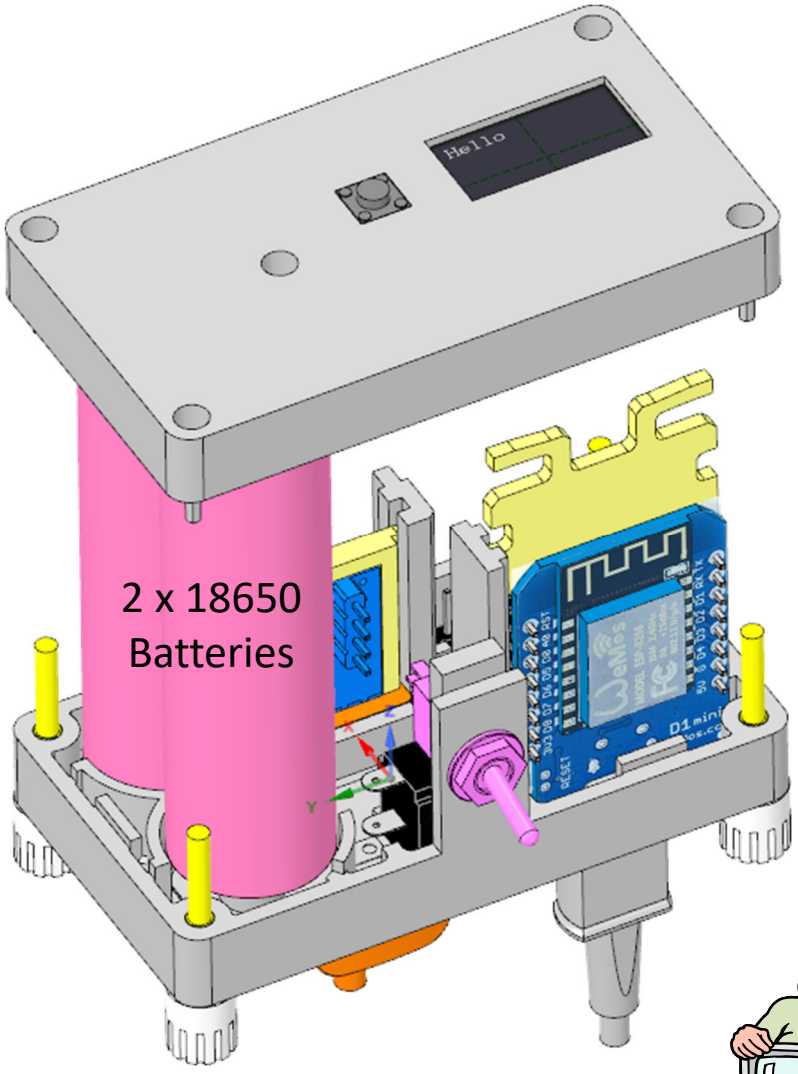
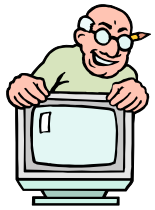
Wii WEMOS D1 Transceiver Mk1

Circuits & Wiring





Read through this document before starting.

+ ESP8266

Released: 28/02/2023 TechKnowTone

Hand Tools:

Recommended:

- Fine Nosed Pliers
- Side Cutters
- 1.5 mm Drill
- 2.0 mm Drill
- 4.0 mm Drill
- Needle Files
- Screwdrivers
- Craft Knife

Note: Not all items needed are shown here.

Released: 28/02/2023 TechKnowTone

Tools & Materials:

Temperature controlled iron
Solder flux
Resin cored solder
Hot melt glue gun
2-part epoxy resin glue
Screw drivers
Wire wrapping tool
Tweezers
Wire wrapping wire 30 AWG
24 AWG stranded wire (red & black)

Released: 28/02/2023 TechKnowTone

Test Equipment:

You will need a multimeter to:

- set up the 3v3 voltage regulator
- check/calibrate the WEMOS battery measurement
- check wiring continuity and for unwanted shorts circuits

It is useful to have one which makes a noise when a short circuit is detected, when checking the integrity of joints, so that you don’t need to keep looking at the display.

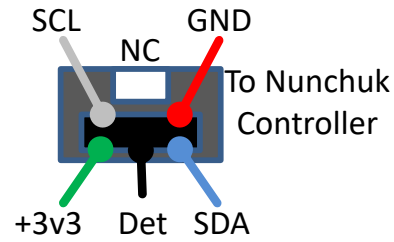
Released: 28/02/2023 TechKnowTone

Wii WEMOS D1 Transceiver Wiring

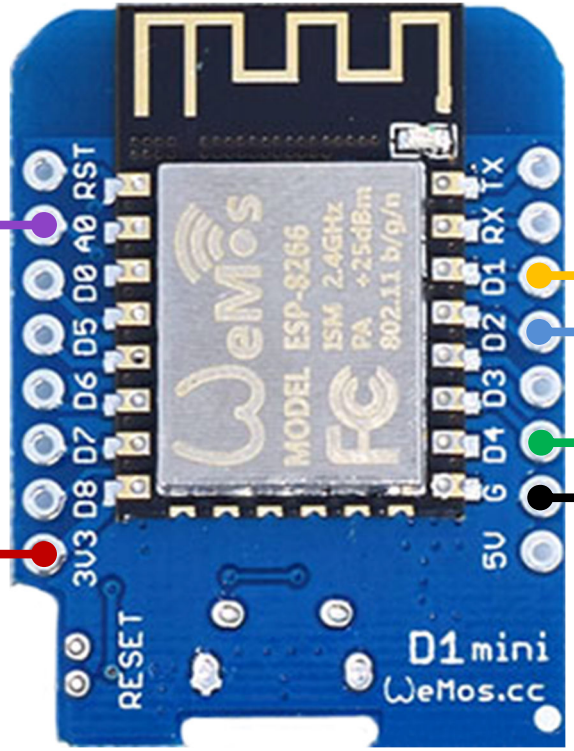
Pin	GPIO
A0	A0
D0	16
D5	14
D6	12
D7	13
D8	15

Pin	GPIO
Tx	1
Rx	3
D1	5
D2	4
D3	0
D4	2

Display connections can vary, ensure power Vcc and GND are of correct polarity!



SW1



GND

3v3

4k7

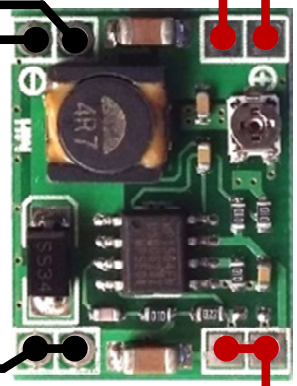
*Optional

O/C

680k

Buck regulator

Adjust for 3v3



1N4006

Ext/ OFF

ON/OFF Power Switch

+7v5

-

+7v5

2 x 18650 Lithium

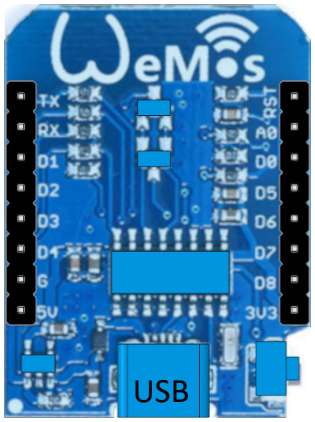
Pin D1	GPIO5	SCL
Pin D2	GPIO4	SDA
Pin D3	GPIO0	
Pin D4	INPUT_PULLUP	LED_BUILTIN

Released: 28/02/2023 TechKnowTone

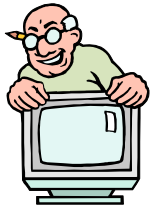
WEMOS Plate Wiring

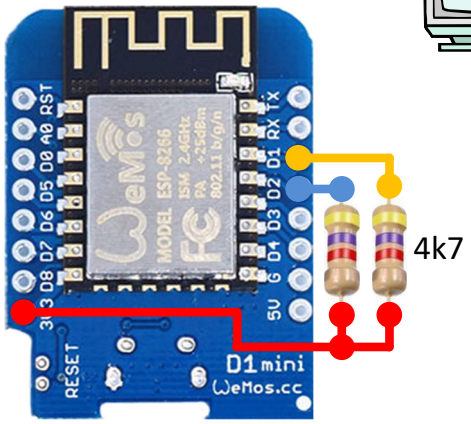
The 3v3 regulator is set up prior to gluing it into the WEMOS plate.

