

Home Appliance Hack-and-IoT Guidebook

**Affordable solutions with
the ESP8266 and 3D printing
*links listing***

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1. Introduction

1.4.3 Section 0: 4. emoncms installation

<https://emoncms.org>

1.4.4 Section 0: 5. MQTT (mosquitto) installation on a Raspberry Pi

<https://guide.openenergymonitor.org/technical/mqtt/>

2. Components

2.1.1 Wemos/Lolin in general

<https://www.wemos.cc/en/latest/d1/index.html>

2.1.2 Sleep Mode

https://www.espressif.com/sites/default/files/documentation/9b-esp8266-low_power_solutions__en.pdf (Link updated 2022-12-25)

2.2 Raspberry Pi

<https://www.raspberrypi.org/>

https://en.wikipedia.org/wiki/Raspberry_Pi

2.2.1 Raspberry Pi configuration

<https://www.raspberrypi.org/software/operating-systems/>

<https://www.raspberrypi.org/documentation/installation/>

<https://www.raspberrypi.org/documentation/remote-access/ssh/>

<https://www.putty.org/>

Xming: <https://sourceforge.net/projects/xming/>

VNC: <https://www.raspberrypi.org/documentation/remote-access/vnc/>

2.3 Neopixel Jewel 7

<https://www.adafruit.com/product/2226>

2.4 IKEA Grönö lamp

<https://www.ikea.com/gb/en/p/groenoe-table-lamp-frosted-glass-white-70373223/>

<https://www.ikea.com/gb/en/p/isbrytare-table-lamp-frosted-glass-white-30504947/>

2.5 SSR

https://en.wikipedia.org/wiki/Solid-state_relay

<https://www.sparkfun.com/products/13015>

2.6 Maxim DS18B20

<https://datasheets.maximintegrated.com/en/ds/DS18B20.pdf>

2.7 QRE1113 (Analog)

<https://www.sparkfun.com/products/9453>

2.8 Silabs MGM210L

<https://www.silabs.com/documents/public/data-sheets/mgm210l-datasheet.pdf>

2.9. SHT30 Shield

https://www.wemos.cc/en/latest/_static/files/sht30-dis_datasheet.pdf

https://www.wemos.cc/en/latest/d1_mini_shield/sht30.html

2.9.2 HP303B Shield

https://www.wemos.cc/en/latest/_static/files/hp303b_datasheet.pdf

https://www.wemos.cc/en/latest/d1_mini_shield/barometric_pressure.html

3. Arduino IDE installation

3.1 Standard Arduino IDE install.

<https://www.arduino.cc/en/Main/Software>

<https://www.arduino.cc/en/Guide/HomePage>

3.2 ESP8266 support

https://arduino.esp8266.com/stable/package_esp8266com_index.json

<https://github.com/esp8266/Arduino/releases>

https://www.wemos.cc/en/latest/tutorials/d1/get_started_with_arduino_d1.html

3.3 SPI Flash File (SPIFFS) system install

<https://github.com/esp8266/arduino-esp8266fs-plugin#arduino-esp8266-file-system-uploader->

<https://github.com/esp8266/arduino-esp8266fs-plugin/releases/tag/0.4.0>

3.4 Alternatives to the SPI Flash File.

<https://github.com/earlephilhower/arduino-esp8266littlefs-plugin/releases>

4. emoncms installation

<https://emoncms.org/>

<https://github.com/openenergymonitor/emonpi/wiki/emonSD-pre-built-SD-card-Download-&-Change-Log>

<https://openenergymonitor.org/> (Link updated 2022-12-25)

<https://github.com/emoncms/emoncms/blob/master/docs/RaspberryPi/readme.md>

<https://www.raspberrypi.org/downloads/raspbian/>

<https://www.raspberrypi.org/documentation/installation/installing-images/README.md>

4.2.1 MariaDB & apache.

<https://stackoverflow.com/questions/43379892/mariadb-cannot-login-as-root>

4.2.2 phpMyAdmin

<http://<rpi-ip-address>/phpmyadmin>

4.2.3 PECL

<https://github.com/igbinary/igbinary>

https://httpd.apache.org/docs/2.4/mod/mod_rewrite.html

<https://redis.io/topics/introduction>

<https://httpd.apache.org/docs/2.4/mod/core.html>

4.3 emoncms code

<https://git-scm.com/>

4.3.1 Configure emoncms

<http://<rpi-ip-address>/emoncms>

4.4 emoncms modules.

