SPEEDY BEE F405 V4

SpeedyBee F405 V4 Flight Controller Stack User Manual

Brand: SPEEDY BEE

Introduction

The SpeedyBee F405 V4 Flight Controller Stack is a high-performance system designed for FPV drones, integrating a powerful F405 Flight Controller and a 4-in-1 55A Electronic Speed Controller (ESC). This stack offers advanced features such as wireless Betaflight configuration via Bluetooth, an onboard blackbox for flight data logging, and a built-in barometer for accurate altitude readings. It is engineered for robust performance with support for 6S motors and includes essential protective components for reliable operation.

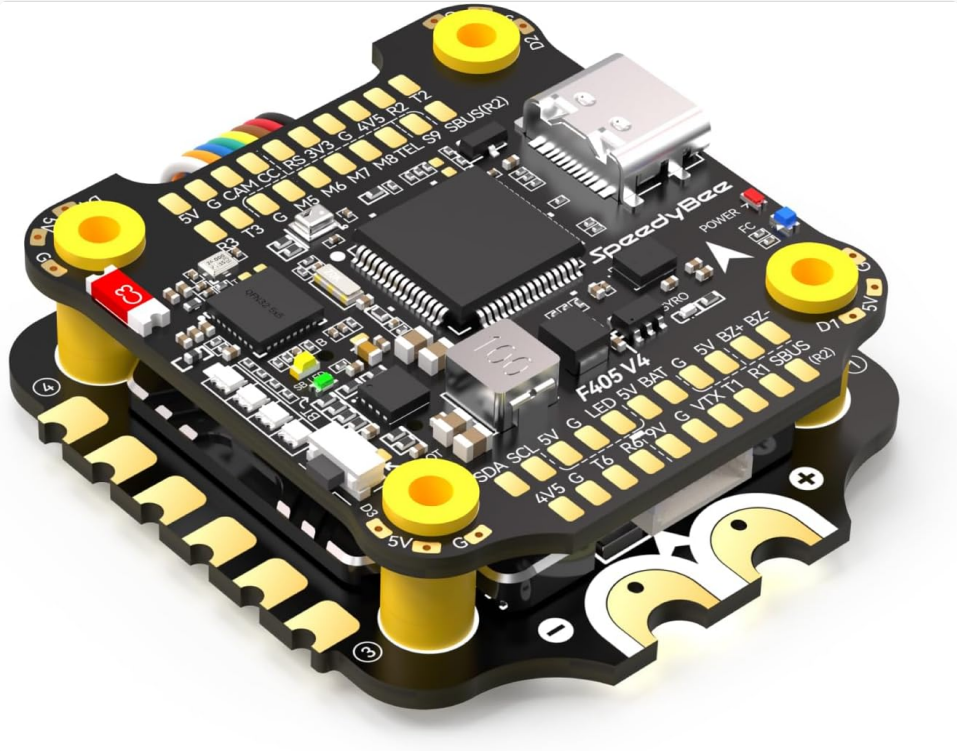

Image: The SpeedyBee F405 V4 Flight Controller and 4-in-1 55A ESC stacked together.

Key Features

- **Wireless Configuration:** Configure your Flight Controller (FC) and ESC wirelessly via Bluetooth using the SpeedyBee app on your smartphone.

- **Powerful 55A 4-in-1 ESC:** Features a robust BB21 MCU, large motor pads for easy soldering, Japan-made filtering SMT capacitors, and an onboard TVS protective diode for smooth flight and real 55A output, ready for 6S motors.
- **Onboard Battery Life Indicator:** A 4-level LED indicator provides real-time battery status, eliminating the need for an external LiPo checker.
- **Wireless Motor Direction Change:** Easily configure motor directions wirelessly through the SpeedyBee app, compatible with BLHeli32, BLHeli_S, and BlueJay ESCs.
- **LED Pads with Simple Switching:** Four sets of LED pads allow for easy connection of LED strips, with presets cyclable via the BOOT button.
- **Integrated Blackbox:** 4GB onboard memory for flight data logging.
- **Built-in Barometer:** Provides accurate altitude hold capabilities.
- **DJI Plug & Play:** Direct compatibility with DJI O3, Vista, and Air Unit V1 systems.
- **Multiple BECs:** Individual 5V 3A and 9V 3A BECs for stable power delivery to peripherals.
- **Sufficient UARTs:** Four UARTs for connecting various peripherals like GPS and receivers.