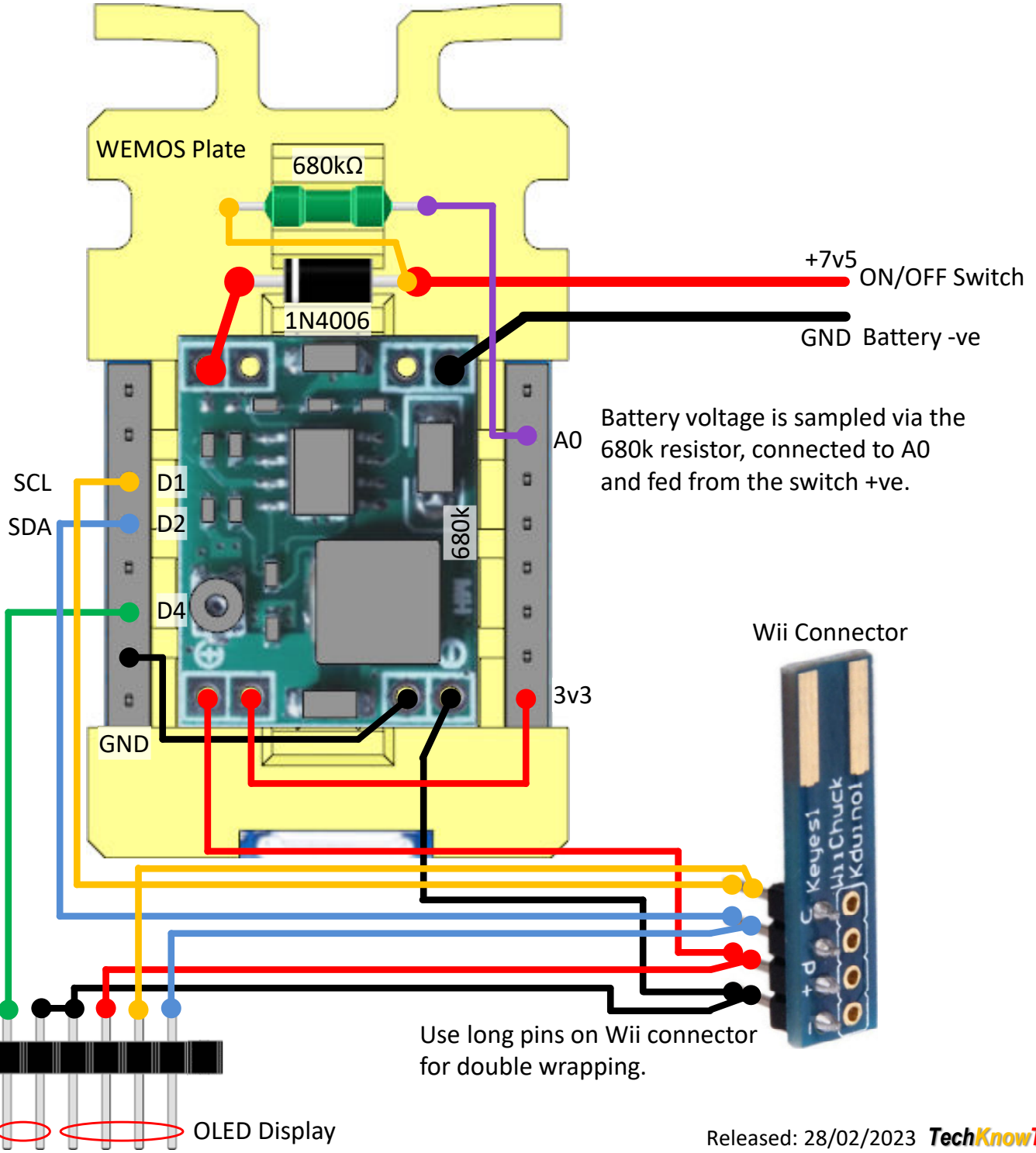
WEMOS D1 mini
viewed from underneath



*Optional I2C pullup resistors may be needed with some Wii controllers. Add if data errors are evident. Value between 2k – 10kΩ



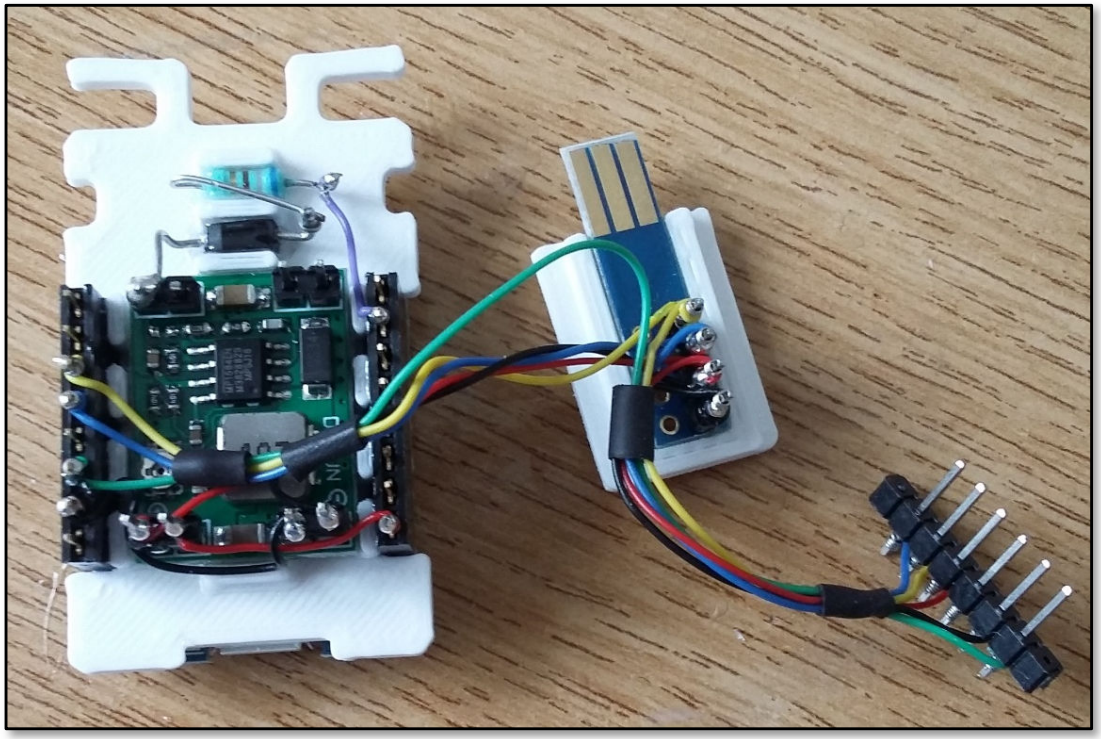




Released: 28/02/2023 TechKnowTone

WEMOS Plate Wiring

These components are wired in this way before being glued into the box base.



Wiring before attaching the power leads

Use long pins on Wii connector for double wrapping. Wrap 1st set, solder then wrap the 2nd.

