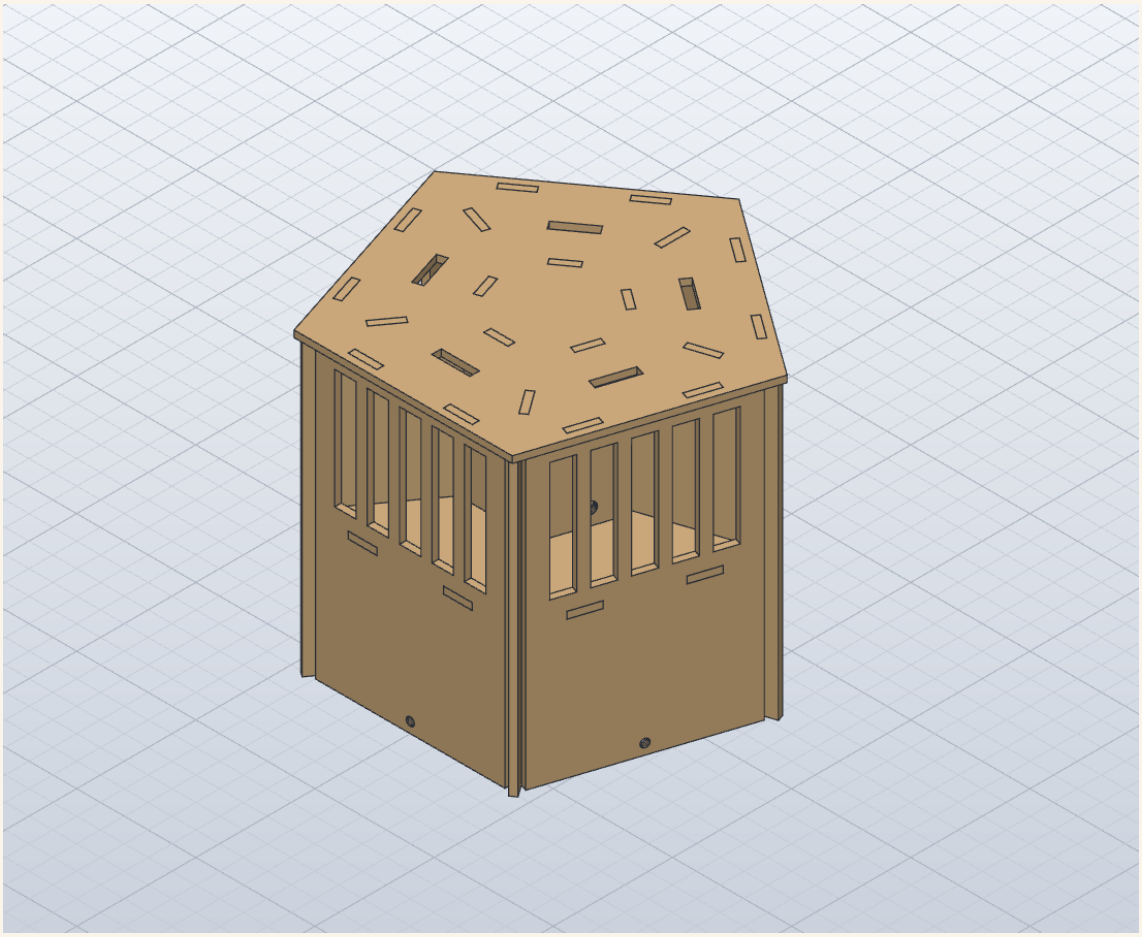
JAXLAB
Making Science Fun

Pentagon Mood Lamp

Assembly guide

Five sides, five colours. A laser-cut plywood lantern run by an ESP32, with its own remote.



18	2	144 x 125	72 min
wooden parts	sheets, 300 x 300 mm	mm, across x tall	of cutting

Designed and checked, not built yet. Every part and fit in this guide was checked by script, and the pictures are 3D renders. Bought-part sizes are typical values: measure yours and cut the fit test first.