Package Contents

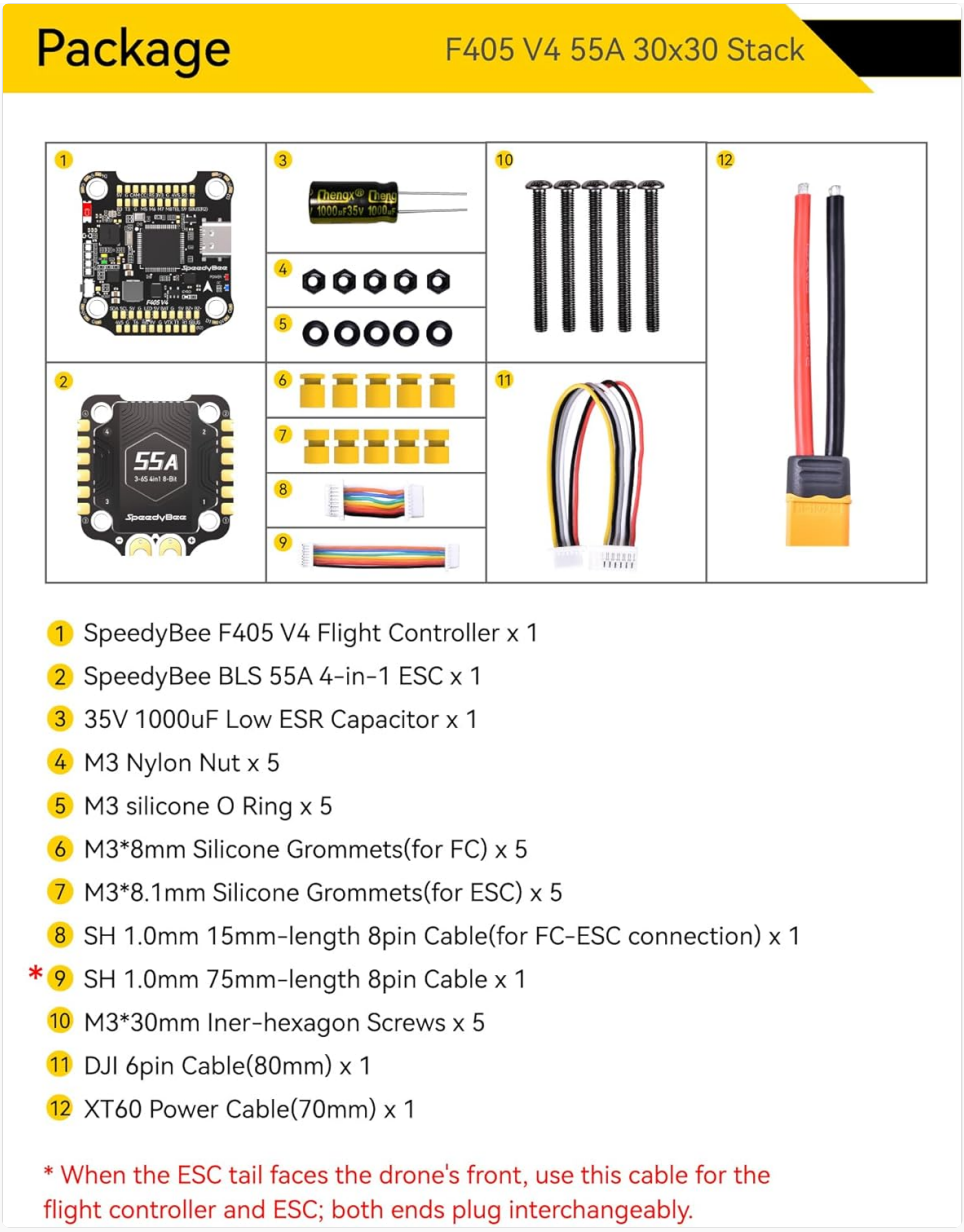

Image: Diagram showing all components included in the SpeedyBee F405 V4 55A 30x30 Stack package.

1. SpeedyBee F405 V4 Flight Controller x 1
2. SpeedyBee BLS 55A 4-in-1 ESC x 1
3. 35V 1000uF Low ESR Capacitor x 1
4. M3 Nylon Nut x 5
5. M3 Silicone O Ring x 5
6. M3*8mm Silicone Grommets (for FC) x 5
7. M3*8.1mm Silicone Grommets (for ESC) x 5
8. SH 1.0mm 15mm-length 8pin Cable (for FC-ESC connection) x 1
9. SH 1.0mm 75mm-length 8pin Cable x 1
10. M3*30mm Inner-hexagon Screws x 5
11. DJI 6pin Cable (80mm) x 1
12. XT60 Power Cable (70mm) x 1

Note: When the ESC tail faces the drone's front, use the SH 1.0mm 15mm-length 8pin cable for flight controller and ESC connection; both ends plug interchangeably.

Setup and Installation

Dimensions

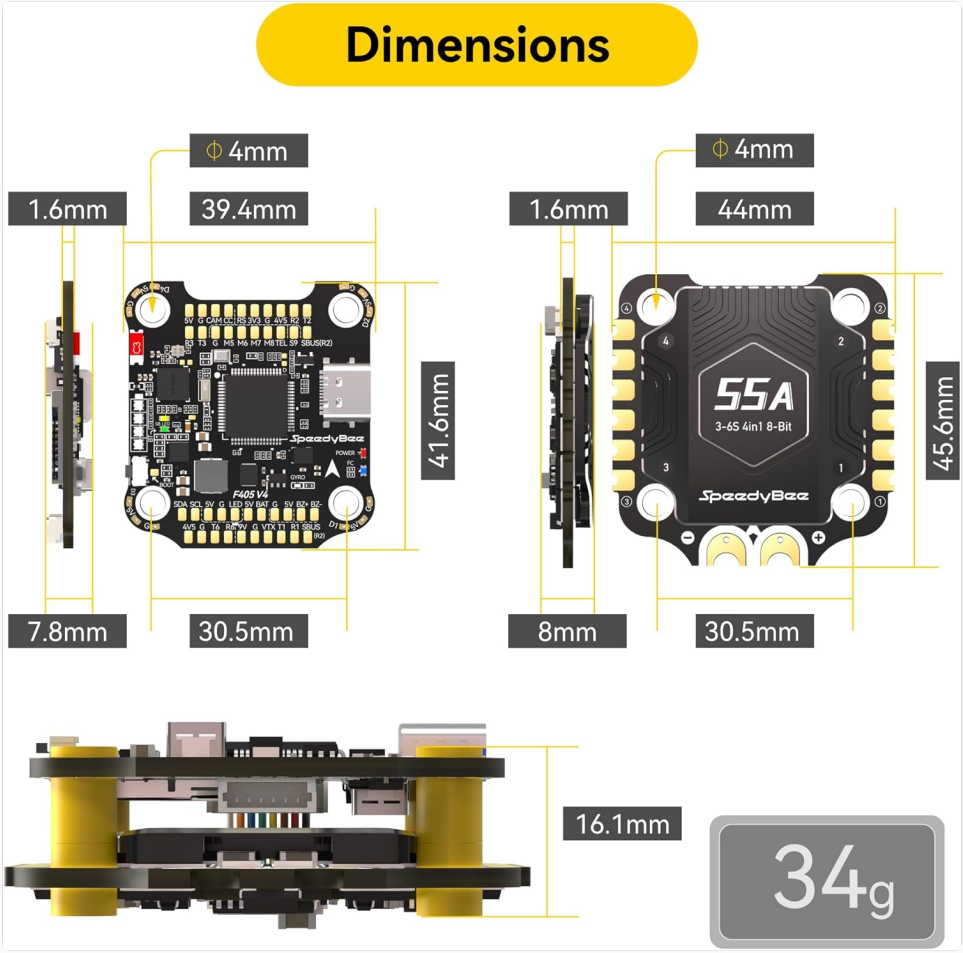

Image: Detailed measurements of the SpeedyBee F405 V4 Flight Controller and 55A 4-in-1 ESC, including stack height and weight.