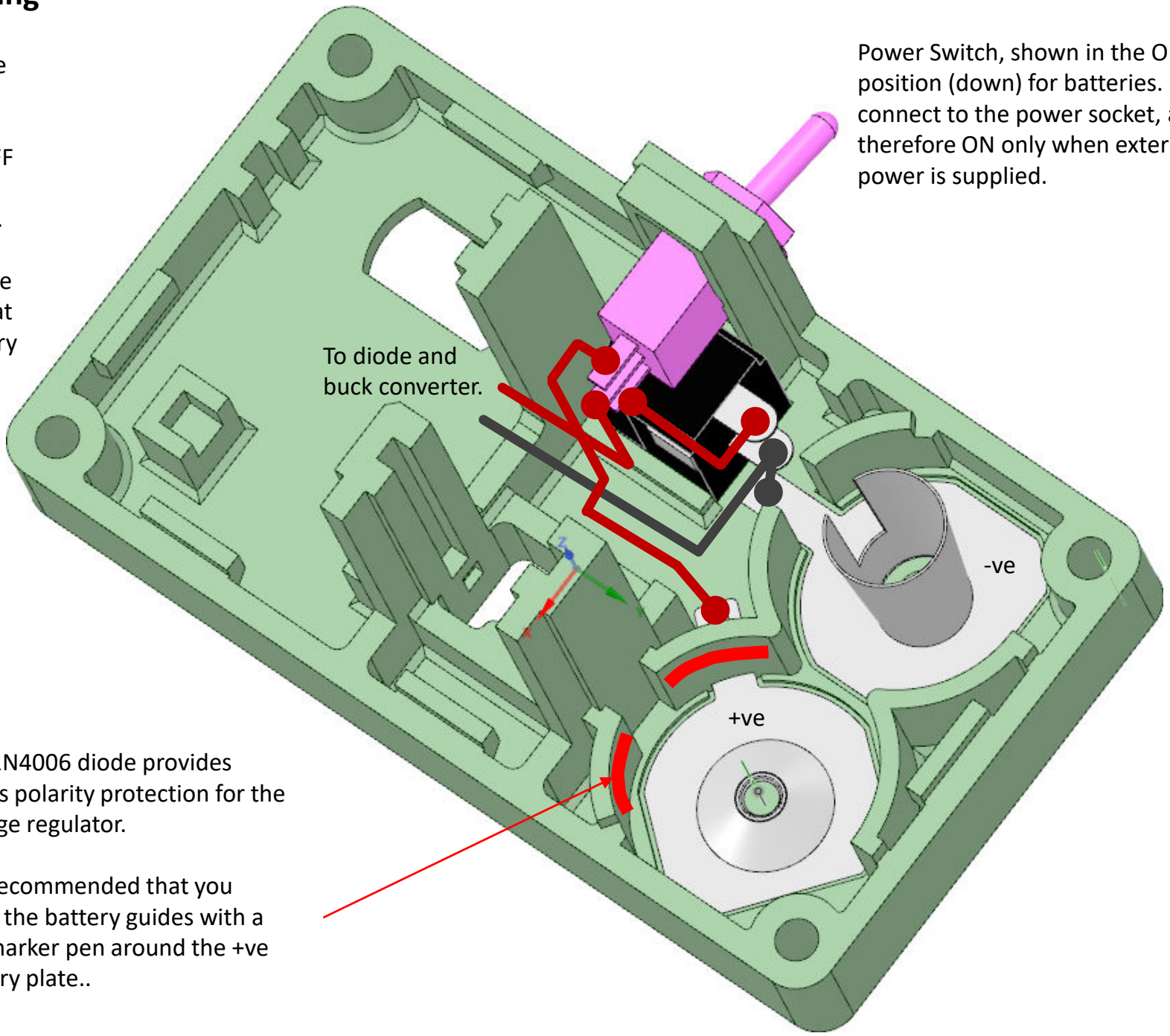
Released: 28/02/2023 TechKnowTone

18650 Battery Clip Wiring

Battery –ve goes directly to the buck regulator.

Battery +ve goes to the ON/OFF switch, then to the 1N4006 diode, then the buck regulator.

DC power socket is wired to the other side of the switch, so that power is either from the battery or the socket.



Power Switch, shown in the ON position (down) for batteries. Up will connect to the power socket, and therefore ON only when external power is supplied.

The 1N4006 diode provides revers polarity protection for the voltage regulator.

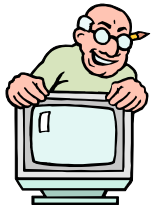
It is recommended that you mark the battery guides with a red marker pen around the +ve battery plate..

Released: 28/02/2023 TechKnowTone

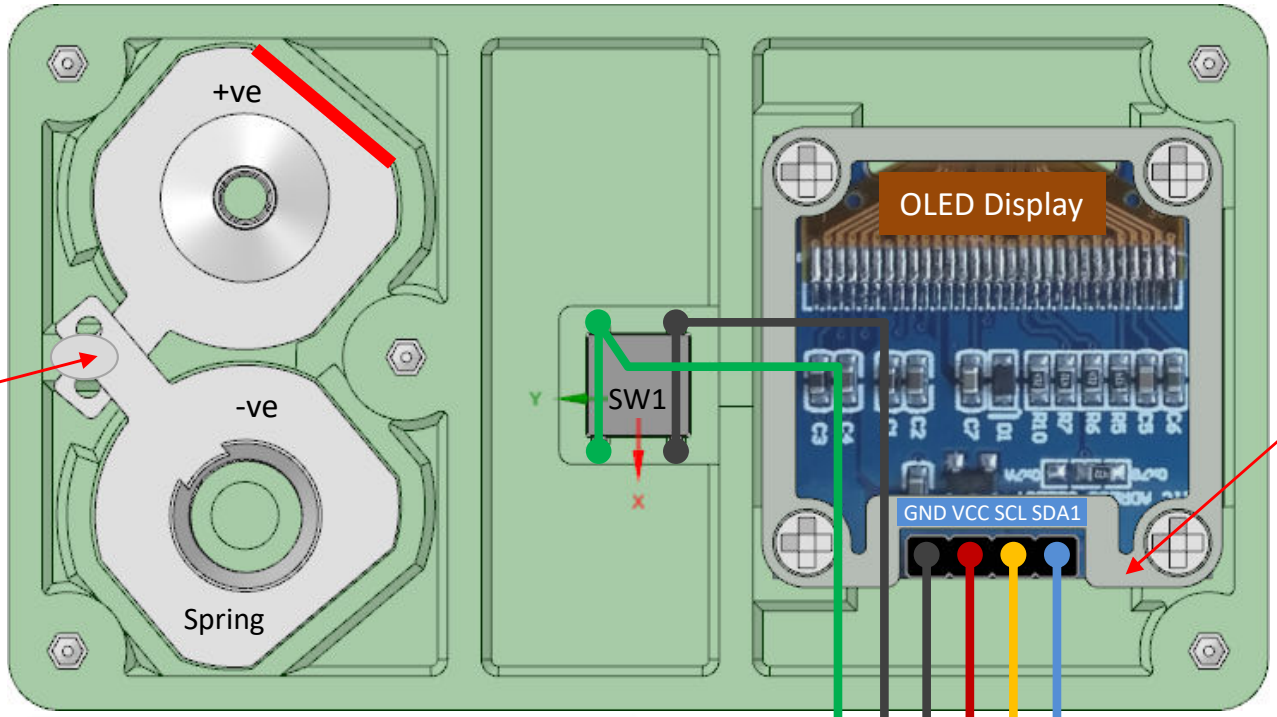
Box Lid Wiring

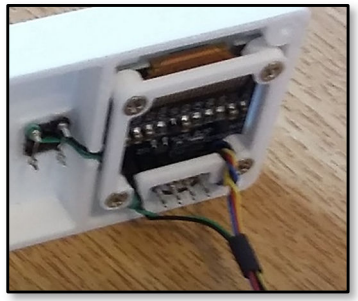
Pre-solder the tabs on the two battery clips separately, then apply a smear of flux to the freshly soldered connections, before gluing the clips into the box lid.

Once the glue has set, load some solder onto the end of a hot iron and use it to fuse the two tabs together.



The I2C harness must be at least the depth of the case. Excess length, can easily be stored in the void of the case.

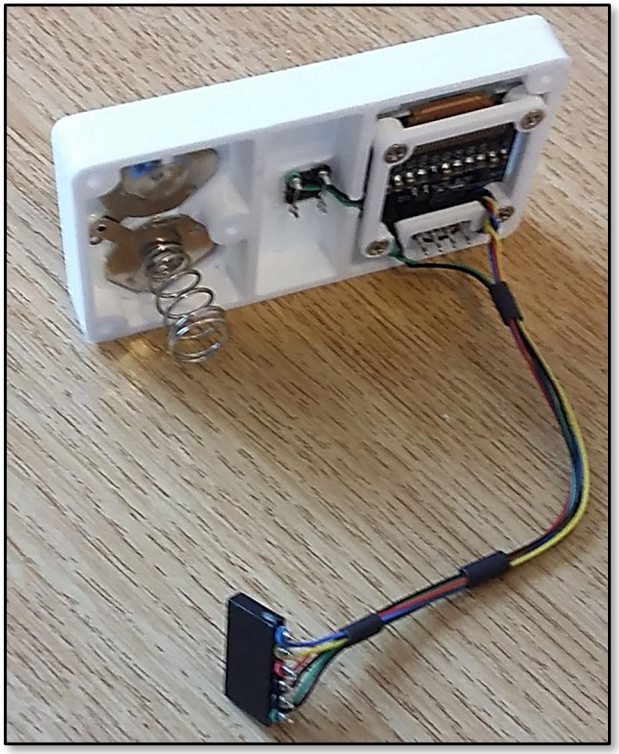




Loop wires around display strap to relieve strain.