What you need

Wood and hardware

Item	How many	Notes
2.8 mm plywood, 300 x 300 mm	2 sheets	Plus a 110 x 30 mm scrap for the fit test
M3 x 12 screw and M3 nut	5 each	Hold the floor in
Baking paper or tracing paper	1 sheet	The diffuser behind the light slots
Wood glue, double-sided foam tape		Tape holds the COBs and the boards

Electronics

Item	How many	Notes
12 V COB LED, one each: blue, yellow, orange, green, pink	5	About 25 x 35 mm
ESP32-C3 SuperMini	2	One in the lamp, one in the remote
Perfboard, 5 x 7 cm (24 x 18 holes)	1	Carries the ESP32, the transistors and the resistors
2N2222 transistor	5	One per colour
400 ohm resistor	5	One per transistor base (220 ohm also works)
18650 cell + 3-cell holder	3 + 1	Makes the 12 V pack
3S BMS	1	Protects the pack
LM2596 buck converter	1	Set to 5.0 V before connecting the ESP32
Panel DC socket, 5.5 x 2.1 mm	1	Charging, 11.5 mm hole
Mini toggle switch	1	On/off, 6 mm hole
12.6 V Li-ion charger (3S), 1-2 A	1	To charge the pack
Remote: 5 push buttons, 1 Li-ion cell, TP4056, small switch		No case for the remote in this guide

Tools

- Laser cutter (the files are for 2.8 mm plywood at 300 mm/min, 2 passes)
- Soldering iron and solder
- Multimeter (to set the LM2596 to 5.0 V)
- Small screwdriver, scissors

Cut the parts

Cut the small fit test first. If the jack, switch, screw, tab and nut all fit it, cut the two sheets.



Sheet 1



Sheet 2 (the logo is engraved on the front wall)

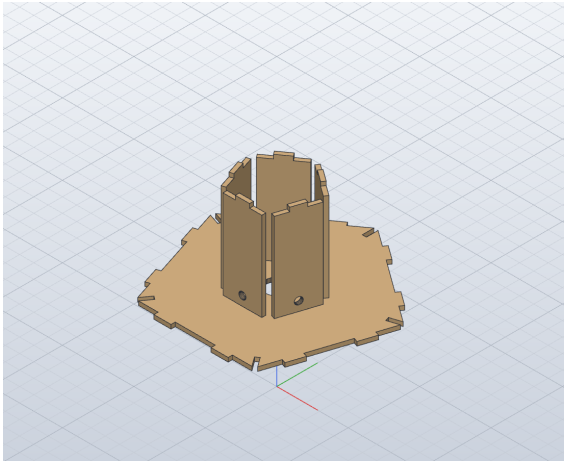
The parts

Part	How many	What it does
Wall	5	One per side, five light slots each. The front wall has the logo; two back walls have the jack hole and the switch hole
Fin	5	Stands on each corner. A post below the shelf, a divider between colours above it
Core plate	5	Small upright plates round the centre. One COB sticks on each
Shelf	1	The pentagon with tabs: electronics go below it, light above
Lid	1	The biggest pentagon, full of slots. Pushes on, no glue
Floor	1	The pentagon with five T-shaped notches for the nuts

Put it together

Glue the walls, fins and core plates to the shelf. Do not glue the lid or the floor: they come off for repairs.

1

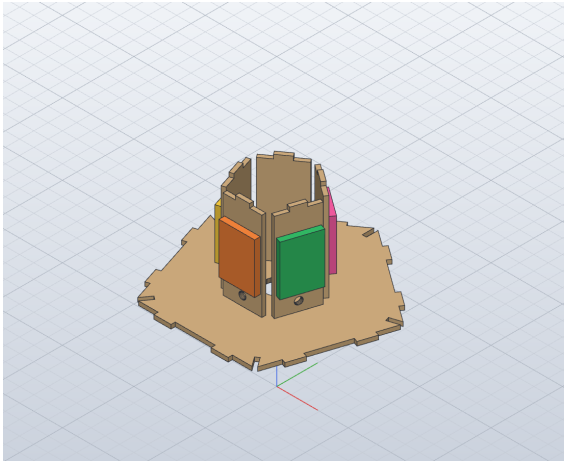


Core plates into the shelf

- Stick diffuser paper behind the light slots of all five walls now, and leave them to dry.
- Glue the five core plates into the five slots round the shelf's middle hole.
- The small wire hole in each plate goes at the bottom.