The Flight Controller measures approximately 39.4mm x 41.6mm, and the ESC measures 44mm x 45.6mm. The total stack height is 16.1mm, with a combined weight of approximately 34g. Mounting holes are 30.5mm x 30.5mm with a 4mm diameter.

Component Layout

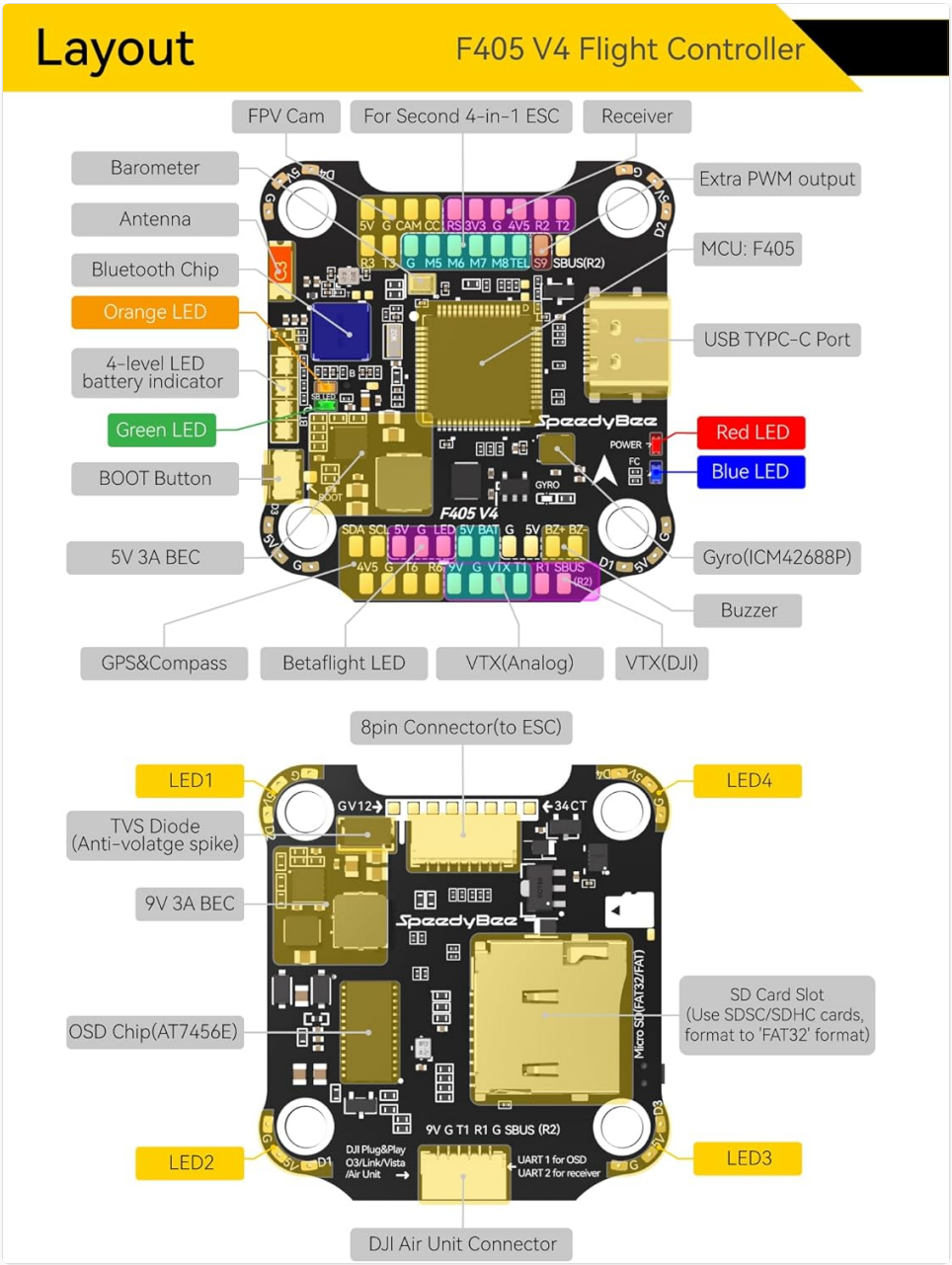

Image: Top and bottom view of the F405 V4 Flight Controller, highlighting key components and connection points.

The F405 V4 Flight Controller features a USB Type-C port, Bluetooth chip, barometer, FPV camera connection, various LED indicators (Red, Green, Blue, Orange), a BOOT button, 5V 3A and 9V 3A BECs, GPS & Compass pads, Betaflight LED, VTX (Analog/DJI) connections, an 8pin connector to the ESC, and an SD card slot for blackbox logging. It also includes LED pads (LED1-LED4) with TVS Diode surge protection.

