ESP32 MultiWii FPV Drone - Circuit Diagram

MH-ET LIVE MiniKit with ESP-NOW Wireless

Page 1: ESP32 Pinout Diagram

ESP32 MH-ET LIVE MiniKit - Top View (USB at Bottom, Antenna at Top)

CONNECTION	OUTSIDE	GPIO	INSIDE	GPIO	ESP32	GPIO	INSIDE	GPIO	OUTSIDE	CONNECTION
LEFT SIDE →	Label	#	Label	#	▲ ANTENNA	#	Label	#	Label	← RIGHT SIDE
Ground	GND	–	RST	–		1	TXD	–	GND	Ground
—	NC	–	SVP	36		3	RXD	27	27	MOTOR 4 (FL)
(input only)	SVN	39	26	26	ESP32 WROOM	22	22/SCL	25	25	MOTOR 2 (FR)
(input only)	35	35	18	18	WiFi ESP-NOW	21	21/SDA	32	32	BUZZER
STATUS LED	33	33	19	19	MH-ET LIVE	17	17	12	TDI	strapping
VBAT ADC	34	34	23	23		16	16	4	4	—
MOTOR 3 (RL)	TMS	14	5	5		–	GND	0	0	strapping
—	NC	–	3V3	–	▼ USB	–	VCC	2	2	strapping
flash	SD2	9	TCK	13		15	TDO	8	SD1	flash
Ground	GND	–	SD3	10		7	SD0	6	CLK	flash

Power: 3V3/VCC (Row 8 inside) = 3.3V output | GND at rows 1, 7, 10 | **I2C:** SCL=GPIO22, SDA=GPIO21 (Right inside, Row 3-4)

Motors

- M1 (RR): GPIO 13 @ TCK (L inside)
- M2 (FR): GPIO 25 @ 25 (R outside)
- M3 (RL): GPIO 14 @ TMS (L outside)
- M4 (FL): GPIO 27 @ 27 (R outside)

I2C (Right Inside)

- SCL: GPIO 22 (row 3)
- SDA: GPIO 21 (row 4)

Peripherals

- Buzzer: GPIO 32 (R outside)
- LED: GPIO 33 (L outside)
- VBAT: GPIO 34 (L outside)

Power

- 3V3: Row 8 (L inside)
- VCC: Row 8 (R inside)
- GND: Rows 1, 7, 10

Wire Color Legend

Battery + / VIN · Ground (GND) · 3.3V Power · Motor PWM Signal · GPIO Signal · I2C Bus · LED · Not Used

Active Pin Connections Summary

Function	GPIO	Side	Row	Board Label	Connects To
Motor 1 (RR)	13	Left	Inside	TCK	Si2302 MOSFET Gate via 10kΩ
Motor 2 (FR)	25	Right	Outside	25	Si2302 MOSFET Gate via 10kΩ
Motor 3 (RL)	14	Left	Outside	TMS	Si2302 MOSFET Gate via 10kΩ
Motor 4 (FL)	27	Right	Outside	27	Si2302 MOSFET Gate via 10kΩ
Buzzer	32	Right	Outside	32	2N2222 Base via 1kΩ
Status LED	33	Left	Outside	33	LED Anode via 220Ω
Battery ADC	34	Left	Outside	34	Voltage Divider Center (input only)
I2C SDA	21	Right	Inside	21	MPU6050 SDA
I2C SCL	22	Right	Inside	22	MPU6050 SCL

Page 2: Component Details & Wiring

1S LiPo Battery

Voltage: 3.7V nominal (3.0V - 4.2V)
Capacity: 150-250mAh
Connector: JST-PH 2.0mm

Terminal	Wire	Connects To
+ Positive	Red	MPM3610 VIN, VBAT divider
- Negative	Black	All GND points

MPM3610 3.3V Regulator

Input: 3.5V - 21V
Output: 3.3V @ 1.2A max
Type: Synchronous buck

Pin	Connects To
VIN	Battery + (Red)
GND	Battery - (Black)
VOUT	ESP32 3V3 pin
EN	Tie to VIN

MPU6050 IMU Module

Type: 6-Axis Gyro + Accelerometer
Interface: I2C @ 400kHz
I2C Address: 0x68

Pin	Connects To
VCC	3.3V (Orange)
GND	Ground (Black)
SDA	GPIO 21 (Purple)
SCL	GPIO 22 (Purple)
INT	Not connected