Tip: Let the glue grab for ten minutes before the next step.

2

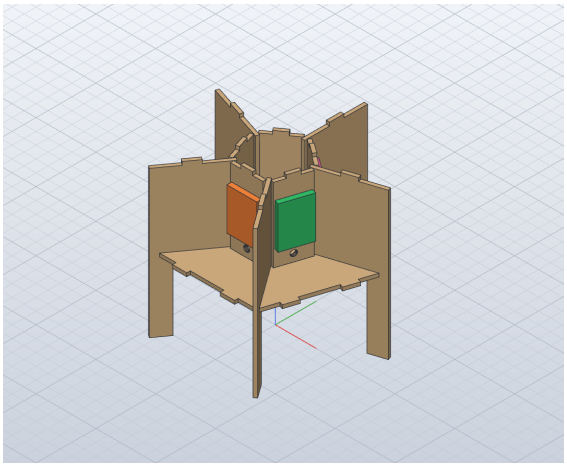


Stick on the COBs

- Solder two wires, about 15 cm, to each COB first.
- Stick one COB on the outside of each plate with foam tape.
- Push its wires through the small hole, into the hollow centre and down through the shelf's middle hole.
- Label each pair of wires with its colour under the shelf.

Tip: Going round: blue, yellow, orange (front), green, pink.

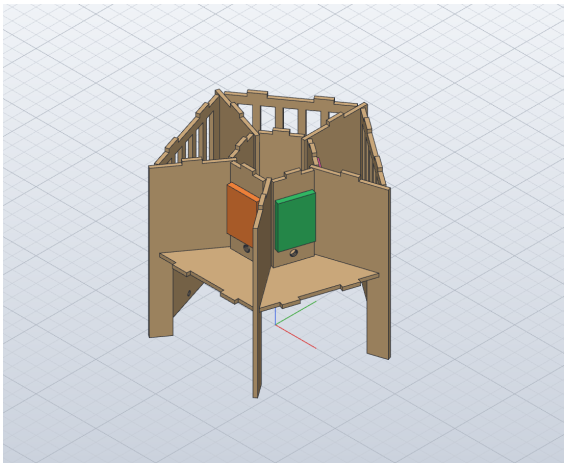
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Stand the fins on the corners

- Each fin slides into a corner notch of the shelf, with its wide part above the shelf.
- The fin's inner end fits between two core plates.
- Run a thin line of glue where the fin sits on the shelf.

4

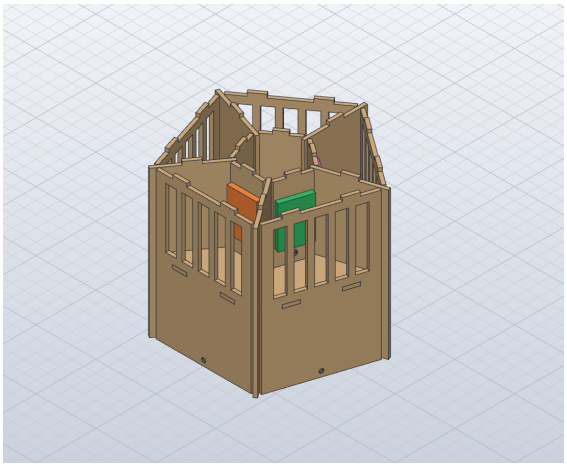


Push on the walls

- Each wall goes between two fins. The shelf's two tabs go through the wall's two small slots.
- Glue the tabs. The wall's edges just touch the fins.
- Front: the wall with the logo. Back right: the jack wall. Back left: the switch wall.

Tip: Fit the jack and the switch into their walls before gluing those two on.