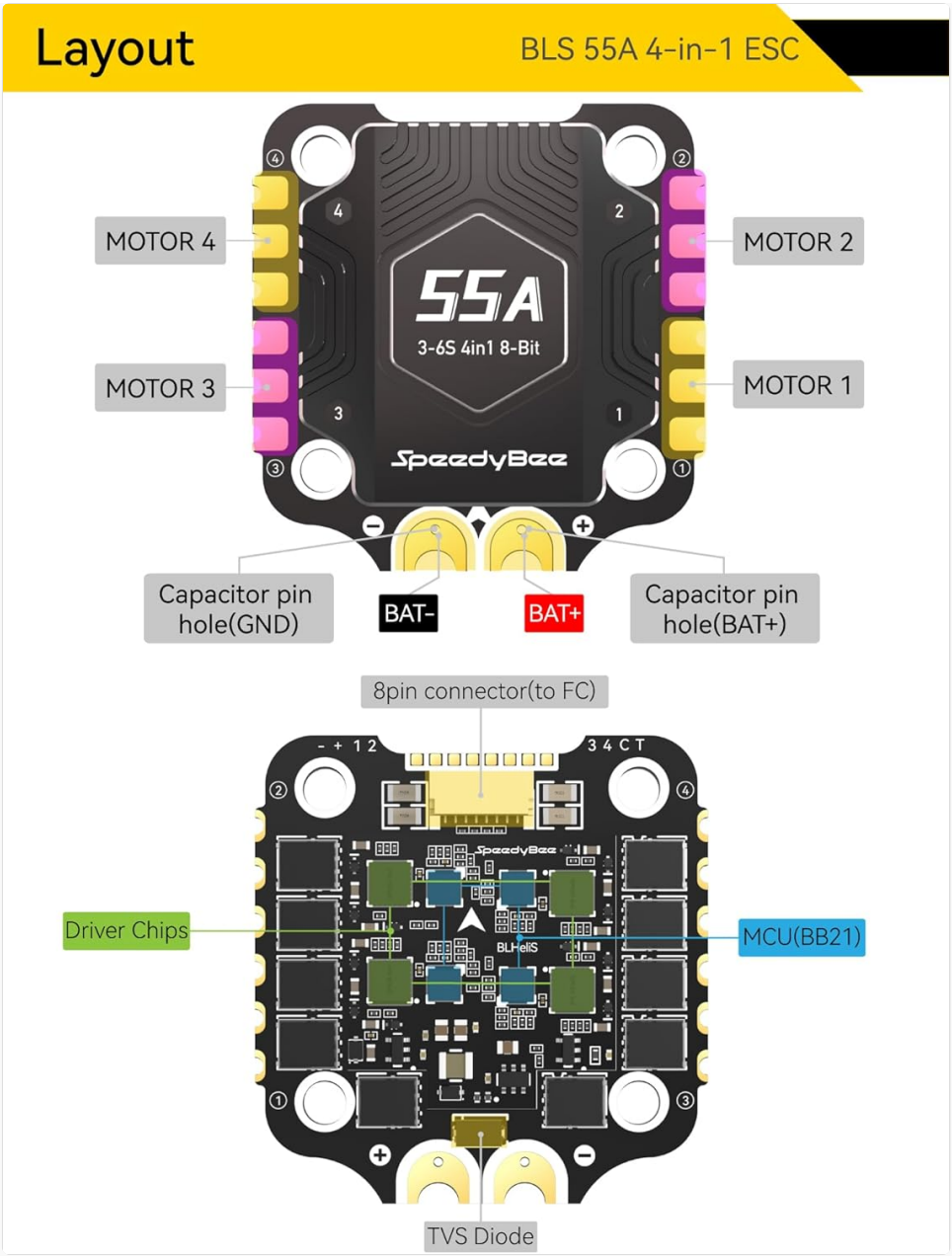

Image: Top and bottom view of the BLS 55A 4-in-1 ESC, showing motor pads, capacitor pin holes, and the 8pin connector.

The BLS 55A 4-in-1 ESC provides connections for four motors (Motor 1-4), capacitor pin holes for BAT+ and GND, and an 8pin connector for communication with the Flight Controller. It incorporates driver chips, an MCU (BB21), and a TVS Diode for surge protection.