Ensure sufficient length

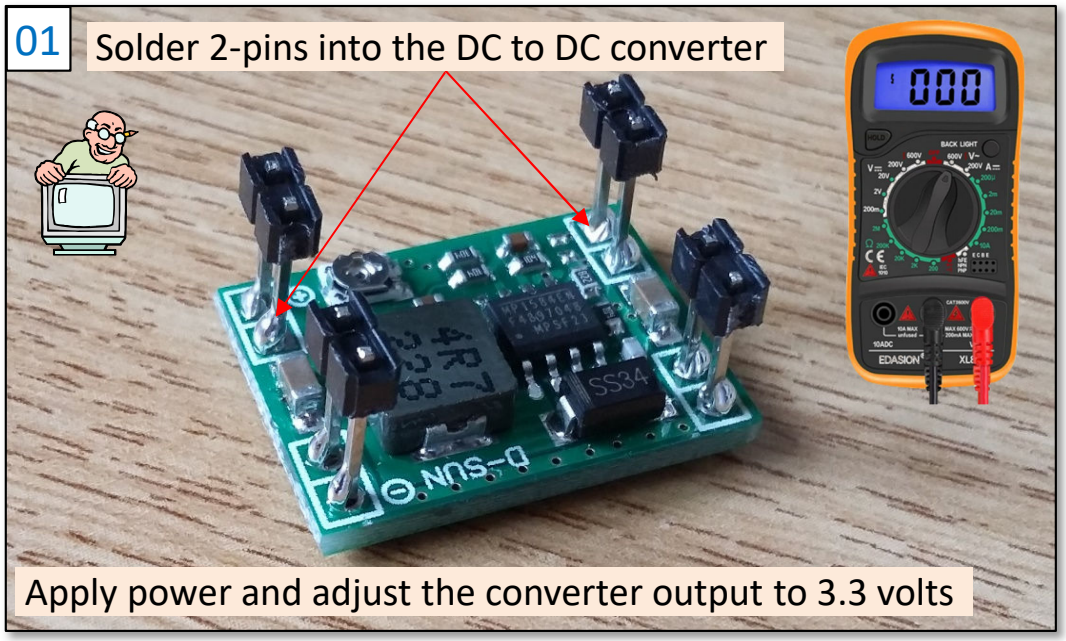
Plugs into 6-pin strip in base

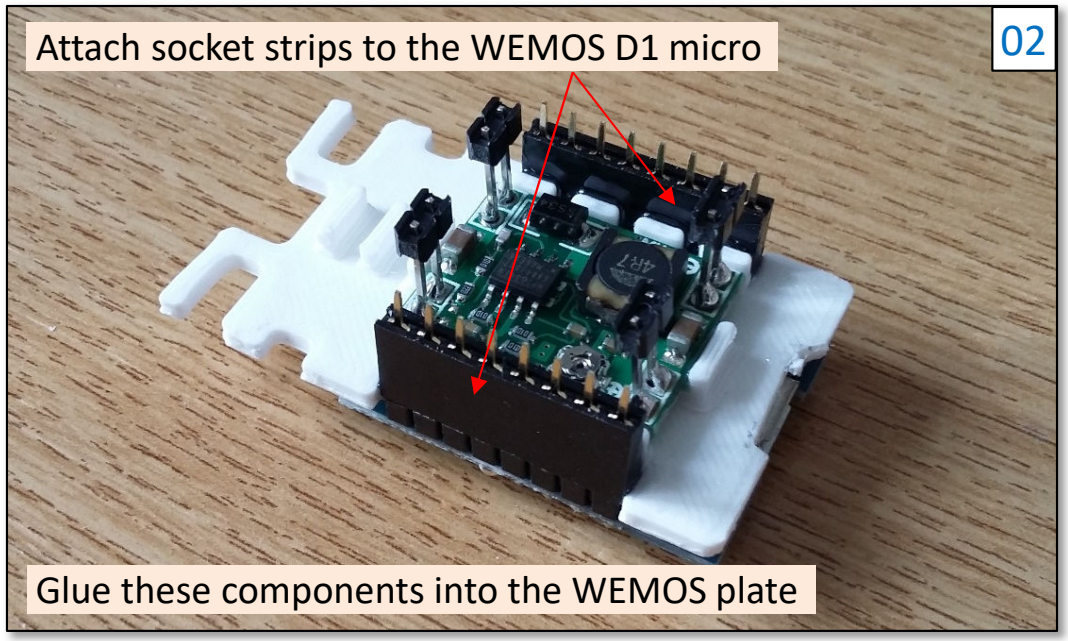


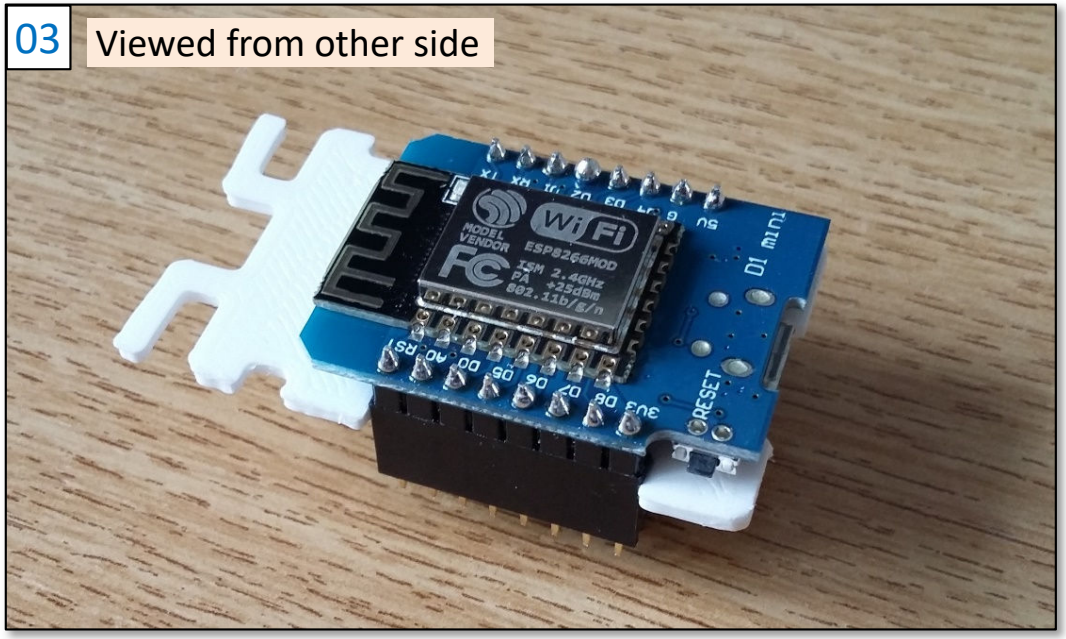
Plug can be removed from base to allow separation from body when charging batteries if needed.

