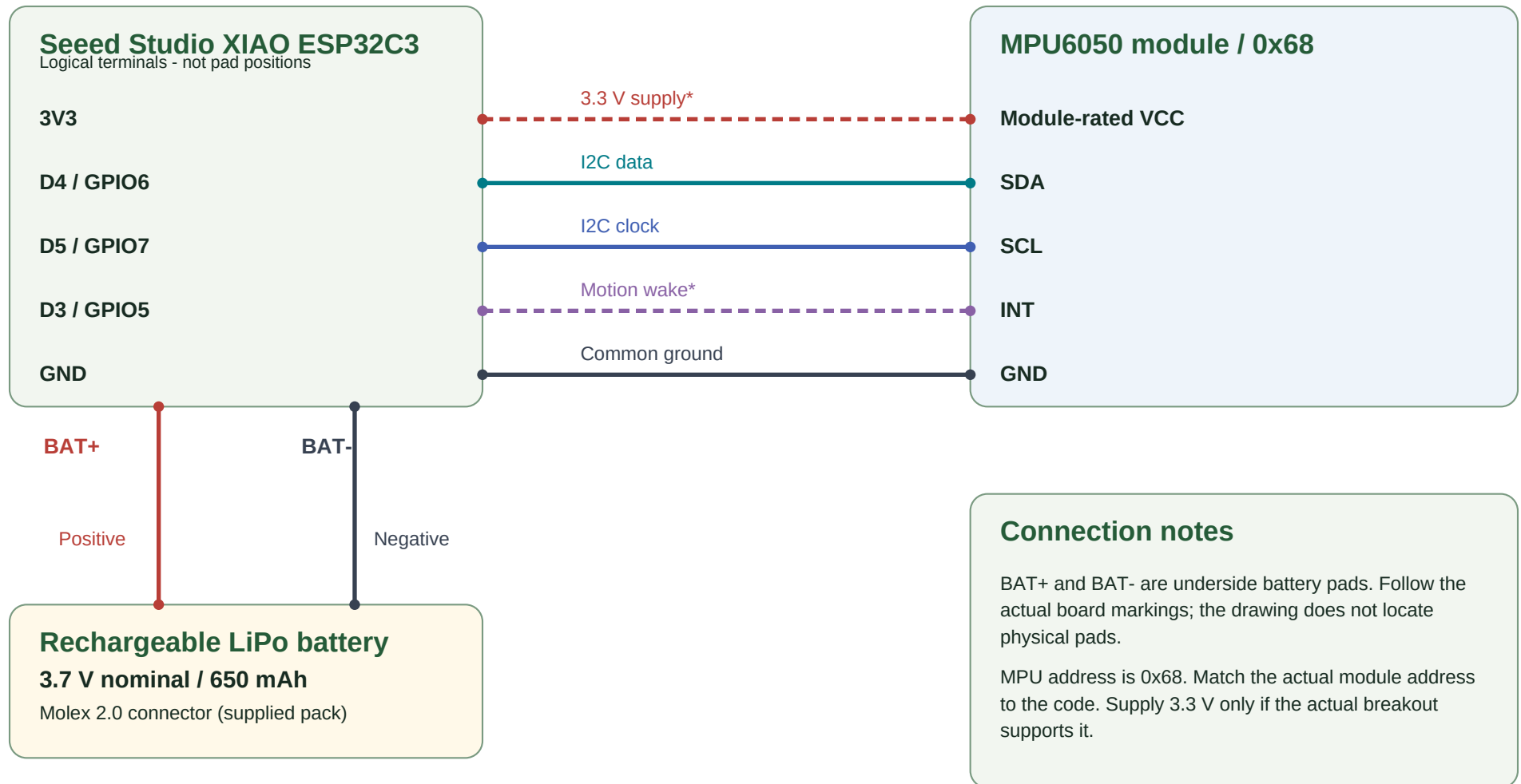




Battery & motion-sensor wiring

XIAO D labels matched to the raw GPIO numbers in the supplied ESPHome code.



SOLID: firmware-assigned signal or manufacturer power terminal.

