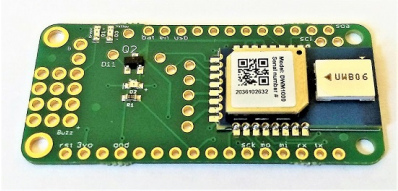
Fleet.ft v0.1

1 Overview

- Ultra-wideband Radio
- Adafruit Feather Family Compatible
- Three programmable LEDs (Red, Yellow, Green)
- Reconfigurable digital output pins for LEDs
- Buzzer high-current draw pins



2 Description

An ecosystem of IoT sensors and functionality has been built around the Adafruit Feather family of development boards. However, one of the things missing until now is the ability to measure accurate wireless distances between different IoT devices. The ultra-wideband technology is an ideal candidate for this purpose since it works on low-power, works over tens of meters of distance and is quite accurate in comparison to any other wireless ranging technology. We have designed a featherwing that we call the Fleet.ft, owing to it needing more than one of its own kind (a fleet), and being able to measure distances (so ft).

This device uses the Decawave UWB chip with a specific set of connections with the Adafruit Feather M0 development board pins. These connections are not changeable, and they are described in subsequent sections. However, we have brought out all the pins from the Decawave UWB DWM1000 module that we are not using so that a developer may use them any way they wish. In addition, we have three colored LEDs on the PCB. Each of these (1 red, 1 yellow, and 1 green) LEDs are connected to a different digital output pin making it programmatically possible to control their function. It is even easy to severe the connection with a specific digital pin and instead connect the LED to another pin, if so desired. This gives developers flexibility when they are also using other IoT sensors with the Fleet.ft.

The red LED is connected in parallel to an open buzzer connection. There is a transistor to ensure enough current is available for a buzzer to be powered, and the device has been tested with HUDZ 12mm buzzers.

3 Pinout

This device uses the SPI bus. The general pinout is compatible with the Adafruit feather family. It is preferable to keep this module on the top so that the antenna signals are not blocked.

Pin	Signal
9	Reset Pin for DWM1000
17 (A3)	IRQ Pin for DWM1000
19 (A5)	SPI Select Pin for DWM1000
SCK	SPICLK for DWM1000
MOSI	MOSI for DWM1000
MISO	MISO for DWM1000
6	Green LED
11	Red LED
12	Yellow LED
5	Silence push button (not in v0.1)

4 Measures and Schematics

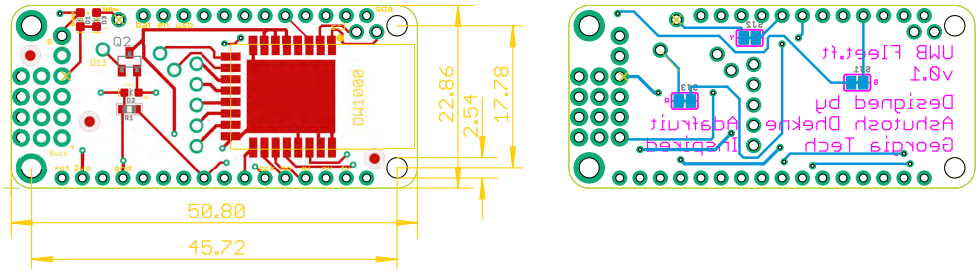


Figure 1: Dimensions of our design and a blueprint of the front and back of the designed PCB

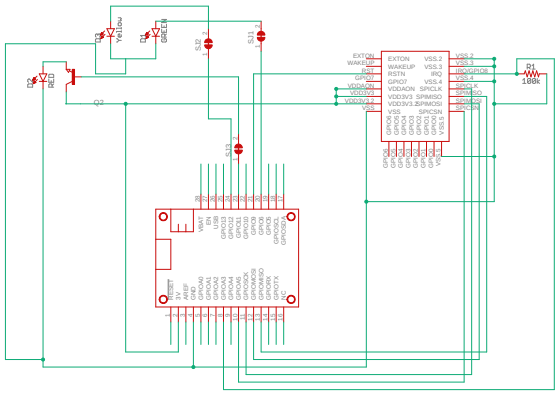


Figure 2: Schematic diagram showing all connections.

5 Configurable LEDs and Buzzer

The LEDs can be used in the program for various purposes. Depending on the application, the developer can choose when to light up the green, yellow, and the red lights. However, many projects will require additional configurability. In particular, the use of a specific GPIO pin for the LED might not be suitable for all development projects. To accommodate

such needs, we have provided the SJ1, SJ2, and SJ3 jumper connections on the back of the board. It is possible to severe the connection between the specific pin and the LED by knifing through the thin wire in these jumpers. The jumpers are also connected to open vias which can be connected to any desired pin by the developer using breadboard jumper wires.

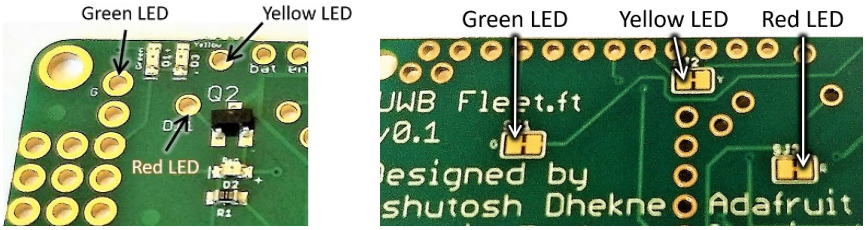


Figure 3: [left] Vias to change the default digital pins to which the LEDs are connected. [right] Jumpers to cut the connection between the default GPIO pins and the LEDs

A ringing of a buzzer must have the same meaning as the red LED since it is connected in parallel with the red LED. Usually the GPIO pins drive around 10mA current. Therefore, we have supplied a transistor which is activated by the GPIO pin and drives more current directly from the power lines. This allows the buzzer to produce loud audible alarm. The buzzer power rails are next to the prototyping area.

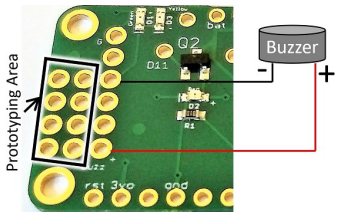


Figure 4: A 3V buzzer can be connected across these vias. It will be driven by the same output pin as the Red LED, but uses a transistor to improve current draw.

6 Decawave DWM1000 GPIO pins

Some developers might find the extra GPIO pins provided by Decawave to be useful, for example, to indicate packet reception and transmission, etc. We have kept the GPIO pins open for the developers to use in any way they wish. However, one of the likely shortcoming is the lack of a Gnd bus on the Fleet.ft. We point the developer to the Gnd pin for the buzzer above which can be re-purposed for grounding any LEDs connected to decawave GPIOs.

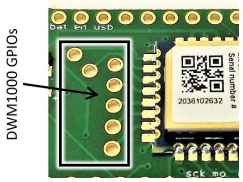


Figure 5: Connecting an LED or other circuits to the Decawave provided GPIO pins is simple since these have been brought out as vias.