Voltage Divider (VBAT)

Purpose: Scale battery voltage for ADC
Ratio: 2:1 (halves voltage)
Max Input: 4.2V → 2.1V output

Component	Connection
R1 (10kΩ)	Battery+ to Center
R2 (10kΩ)	Center to GND
Center tap	GPIO 34 (Blue)

Motor Drivers (×4)

Motor 1 - Rear Right (GPIO 13)

Rotation: Clockwise (CW) ↻
MOSFET: Si2302 N-Channel
Gate Resistor: 10kΩ
Flyback Diode: 1N5819

Motor 2 - Front Right (GPIO 25)

Rotation: Counter-CW (CCW) ↺
MOSFET: Si2302 N-Channel
Gate Resistor: 10kΩ
Flyback Diode: 1N5819

Motor 3 - Rear Left (GPIO 14)

Rotation: Counter-CW (CCW) ↺
MOSFET: Si2302 N-Channel
Gate Resistor: 10kΩ
Flyback Diode: 1N5819

Motor 4 - Front Left (GPIO 27)

Rotation: Clockwise (CW) ↻
MOSFET: Si2302 N-Channel
Gate Resistor: 10kΩ
Flyback Diode: 1N5819

Buzzer (GPIO 32)

Type: 5V Passive Buzzer

Driver: 2N2222 NPN Transistor
Base Resistor: 1kΩ
Power: 3.3V or 5V to Buzzer+

2N2222 Pin	Connects To
Base (B)	GPIO 32 via 1kΩ
Collector (C)	Buzzer - terminal
Emitter (E)	Ground

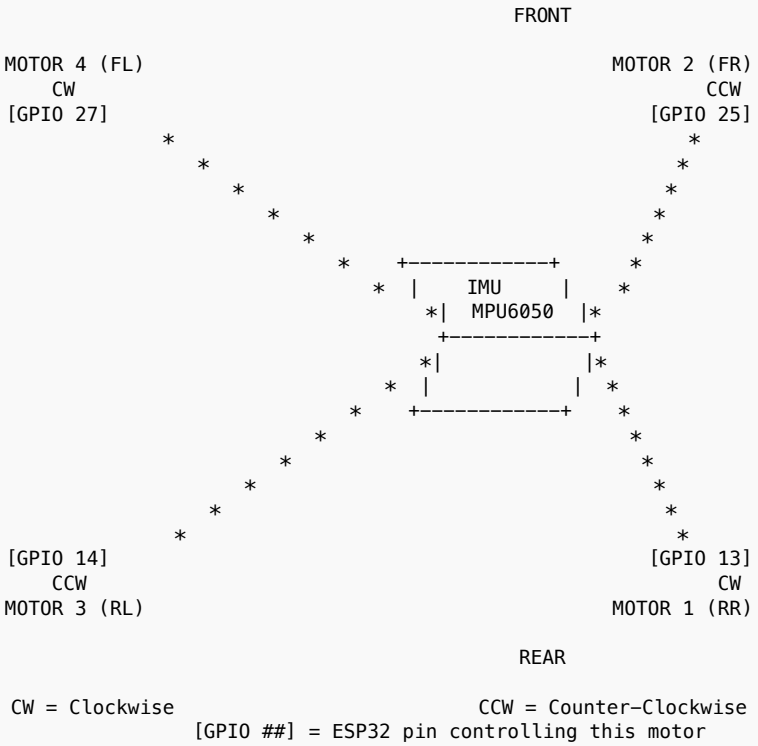
Status LED (GPIO 33)

Type: 3mm or 5mm LED

Color: Green or Blue
Current Limiting: 220Ω resistor
Current: ~10mA @ 3.3V

LED Pin	Connects To
Anode (+)	GPIO 33 via 220Ω
Cathode (-)	Ground

Motor Layout (Quad-X Configuration)