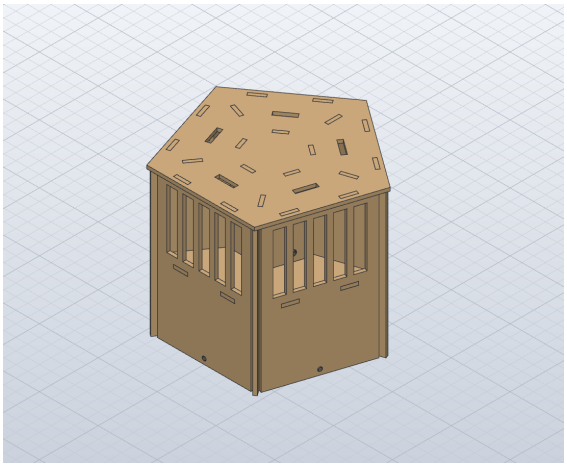
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All five walls on

- Check every wall is pushed down level with the others: the lid needs the tabs lined up.
- Wrap a rubber band or tape round the lamp while the glue dries.

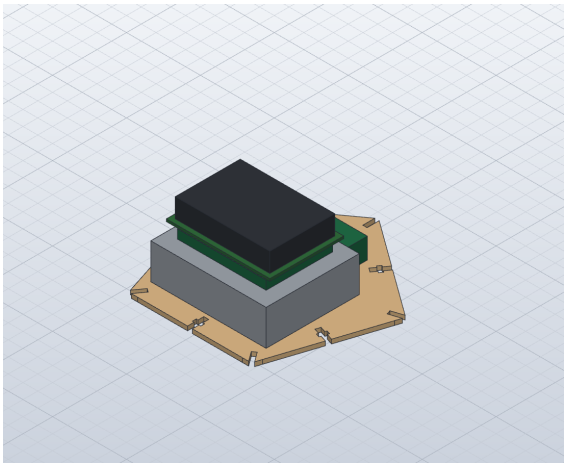
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Push on the lid

- Line up the lid's slots with the wall tabs, fin tabs and core tabs, and press down evenly.
- No glue: the lid lifts off if a COB ever needs replacing.
- The five short slots in the lid are vents. Leave them open.

7

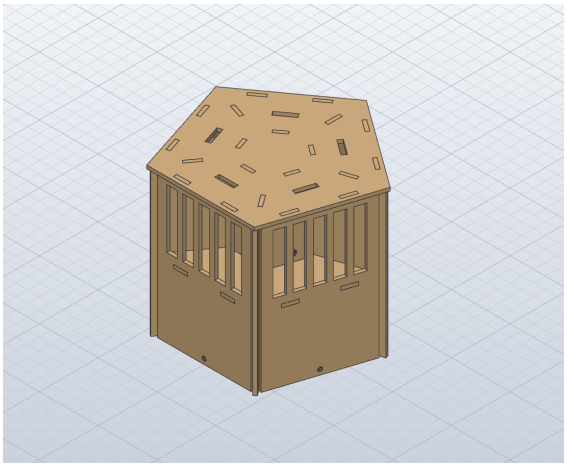


Load the floor

- Tape the cell holder to the middle of the floor and the BMS on top of it.
- Stick foam pads on the BMS and lay the perfboard on them, parts up. The LM2596 lies behind the holder.
- Wire everything (next pages) and test all five colours before closing up.

Tip: Flash the ESP32 before it goes in. After that the phone page and the remote are all you need.

8



Close it up

- Drop an M3 nut into each T-shaped notch in the floor's edge.
- Slide the floor up inside the walls until its edge lines up with the small hole near the bottom of each wall.
- Put an M3 x 12 screw through each wall into its nut. Five screws, snug, not tight.

Wiring

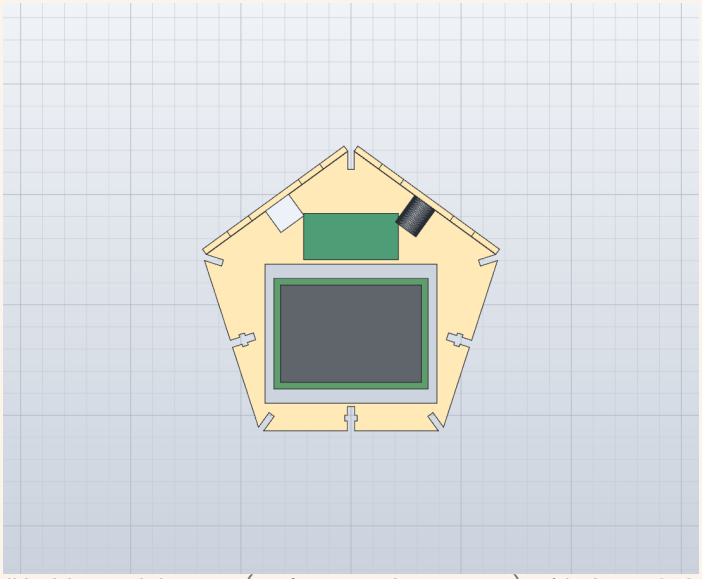
Each colour has its own transistor. All five COB plus wires share the 12 V rail, and everything shares one ground.