Connecting the FC & Motors

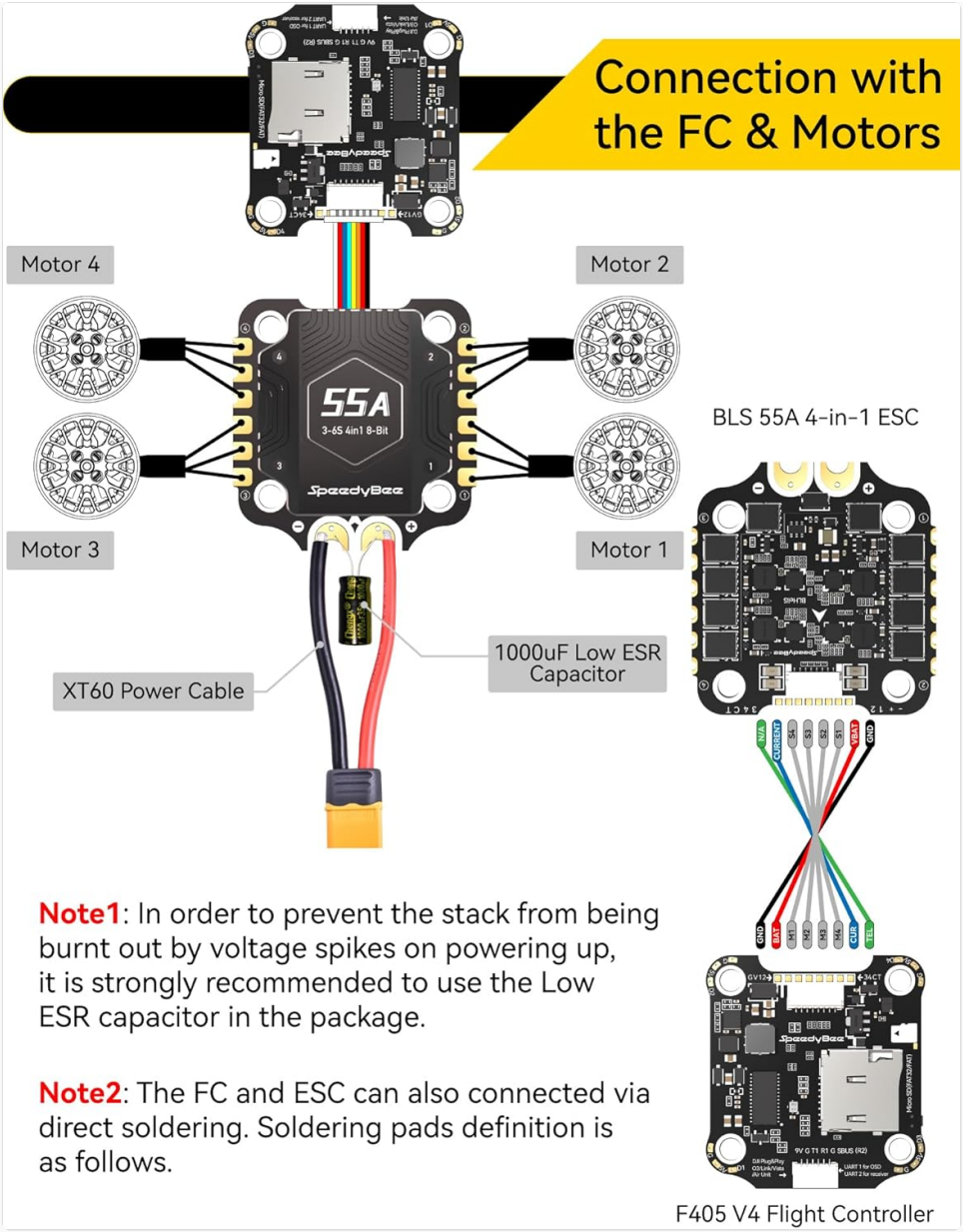

Image: Diagram illustrating the connection of the Flight Controller to the 4-in-1 ESC, motors, and power cable with capacitor.

Connect the 4-in-1 ESC to the Flight Controller using the provided 8-pin cable. Ensure the cable is fully seated to avoid power issues. Solder your motors to the designated motor pads on the ESC. For power, connect the XT60 Power Cable to the ESC. It is strongly recommended to use the included 1000uF Low ESR capacitor across the main battery terminals to prevent voltage spikes upon powering up, which can damage the stack. The FC and ESC can also be connected via direct soldering if preferred, referring to the layout diagrams for pad definitions.

Digital FPV System Connections

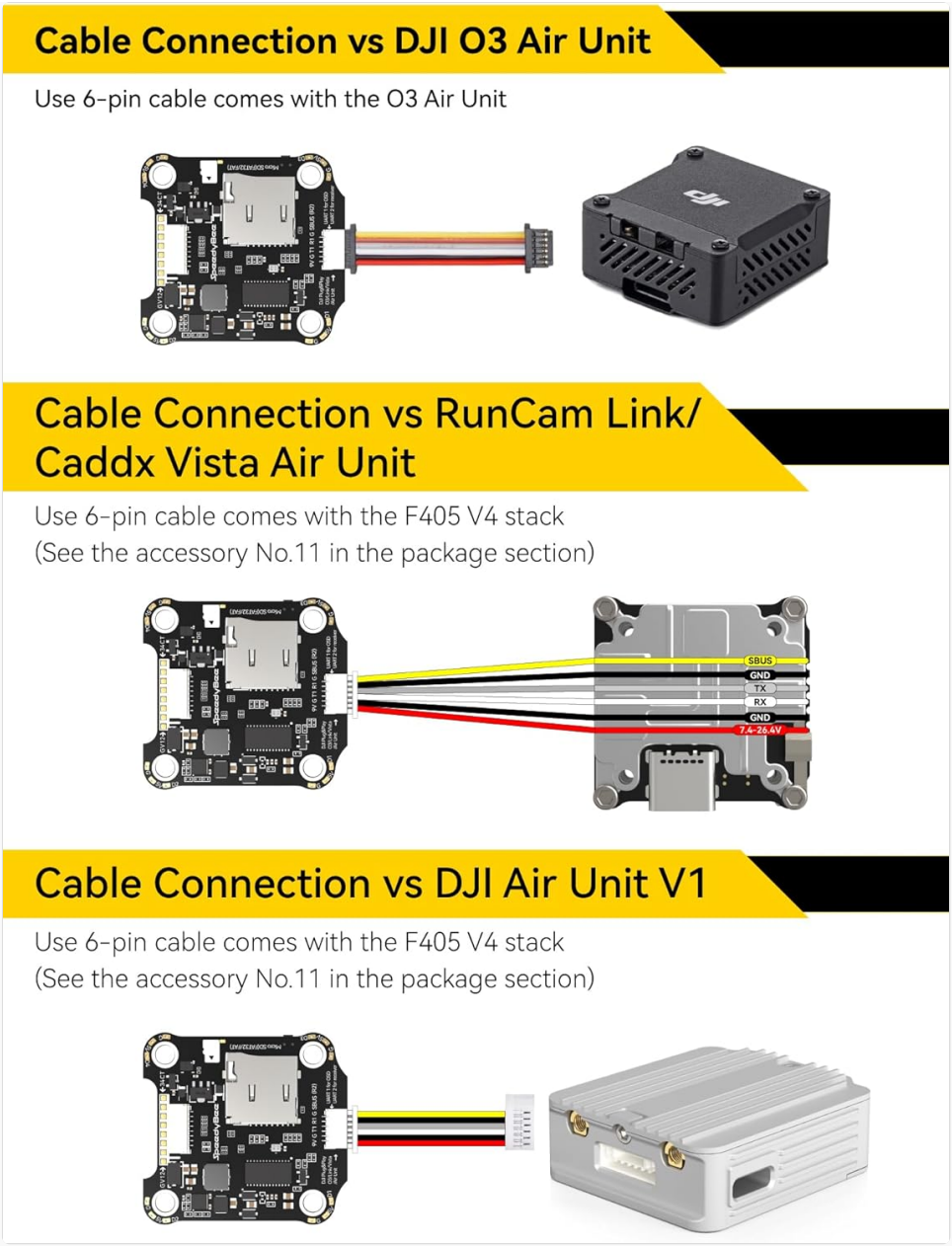

Image: Diagrams showing how to connect various digital FPV air units (DJI O3, RunCam Link/Caddx Vista, DJI Air Unit V1) to the F405 V4 Flight Controller.