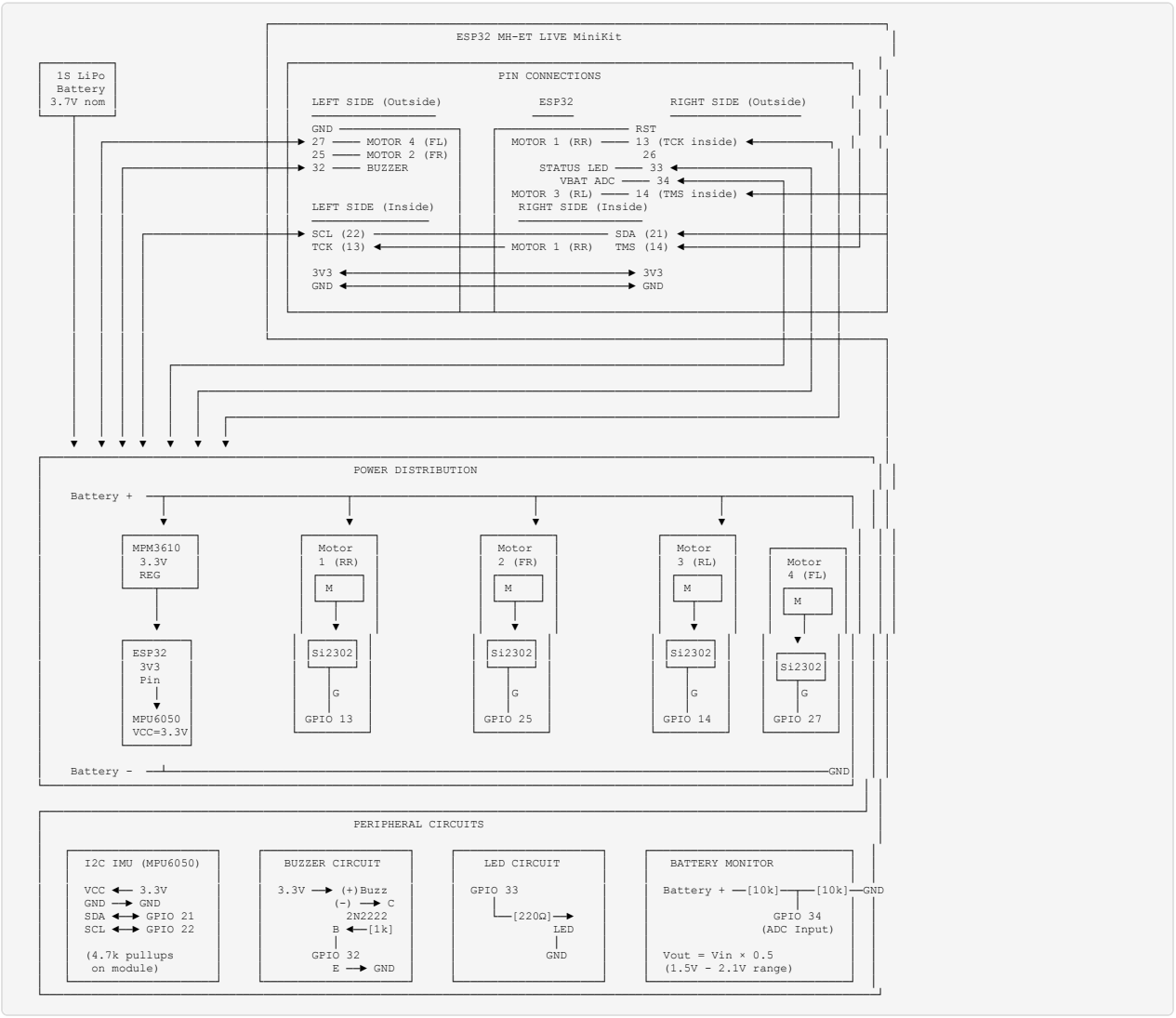


CW = Clockwise CCW = Counter-Clockwise

[GPIO ##] = ESP32 pin controlling this motor

Page 3: Complete System Schematic

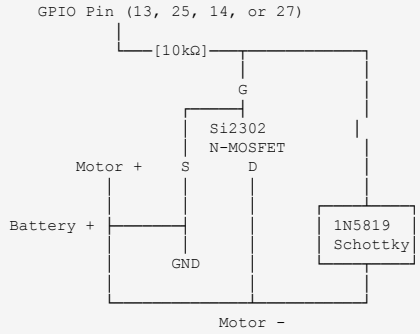
ESP32 MultiWii Drone - Full Circuit Diagram