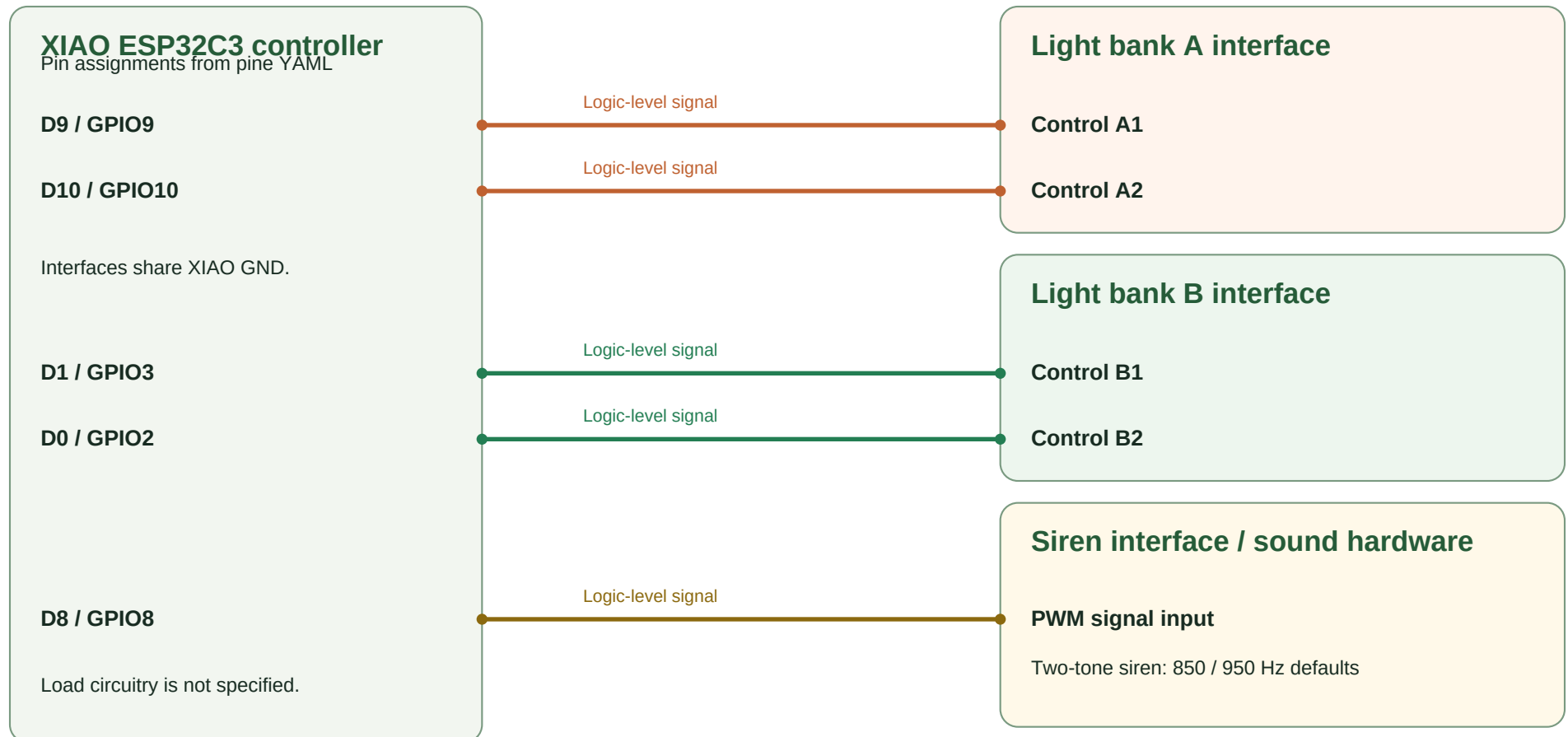
DASHED (*): inferred / conditional connection; confirm the module supply and INT wiring.

The firmware configures GPIO5 as a high-level wake input and writes MPU motion-interrupt registers. INT-to-D3 is the inferred wake path, not an observed installed wire.

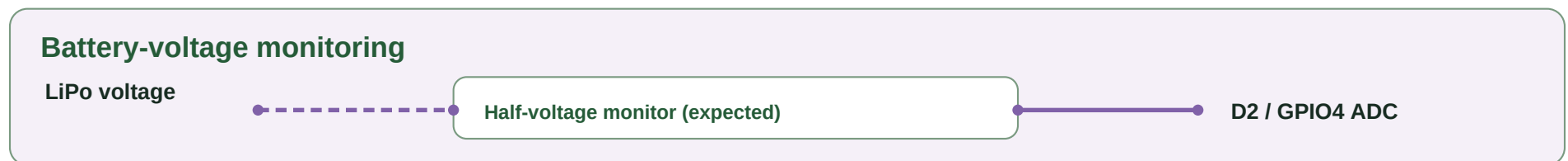


Lights, siren & battery-monitor schematic

Functional signal schematic. Output hardware and monitor circuitry are represented as blocks.



Battery monitoring requires an input interface; do not connect the raw LiPo voltage directly to the ADC.





Device pin map & operation

Pin names are translated from the Sseed XIAO ESP32C3 manufacturer documentation.