The F405 V4 stack supports direct plug-and-play connections for popular digital FPV systems:

- **DJI O3 Air Unit:** Use the 6-pin cable that comes with the O3 Air Unit.
- **RunCam Link/Caddx Vista Air Unit:** Use the 6-pin cable provided with the F405 V4 stack (accessory No.11).
- **DJI Air Unit V1:** Use the 6-pin cable provided with the F405 V4 stack (accessory No.11).

Important Connection Notes:

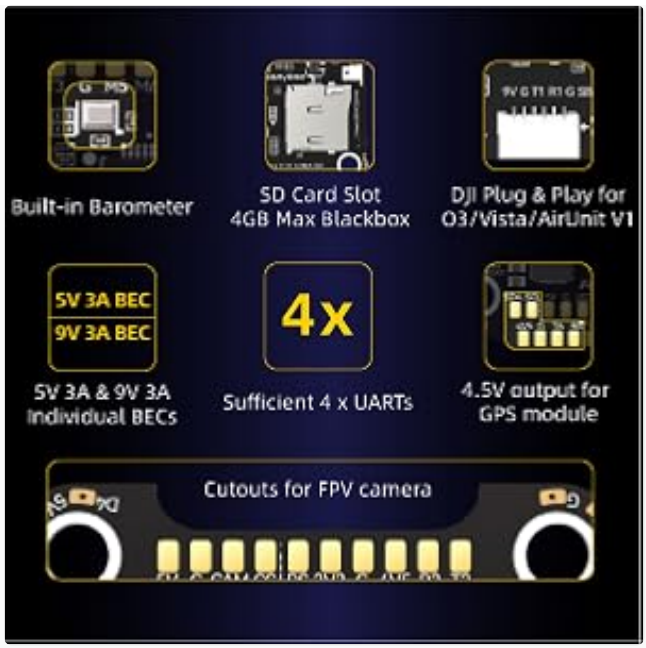

Image: Diagram showing a wire that should NOT be connected for proper external SBUS receiver function when using DJI O3/Vista/Air Unit V1.

When connecting an external SBUS receiver, ensure you **DO NOT** connect the specific wire indicated in the diagram to allow the external SBUS receiver to function properly. This wire is typically related to the internal receiver functionality of the digital FPV system.

Image: Diagram showing a wire that needs to be disconnected for some ELRS receivers to function properly when connected to DJI O3/Vista/Air Unit V1.

For certain ELRS receivers, it may be necessary to disconnect a specific wire as shown in the diagram to ensure proper functionality when integrated with DJI O3, Vista, or Air Unit V1 systems. Always consult the ELRS receiver's documentation for specific wiring requirements.