Colour	ESP32 pin	Path (all on the perfboard, next pages)
Blue	GPIO0	Pin to 400 ohm resistor to 2N2222 base. Collector to COB minus. Emitter to ground
Yellow	GPIO1	Pin to 400 ohm resistor to 2N2222 base. Collector to COB minus. Emitter to ground
Orange	GPIO3	Pin to 400 ohm resistor to 2N2222 base. Collector to COB minus. Emitter to ground
Green	GPIO4	Pin to 400 ohm resistor to 2N2222 base. Collector to COB minus. Emitter to ground
Pink	GPIO5	Pin to 400 ohm resistor to 2N2222 base. Collector to COB minus. Emitter to ground

Power

- Pack plus goes to the BMS, then the toggle switch, then the 12 V rail (all five COB plus wires, and the LM2596 input plus).
- LM2596 output plus (set to 5.0 V) goes to the ESP32's 5V pin.
- Pack minus, LM2596 minus, ESP32 G and all five emitters join together: one common ground.
- The DC socket goes to the BMS charge terminals. Charge only with a 12.6 V Li-ion charger.
- A 2N2222 has three legs: emitter, base, collector, with the flat face towards you. Check one before soldering five.

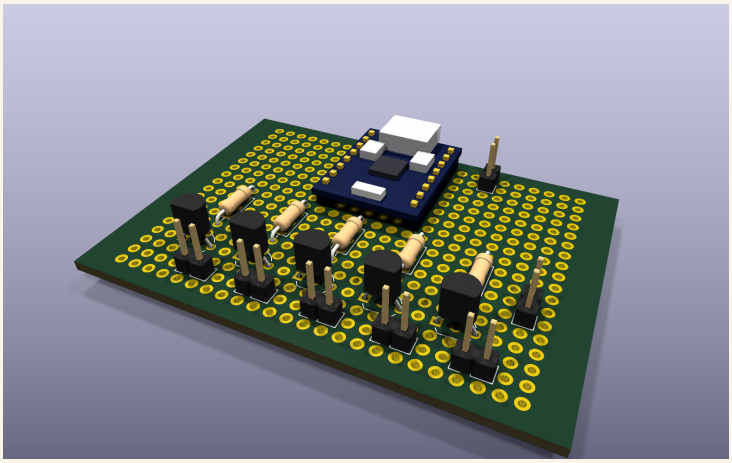
Where things sit on the floor (seen from above, front at the bottom)



The perfboard lies over the cell holder and the BMS (on foam pads, parts up), with the LM2596 behind them. The jack and the switch are in the two back walls.

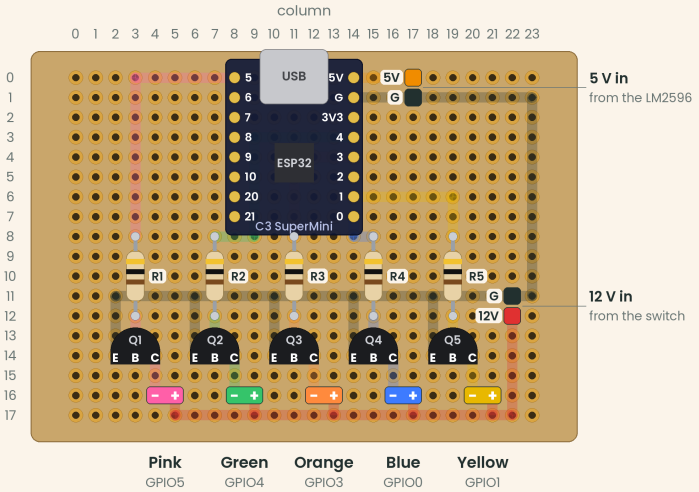
The circuit board

The ESP32, the five transistors and the five resistors go on one ordinary 5 x 7 cm perfboard. Every connection runs along the grid on the solder side and no two cross, so there are no jumper wires.



