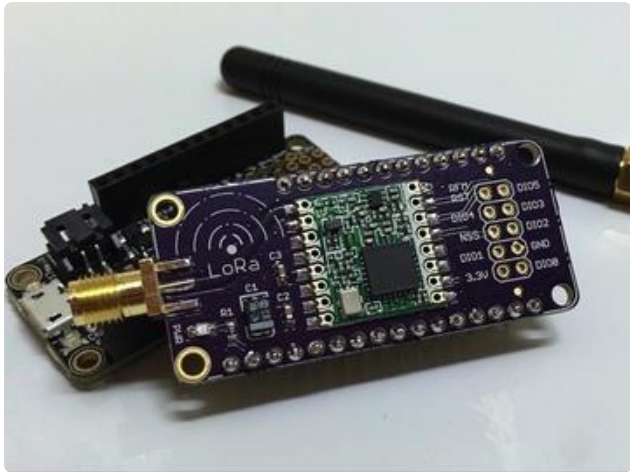
<https://www.adafruit.com/product/4003>



The [Particle Classic Adapter \(https://adafru.it/DOD\)](https://adafru.it/DOD) allows classic Particle accessories to connect to the Feather formatted Particle boards.



Dan Watson made a lovely LoRaWAN FeatherWing, check it out here (<https://adafru.it/woE>)



Dan Watson also has a [RFM-style module breakout \(https://adafru.it/DOF\)](https://adafru.it/DOF) FeatherWing, when you don't mind implementing LoRaWAN in-chip

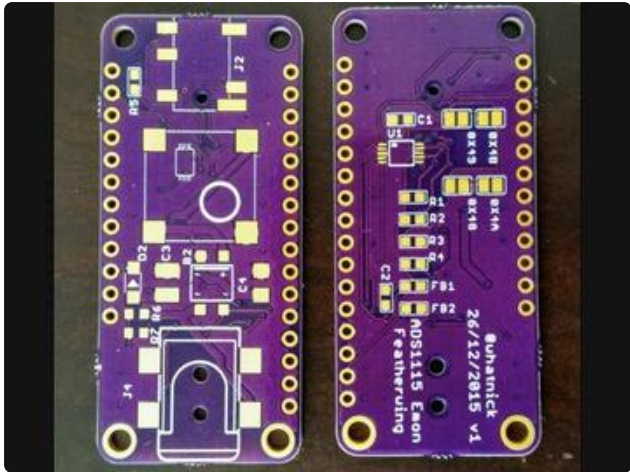


Radomir Dopieralski (<https://adafru.it/wpa>) made a cool mini-game FeatherWing with a D-Pad, 8x8 Mini LED with PWM driver! (<https://adafru.it/wpb>)



Justin Jordan created a Wing for his Maxim Feather that adds lots of 1-Wire sensor support. Check it out at Hackster (<https://adafru.it/wpc>)

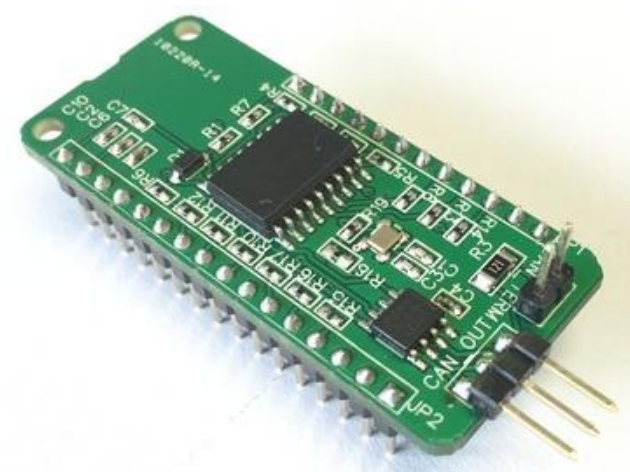




Tisham Dhar made a cool energy-monitoring FeatherWing using the ADS1115 16-bit ADC (<https://adafru.it/wpd>)

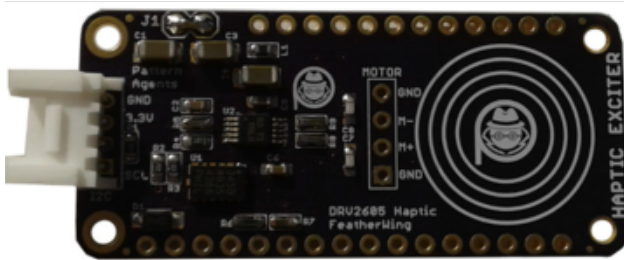


Tisham also has for sale a [ATM90E26 FeatherWing \(https://adafru.it/DOE\)](https://adafru.it/DOE) for more advanced power monitoring available for purchase at Tindie.

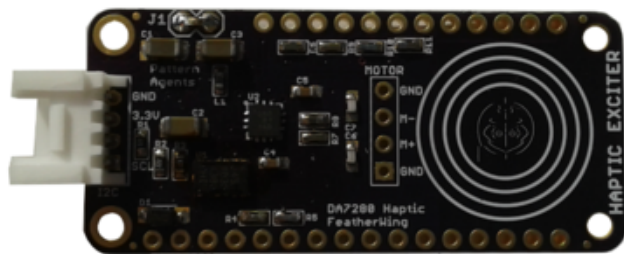


Armin created a CAN FeatherWing using the MCP2515 CAN controller with an 3.3V CAN transceiver (<https://adafru.it/wpA>)





PatternAgents [Agent-DRV2605 \(https://adafru.it/DSh\)](https://adafru.it/DSh) FeatherWing contains a TI DRV2605L Haptic Driver and ADI ADXL345 Accelerometer.



The [Agent-DA7280 \(https://adafru.it/DSh\)](https://adafru.it/DSh) has a DialogSemi DA7280L Haptic Driver and ADI ADXL345 Accelerometer.