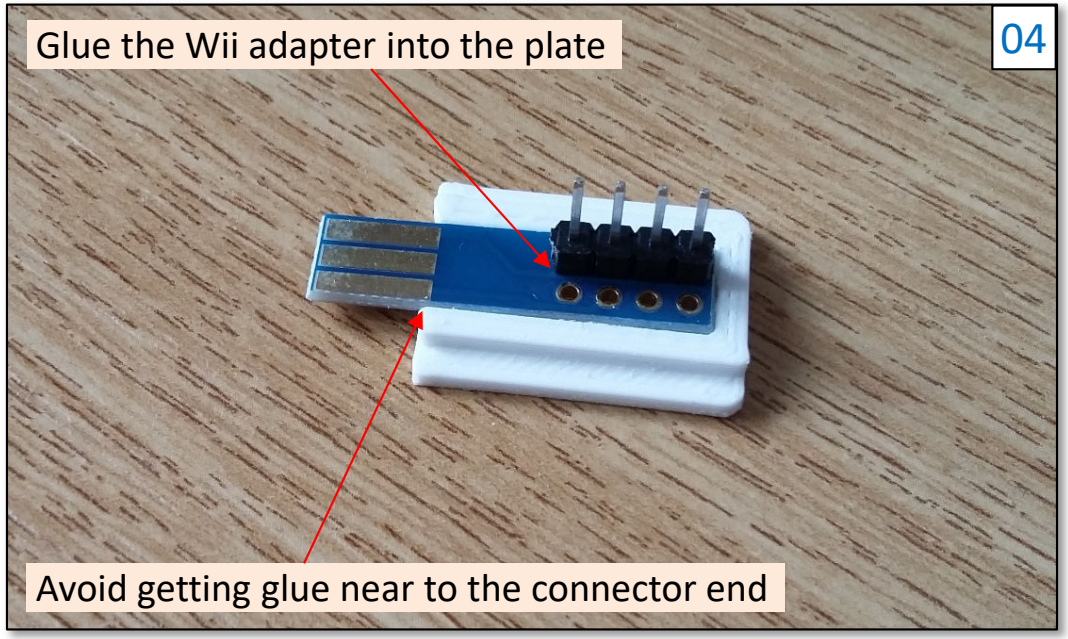
Released: 28/02/2023 TechKnowTone

Wiring Sequence Photos



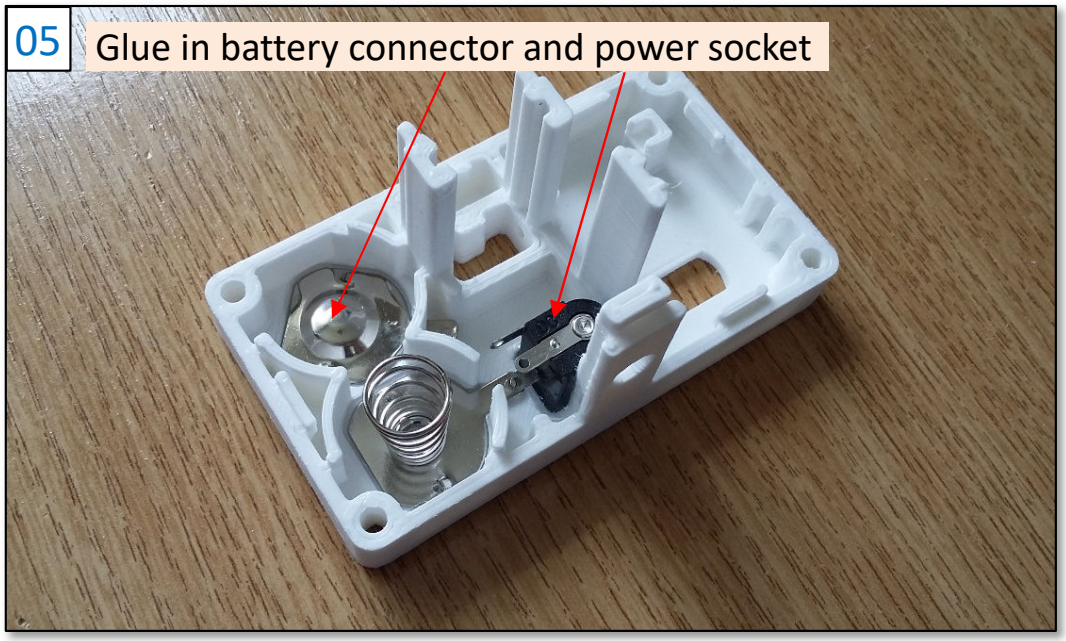


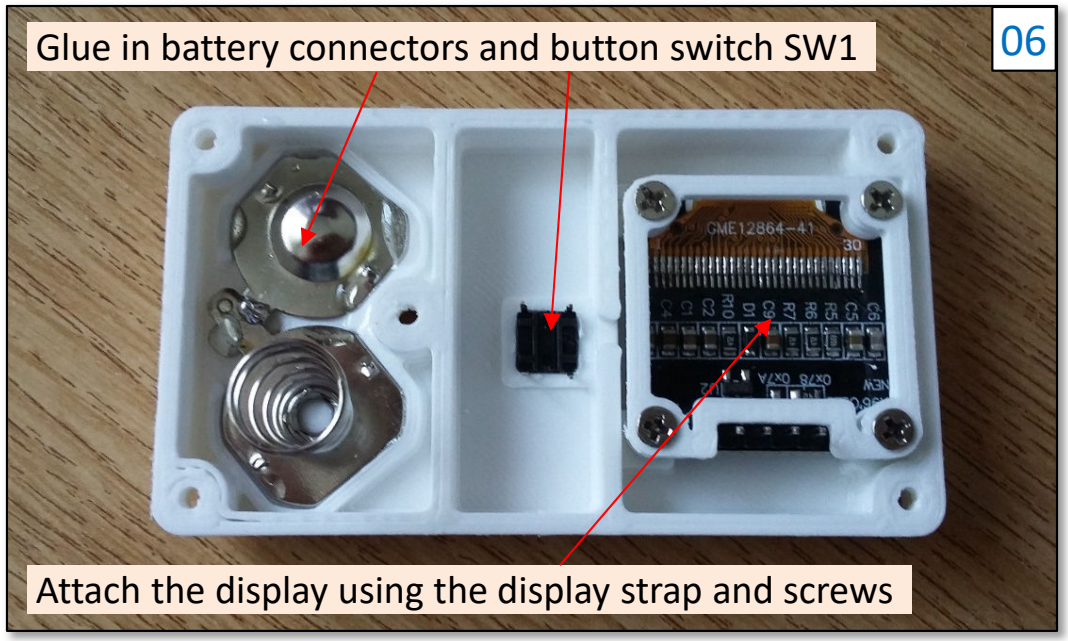


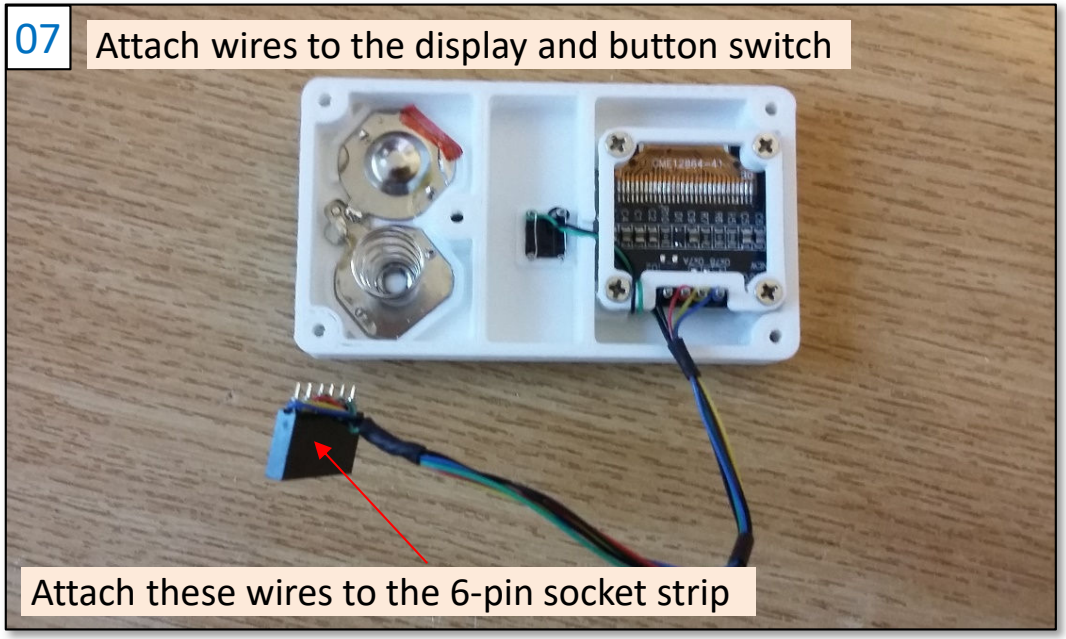


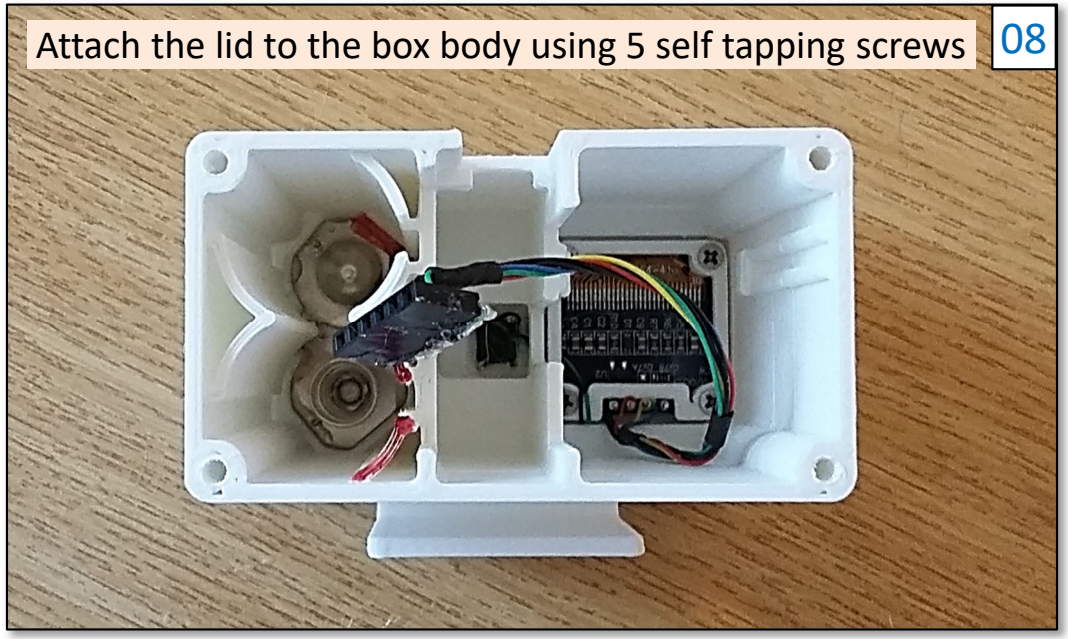