General Wiring Diagram

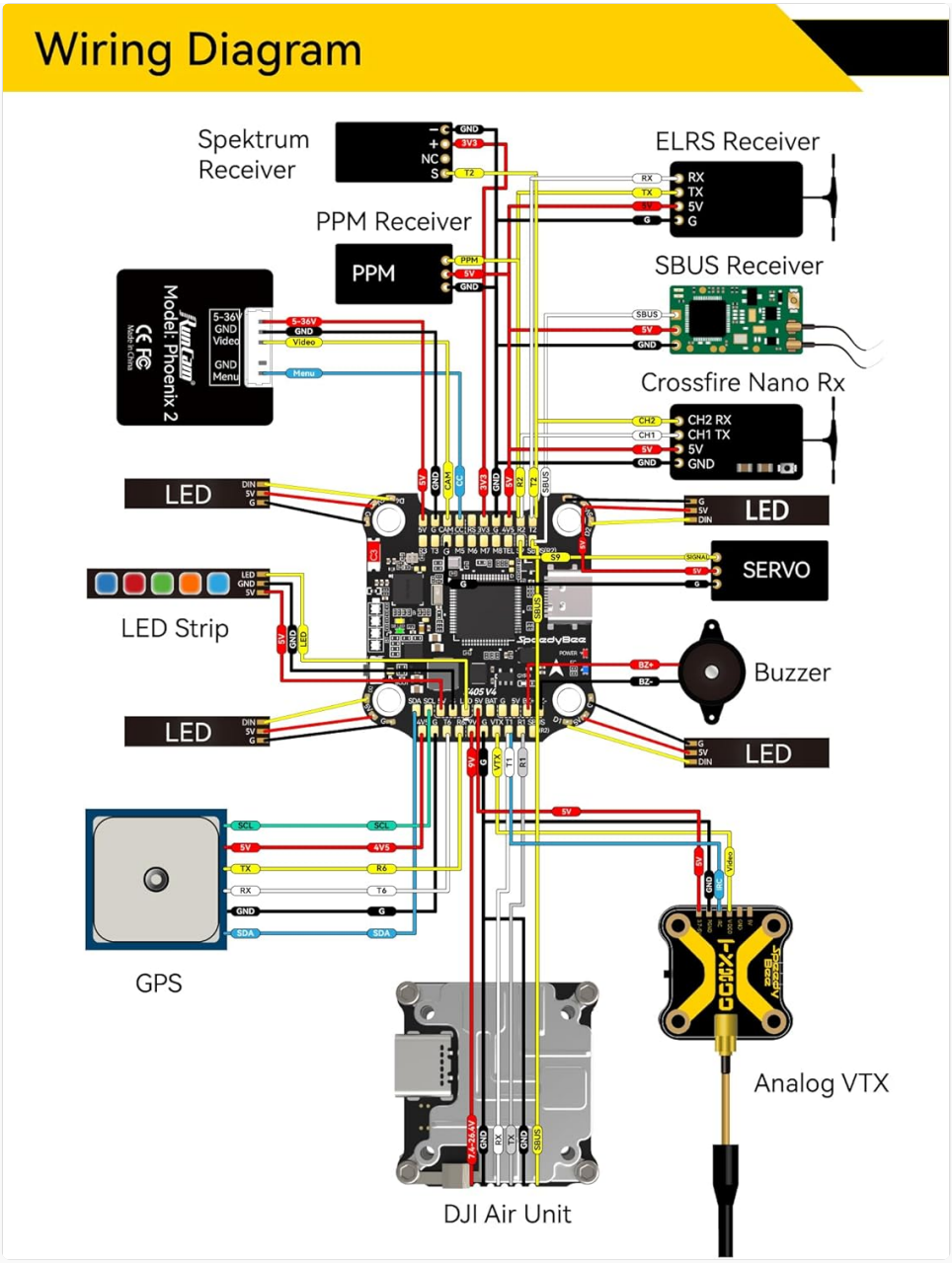

Image: A detailed wiring diagram illustrating connections for various peripherals including Spektrum, ELRS, PPM, SBUS, Crossfire Nano Rx receivers, LEDs, LED strips, Servo, Buzzer, GPS, Analog VTX, and DJI Air Unit.

This diagram provides a comprehensive overview of how to connect various components to the SpeedyBee F405 V4 Flight Controller. It shows connections for different receiver types (Spektrum, ELRS, PPM, SBUS, Crossfire Nano Rx), LED lighting, servos, buzzers, GPS modules, analog video transmitters, and DJI Air Units. Always ensure correct polarity and pin assignments when making connections to avoid damage to components.

Operating Instructions

Wireless Configuration via SpeedyBee App

The SpeedyBee F405 V4 Flight Controller Stack features integrated Bluetooth, allowing for full configuration of both the FC and ESC directly from your smartphone using the SpeedyBee app. This eliminates the need for a computer in the field, making tuning and adjustments convenient.

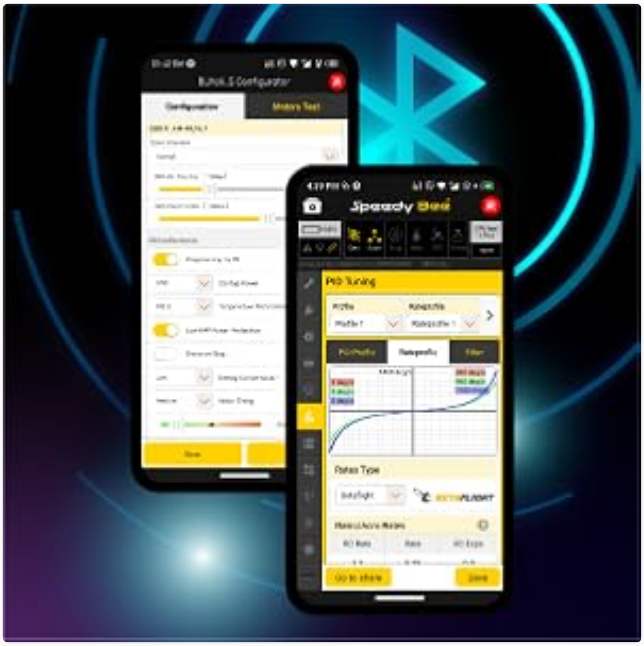

Image: Screenshots of the SpeedyBee mobile application interface, showing options for Betaflight configuration and PID tuning.

To use, simply power on your drone, open the SpeedyBee app, and connect via Bluetooth. You can access various settings including PID tuning, motor testing, and general configuration. The app provides a user-friendly interface for managing your drone's settings.

Wireless Motor Direction Change

After building or repairing your drone, you can easily change motor directions wirelessly using the SpeedyBee app. This feature is compatible with all BLHeli32, BLHeli_S, and BlueJay ESCs, simplifying the setup process.

Image: A smartphone screen displaying the SpeedyBee app with an option to wirelessly change motor direction, showing a drone diagram.

LED Control

The Flight Controller provides four sets of LED pads, allowing you to connect external LED strips for enhanced visibility or aesthetic purposes. You can cycle through different pre-programmed LED presets by simply pressing the BOOT button on the Flight Controller.

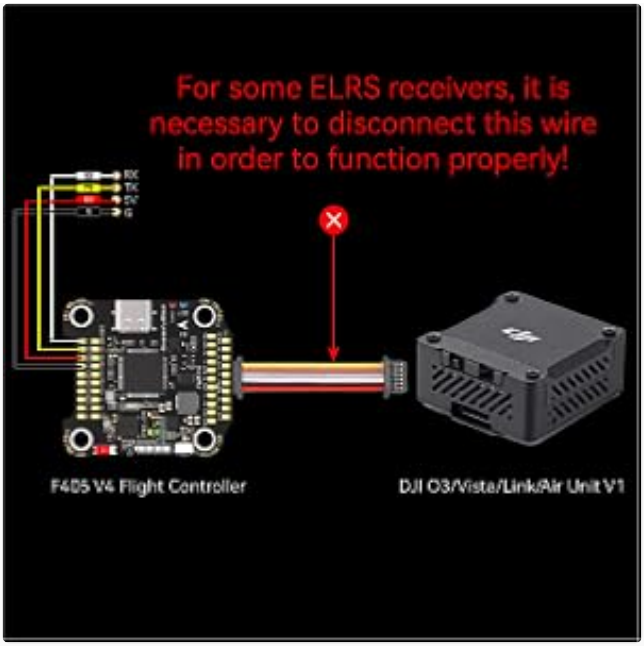

Image: Close-up view of the Flight Controller highlighting the soldering pads for M1-M4 and M5-M8, which can be used for LED connections.

Battery Life Indicator

The Flight Controller features an onboard 4-level LED battery indicator, providing a quick visual reference of your battery's charge level without needing additional equipment.