JAXLAB mood lamp: perfboard layout

Parts side · 5 x 7 cm board, 24 x 18 holes



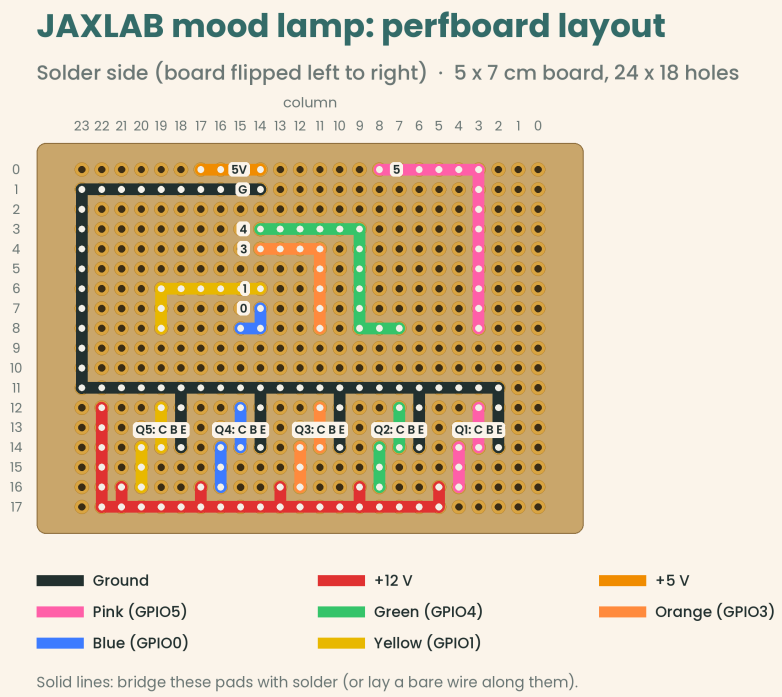
COB wire pads: - to the COB's minus wire, + to its plus wire

Ground
+12 V
+5 V
Pink (GPIO5)
Green (GPIO4)
Orange (GPIO3)
Blue (GPIO0)
Yellow (GPIO1)

Faint lines show the solder-side runs under the board. The two under the ESP32 go on first.

The circuit board: solder side

The board flipped over left to right, as you see it while soldering.



Solid lines: bridge these pads with solder (or lay a bare wire along them).

Soldering order

- The two runs under the ESP32 first (green and orange): you cannot reach them once it is on.
- Resistors, then transistors, then the ESP32 on its header pins.
- The remaining runs: ground (black), +12 V (red), +5 V and the short links.
- Wires last. With a meter, check there is no connection between +12 V and ground before you power it.
- Follow the pin labels printed on your ESP32 if they differ from the drawing.

Using the lamp

From the remote

Do this	The lamp does this
Tap a button	That colour on or off
Hold a button	Dims it. Hold again to brighten
Buttons 1 + 5 together	Flow mode: the colours fade in turn
Buttons 2 + 4 together	Everything off

From a phone

- Join the Wi-Fi network JAXLAB-MoodLamp (password moodlamp).
- Open 192.168.4.1 in the browser.
- Tap a colour's circle to switch it, drag its slider to dim it. Flow and All off are at the bottom.

If something is wrong

What you see	Likely cause
One colour never lights	Its COB is wired backwards, or its transistor's legs are in the wrong order
One colour never switches off	Collector and emitter swapped on its transistor
Nothing lights, ESP32's blue LED blinks at power-on	The 12 V rail is not reaching the COBs, or the grounds are not joined
A transistor is too hot to hold	That COB draws too much: put two 400 ohm resistors in parallel on its base
The remote's LED does not flash	Lamp off or out of range
A bright patch shows through the paper	Add a second layer of diffuser paper

Files

- Cut files, 3D model and this guide: jaxlabs.site
- Lamp firmware: mood_lamp. Remote firmware: mood_lamp_remote (Arduino, ESP32 core 3.x).