Released: 28/02/2023 TechKnowTone

Wiring Sequence



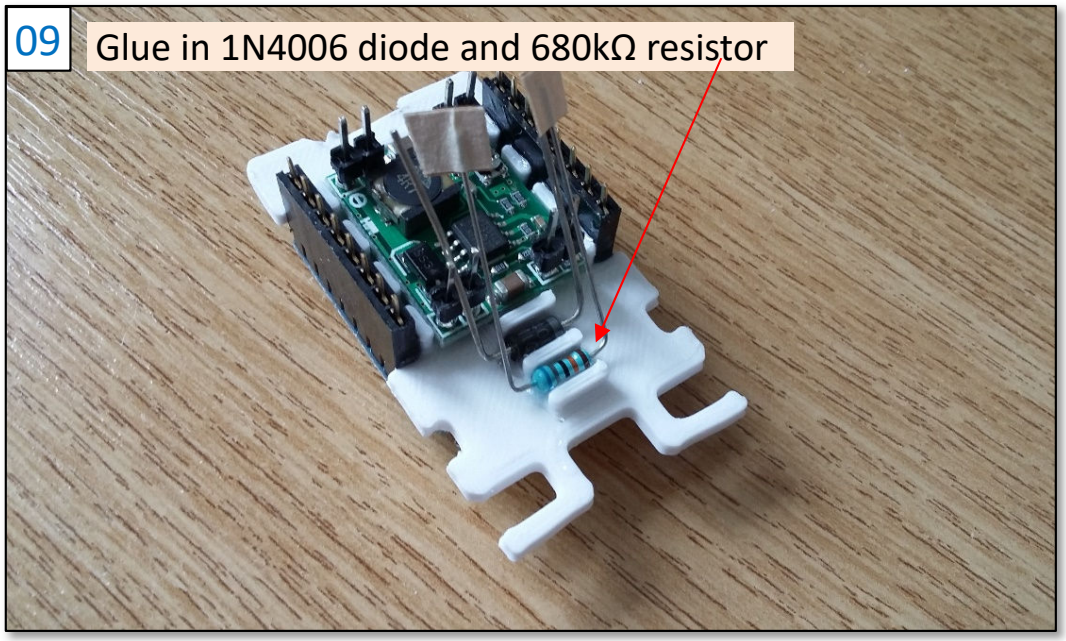




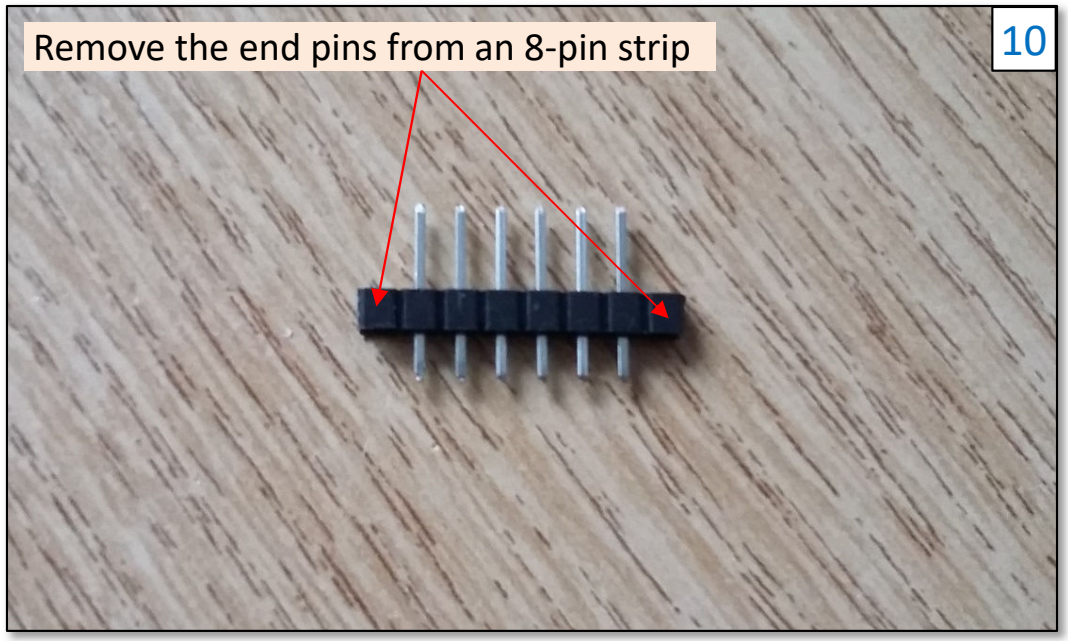


Wiring Sequence

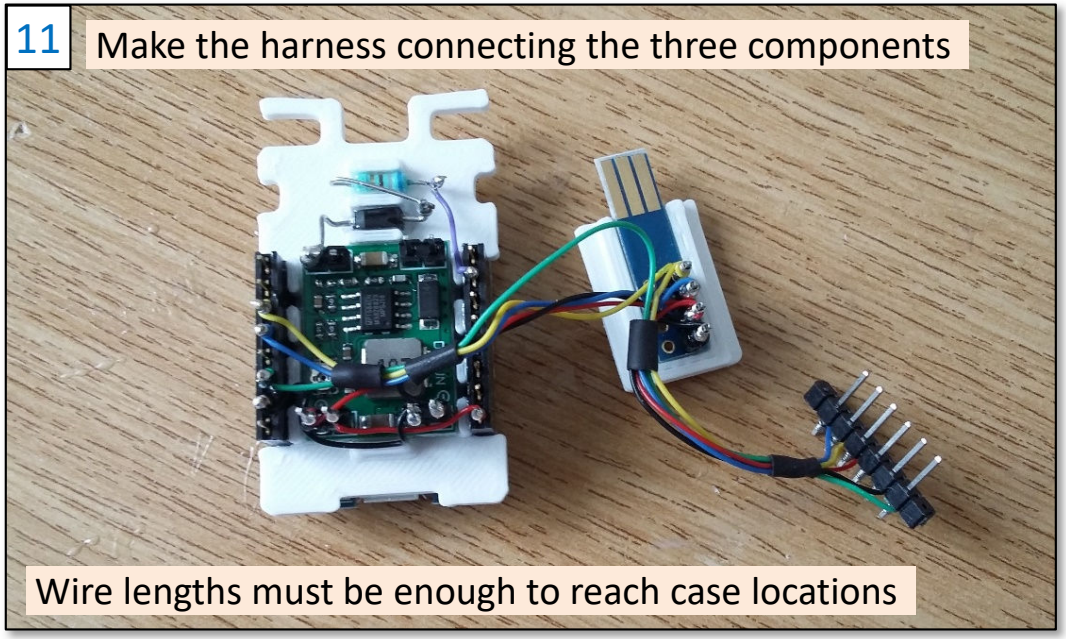
09 Glue in 1N4006 diode and 680kΩ resistor