Page 4: Component Schematics & Bill of Materials

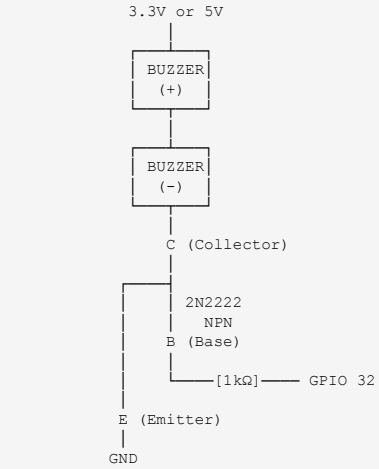
Component Schematics (Detail Views)

Motor Driver Circuit (Build ×4)



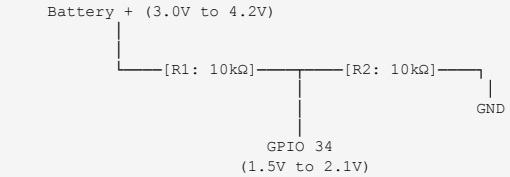
Notes:
- 10kΩ resistor limits gate current
- 1N5819 Schottky diode protects MOSFET from back-EMF when motor is switched off
- Motor + connects directly to Battery +
- MOSFET switches the Motor - (ground side)

Buzzer Driver Circuit



Notes:
- 1kΩ resistor limits base current (~2.5mA)
- NPN transistor switches buzzer ground
- GPIO HIGH = buzzer ON
- GPIO LOW = buzzer OFF

Voltage Divider (Battery Monitor)

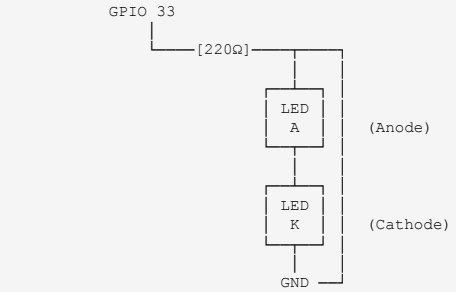


Formula:
  Vout = Vin × R2 / (R1 + R2)
  Vout = Vin × 10k / (10k + 10k)
  Vout = Vin × 0.5

Examples:
  Battery 4.2V (full) → GPIO reads 2.1V
  Battery 3.7V (nom)   → GPIO reads 1.85V
  Battery 3.0V (empty) → GPIO reads 1.5V

Note: ESP32 ADC max is 3.3V, divider keeps voltage in safe range for 12-bit ADC

LED Indicator Circuit



Formula:
  R = (Vgpio - Vled) / Iled
  R = (3.3V - 2.0V) / 0.010A
  R = 130Ω minimum → use 220Ω

Notes:
- 220Ω gives ~6mA (safe, visible)
- Longer LED leg = Anode (+)
- Flat side of LED = Cathode (-)

Bill of Materials

Qty	Component	Value/Type	Notes
1	ESP32 Development Board	MH-ET LIVE MiniKit	Or compatible ESP32 DevKit
1	IMU Module	MPU6050	GY-521 breakout common
1	Voltage Regulator	MPM3610 3.3V	Adafruit breakout

4	Brushed Motors	8.5×20mm coreless	716 or 720 size
4	N-Channel MOSFET	Si2302	SOT-23 package
4	Schottky Diode	1N5819	Flyback protection
4	Resistor	10kΩ	MOSFET gate resistors
2	Resistor	10kΩ	VBAT voltage divider
1	Resistor	1kΩ	Buzzer transistor base
1	Resistor	220Ω	LED current limiter
1	NPN Transistor	2N2222	Buzzer driver
1	Passive Buzzer	5V	Magnetic or piezo
1	LED	3mm or 5mm	Green or blue
1	LiPo Battery	1S 3.7V 150-250mAh	JST-PH connector

Important Notes

- **Strapping Pins:** GPIO 0, 2, 12, 15 affect boot mode - avoid using for outputs
- **Input-Only Pins:** GPIO 34, 35, 36, 39 cannot be used as outputs
- **Motor PWM:** Uses 32kHz frequency, 8-bit resolution (0-255 duty cycle)
- **I2C Pullups:** Most MPU6050 modules have built-in 4.7kΩ pullups
- **Power Sequence:** MPM3610 auto-enables on power - no control needed
- **VBAT Calibration:** Adjust VBAT_SCALE in config.h if readings are off
- **ESP-NOW:** No external radio needed - uses built-in WiFi at 250kbps