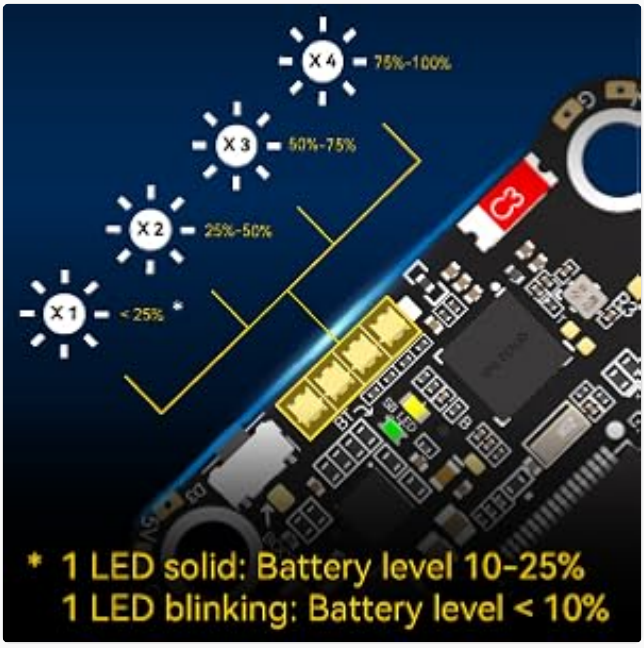

Image: Diagram explaining the 4-level LED battery indicator: X4 (75%-100%), X3 (50%-75%), X2 (25%-50%), X1 (<25%). It also notes that 1 LED solid indicates 10-25% battery, and 1 LED blinking indicates less than 10% battery.

Maintenance

To ensure the longevity and optimal performance of your SpeedyBee F405 V4 Flight Controller Stack, follow these maintenance guidelines:

- **Cleanliness:** Regularly inspect the boards for dust, debris, or solder splashes. Use compressed air or a soft brush to gently clean the components.

- **Connections:** Periodically check all soldered connections and cable plugs for secure fit and signs of wear. Ensure the 8-pin connector between the FC and ESC is fully seated.
- **Capacitor:** The included Low ESR capacitor is crucial for filtering voltage spikes. Ensure it is properly installed and inspect it for any physical damage. Replace if necessary.
- **Firmware Updates:** Keep your Betaflight and ESC firmware updated to the latest stable versions to benefit from performance improvements and bug fixes. Use the SpeedyBee app or Betaflight Configurator for updates.
- **Physical Protection:** Protect the stack from physical impacts and moisture. Consider using appropriate mounting solutions and enclosures for your drone.

Troubleshooting

This section addresses common issues you might encounter with your SpeedyBee F405 V4 Flight Controller Stack:

- **No Power to FC/ESC:**
  - Check the main battery connection and ensure the XT60 cable is securely soldered.
  - Verify that the 8-pin connector between the FC and ESC is fully pushed in and seated correctly. Loose connections are a common cause of power issues.
  - Inspect the Low ESR capacitor for proper installation and any signs of damage.
- **Receiver Not Responding/No Signal:**
  - Ensure the receiver is correctly wired to the appropriate UART on the Flight Controller as per the wiring diagram.
  - Verify that the correct serial protocol (e.g., CRSF, SBUS, IBUS) is selected in the Betaflight Configurator's Ports and Configuration tabs.
  - Check for proper binding between your radio transmitter and receiver.
  - If using an external SBUS or ELRS receiver with a digital FPV system, ensure any conflicting wires are disconnected as per the specific connection notes in the Setup section.
- **Motors Not Spinning/Incorrect Direction:**
  - Confirm that the ESC is properly connected to the FC and receiving power.
  - Check motor soldering points for cold joints or shorts.
  - Use the SpeedyBee app or Betaflight Configurator to test individual motors and adjust their direction wirelessly if needed.
  - Ensure the correct DShot protocol is selected in Betaflight.
- **Flight Performance Issues (e.g., Yaw Twitches):**
  - Perform a gyroscope and accelerometer calibration in Betaflight Configurator on a level surface.
  - Review PID tuning settings. While the SpeedyBee app allows for easy tuning, significant changes might require careful adjustment.
  - Check for any loose components or vibrations that could affect the gyroscope.
- **Bluetooth Connectivity Issues:**
  - Ensure the SpeedyBee app is updated to the latest version.

- Restart both the Flight Controller (by power cycling the drone) and your smartphone.
- Verify Bluetooth is enabled on your smartphone and the app has necessary permissions.

For more detailed troubleshooting and advanced configuration, refer to the official Betaflight documentation and the SpeedyBee support resources.

Technical Specifications

Feature	Specification
Flight Controller MCU	STM32F405
IMU (Gyro)	ICM42688P
Barometer	Built-in
OSD Chip	AT7456E
Blackbox Memory	4GB (Micro SD Card Slot)
UARTs	4 (UART1, UART2, UART3, UART4)
ESC Current	55A (Continuous)
ESC Burst Current	65A (10 seconds)
ESC Firmware	BLHeli_S / BlueJay
Input Voltage	3-6S LiPo
BEC Output	5V 3A, 9V 3A (individual)
GPS Module Output	4.5V
Wireless Connectivity	Bluetooth
Dimensions (FC)	39.4mm x 41.6mm x 7.8mm
Dimensions (ESC)	44mm x 45.6mm x 8mm
Mounting Pattern	30.5mm x 30.5mm (M3)
Weight	Approx. 34g (Stack)

Warranty and Support

The SpeedyBee F405 V4 Flight Controller Stack is covered by the manufacturer's standard warranty. Please retain your proof of purchase for any warranty claims.

For technical support, firmware updates, or additional resources, please visit the official SpeedyBee website or refer to the comprehensive user guide available in PDF format:

Download Official User Manual (PDF)

You can also find community support and discussions on various FPV forums and social media groups dedicated to SpeedyBee products.