10 Remove the end pins from an 8-pin strip

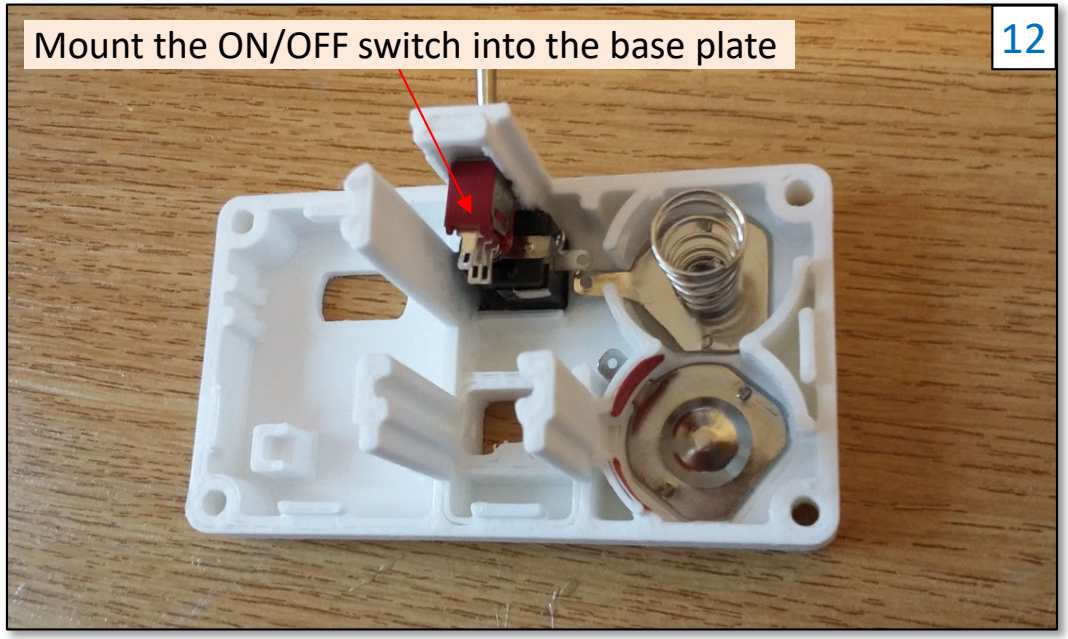


11 Make the harness connecting the three components



Wire lengths must be enough to reach case locations

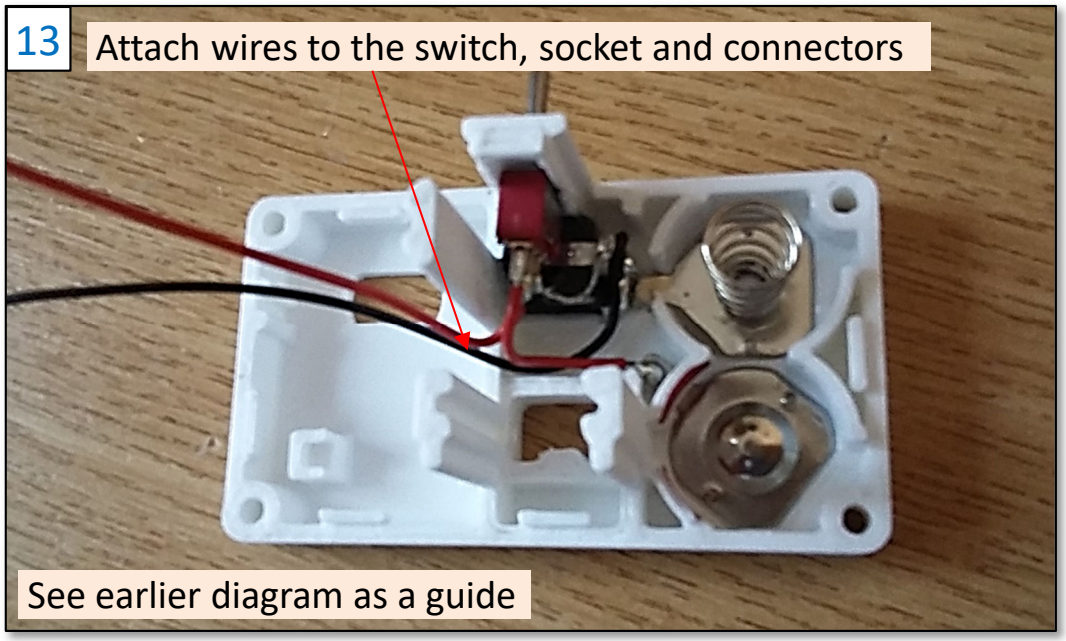
12 Mount the ON/OFF switch into the base plate