Function	ESPHome GPIO	XIAO label	Connection / behavior
Light bank B / output B2	GPIO2	D0	Interlocked with GPIO3; starts ON.
Light bank B / output B1	GPIO3	D1	Interlocked with GPIO2; starts OFF.
Battery-voltage input	GPIO4 / ADC1_CH4	D2 / A2	Half-voltage monitor output; firmware multiplies by 2.
Configured wake input	GPIO5	D3	MPU INT inferred; high-level wake configuration.
MPU6050 I2C data	GPIO6	D4 / SDA	Sensor SDA; address 0x68.
MPU6050 I2C clock	GPIO7	D5 / SCL	Sensor SCL; sampled every 200 ms.
Siren PWM	GPIO8	D8	Siren interface control; initial frequency 850 Hz.
Light bank A / output A1	GPIO9	D9	Interlocked with GPIO10; starts ON.
Light bank A / output A2	GPIO10	D10	Interlocked with GPIO9; starts OFF.

What the code does

Lights: a 200 ms interval toggles both pairs, with 200 ms interlock waits. The firmware does not identify which physical lamp color each output drives. Master Enable controls the siren, not the light banks.

Siren: low/high tones default to 850/950 Hz, each adjustable from 100 to 3000 Hz. PWM duty is the volume setting. Awake/sleep defaults are 30 seconds / 30 minutes; the car publishes inactive one second before sleeping.

Source & verification

Diagram positions are illustrative. Load power, polarity and current handling belong to the actual light/siren interface circuit. GPIO lines are control signals. Physical wiring and operation have not been tested here.

Firmware baseline: `downloads/pinewood-derby/pine-esphome-reference.yaml`. The supplied `esp32-c3-devkitm-1` board target is retained. D6 / GPIO21 and D7 / GPIO20 are unused in this configuration.

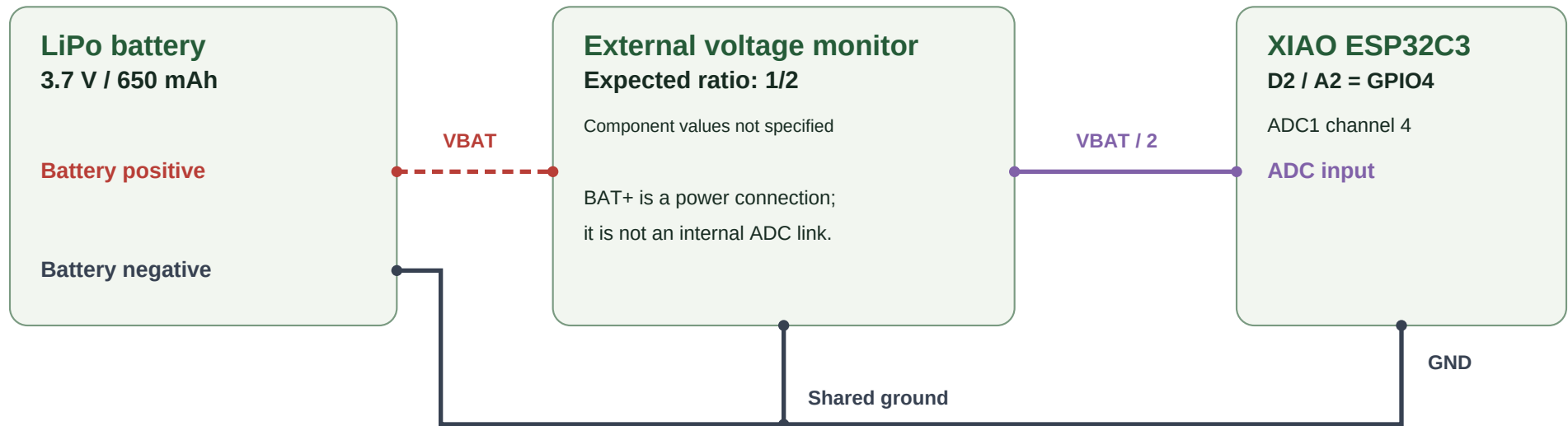
Board pin / battery-pad source: [Sseed Studio XIAO ESP32C3 Getting Started](#)

Project files: tryonelectronics.com/projects/pinewood-derby#files



Battery voltage & charge-level reference

Verified ADC pin mapping; the actual installed sensing circuit still requires measurement.



The code uses GPIO4, attenuation: auto, a 10-second interval and multiply: 2.0. Battery Level is calculated from Battery Voltage and uses no additional connection. Below are expected values from the code, not measured results.

Battery voltage (V)	Expected ADC voltage (V)	Estimated Battery Level
3.55	1.775	0%
3.825	1.9125	50%
4.10	2.050	100%

Check the live voltage against a multimeter and confirm the half-voltage ADC input. Percentage is a linear estimate, not a fuel gauge. The raw LiPo must not connect directly to D2. LEVEL on the card means car tilt.