Released: 28/02/2023 TechKnowTone

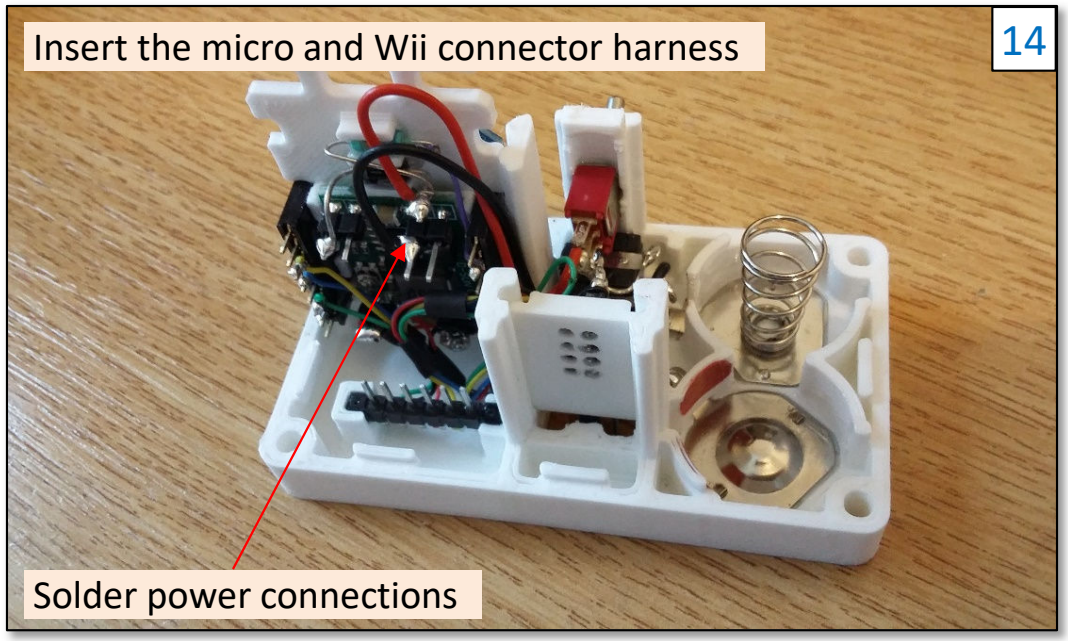
Wiring Sequence

13 Attach wires to the switch, socket and connectors



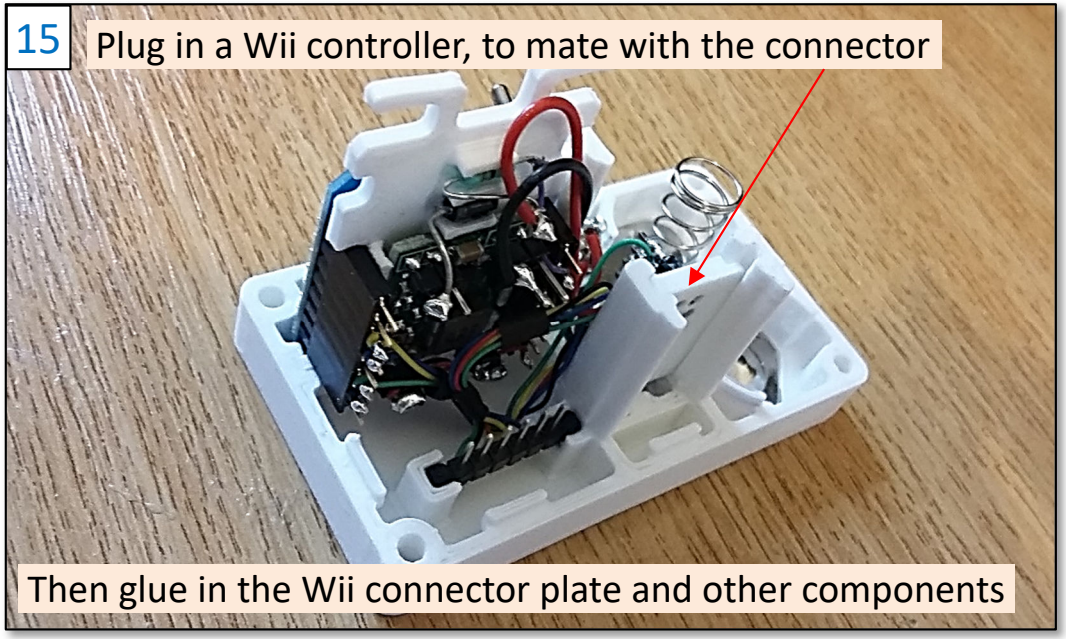
See earlier diagram as a guide

14 Insert the micro and Wii connector harness



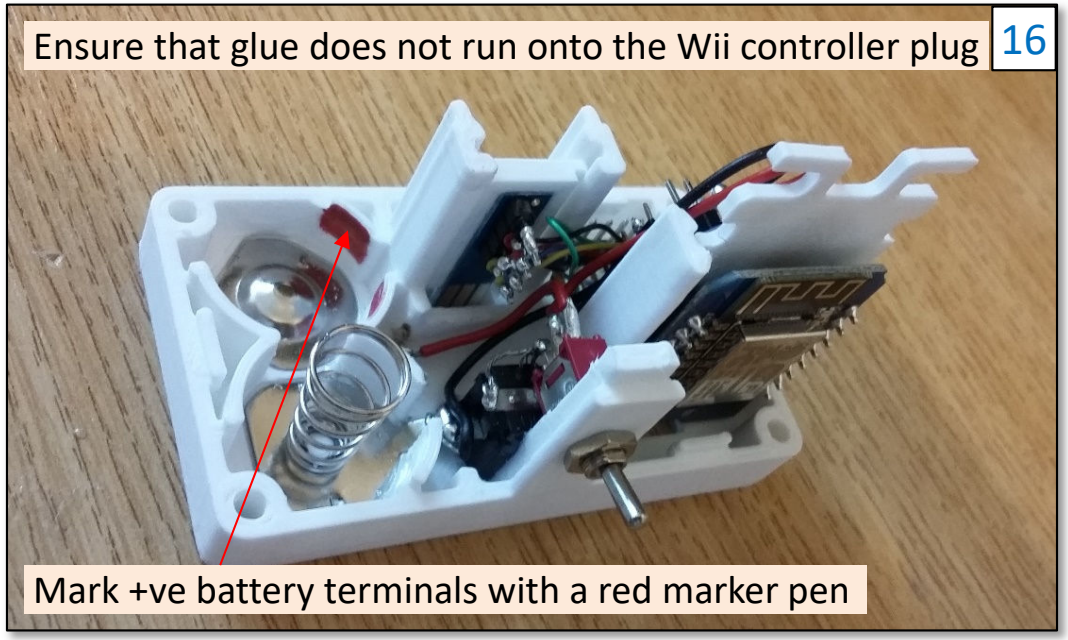
Solder power connections

15 Plug in a Wii controller, to mate with the connector



Then glue in the Wii connector plate and other components

16 Ensure that glue does not run onto the Wii controller plug

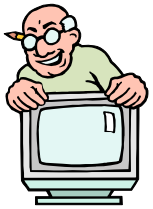


Mark +ve battery terminals with a red marker pen

2.4GHz

ESP NOW

All done, and ready for final testing.
Note that the benefit of using wire wrap is that you can test during the build process.



Battery Voltage Health Monitoring

See 18650 discharge curve obtained from the internet. In this analysis both batteries are identical and connected in series,
Assume fully charged batteries max voltage is V_{BM} >= 8.2v max
I measured fully recharged 18650 at 8.4v when connected and ON.
Set battery warning point at V_B = 7.00v
Set battery critical point at V_{BC} = 6.60v

WEMOS D1 is powered from DC-DC buck converter at 3.3v
It has internal resistor network of 220k + 100k, so 3.2v at A0 pin gives 1.0v at VADC == 1023 on 10-bit converter (1023 max).
If we use a 680k resistor feeding A0 we get 10.0v == 1023
Using a Multimeter I determined the conversion factor to be 1030

MAX: V_M = 8.2v, gives A0 = 839 on ADC (V_M* 102.3)

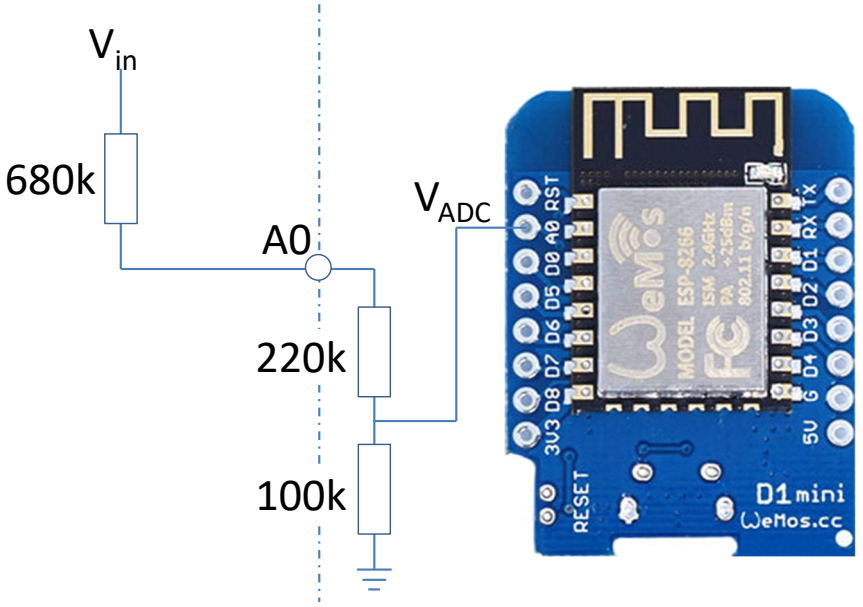
WARNING: V_B = 7.0v, gives A0 = 716on ADC (V_B* 102.3)

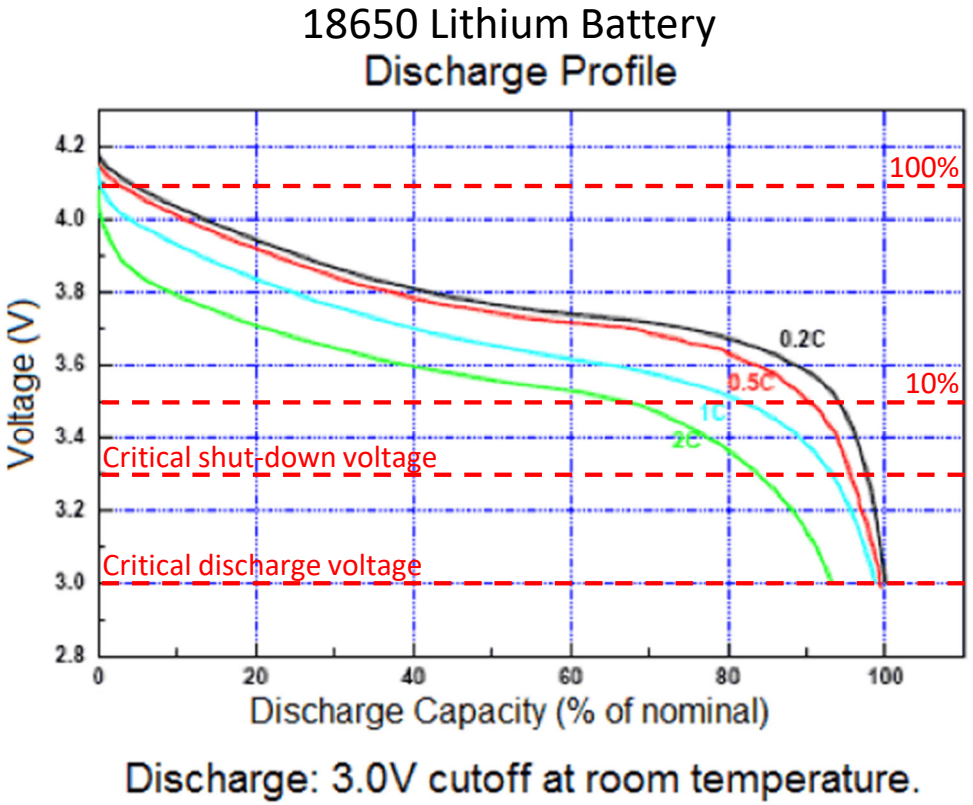
CRITICAL: V_{BC} = 6.6v, gives A0 = 675 on ADC (V_{BC}* 102.3)

The code will sample the battery voltage on power-up to ensure it is sufficient, then at every regular intervals, calculating an average to remove noise.

Given the relatively light current drawn I have assumed a linear discharge curve ranging from 8.2v (100%) to 6.6v (0%) capacity. The rate of discharge is monitored and used to actively predict the life of the battery in use.

Note: If connected to USB port with internal battery switched OFF the ADC will read a value much less than 5 volts. So if the micro starts with such a low reading it assumes that it is on USB power.





Discharge: 3.0V cutoff at room temperature.