4.4.1 Dashboard

<https://github.com/emoncms/dashboard/>

4.4. 2 Graph

`/var/www/emoncms/Modules/graph/Readme.md`

<https://github.com/emoncms/graph>

4.4.3 Apps

<https://github.com/emoncms/app>

4.5 Documentation.

<https://github.com/emoncms>

<https://github.com/emoncms/emoncms>

<https://community.openenergymonitor.org/c/emoncms/showcase>

5. MQTT (mosquitto) installation on a Raspberry Pi

<http://mqtt.org/faq>

<https://mosquitto.org/>

5.1. Installation of the Mosquitto broker.

<http://repo.mosquitto.org/debian/>

5.4. Installation of the Mosquitto client (Windows PC)

<http://www.mqttfx.org/>

8. ESP8266 watchdogs

8.2. Loop watchdog

<https://mongoose-os.com/blog/esp8266-watchdog-timer/>

https://sigmdel.ca/michel/program/esp8266/arduino/watchdogs2_en.html

<https://github.com/sstaub/Ticker>

<https://www.esp8266.com/viewtopic.php?p=2096#p2112>

8.2.1. Boot reason

https://www.espressif.com/sites/default/files/documentation/esp8266_reset_causes_and_common_fatal_exception_causes_en.pdf

https://www.sigmdel.ca/michel/program/esp8266/arduino/watchdogs_en.html#ESP8266_WDT_RECOV

<https://github.com/esp8266/Arduino/releases>

https://www.sigmdel.ca/michel/program/esp8266/arduino/watchdogs3_en.html

9. ESP8266 Over The Air – update/programming (OTA).

<https://www.arduino.cc/reference/en/libraries/arduinoota/>

9.1.3.2. Firmware update

<http://webupdate.local/update>

<http://webupdate.local/>

<http://<xx>.html> page.

http://<IP-address>/NEOPixel_new_20210228.html

9.1.3.3. Filesystem build

```
httpUpdater.setup(&httpServer, update_path,  
update_username, update_password); // OTA
```

<http://webupdate.local/update>

10. ESP8266 WiFi antenna

10.5. DIY Yagi antenna. (2.4 GHz)

<https://www.ab9il.net/wlan-projects/wifi6.html>

<http://fermi.la.asu.edu/w9cf/yagipub/index.html> (SLOW response 2022-12-25)

10.7. Further studying

<https://www.allaboutcircuits.com/projects/all-about-omnidirectional-wi-fi-antennas/>

<https://fabioaltieri.com/2012/06/02/diy-cheap-internal-wifi-antenna/>

<https://www.digikey.com/en/articles/techzone/2012/nov/selecting-antennas-for-embedded-designs>

<https://circuitdigest.com/article/how-to-design-a-pcb-antenna-for-24ghz>

<https://www.silabs.com/documents/public/application-notes/an1088-designing-with-pcb-antenna.pdf>

https://www.st.com/content/ccc/resource/technical/document/application_note/group0/ce/a6/df/76/3e/71/45/b2/DM00470410/files/DM00470410.pdf/jcr:content/translations/en.DM00470410.pdf

<https://www.ti.com/lit/pdf/swra117?keyMatch=AN043>

11. ESP8266 housing.

11.1. LOLIN D1 mini standard housing.

https://www.wemos.cc/en/latest/d1/d1_mini.html

12. VPN gateway.

12.1. Firewall configuration.

<https://openvpn.net/community-downloads/>

12.2. Raspberry Pi configuration

<https://www.raspberrypi.org/software/operating-systems/#raspberry-pi-os-32-bit>

14. IKEA hack

14.2.1. Additional libraries

https://github.com/adafruit/Adafruit_NeoPixel

<https://learn.adafruit.com/adafruit-neopixel-uberguide/arduino-library-use>

14.2.3.1. WEB interface

http://<IP-address>/NEOPixel_new_20210228.html

http://IKEA-webupdate.local/NEOPixel_new_20210228.html

14.2.6.4. Fade

<https://www.elektormagazine.com/magazine/elektor-60/41945/>

https://en.wikipedia.org/wiki/Weber%E2%80%93Fechner_law

15. Door lock monitor

15.3.2. Emoncms dashboard.

<http://<rpi-ip-address>/emoncms/input/api>

[http://172.16.0.11/emoncms/input/post?node=DL1&fulljson={"LockStatus":1}&apikey=4eaed071560b279737c4db67341ffc38](http://172.16.0.11/emoncms/input/post?node=DL1&fulljson={)

15.3.3. MQTT wemos firmware

<https://learn.adafruit.com/mqtt-adafruit-io-and-you/overview>

https://github.com/adafruit/Adafruit_MQTT_Library

15.3.3.1. MQTT client publisher

<https://mosquitto.org/man/mqtt-7.html>

<https://www.hivemq.com/blog/mqtt-essentials-part-6-mqtt-quality-of-service-levels/>

16. Energy sensor

<https://shop.openenergymonitor.com/optical-utility-meter-led-pulse-sensor/> (Link updated 2022-12-25)

16.2. Dashboard.

<http://<rpi-ip-address>/emoncms/input/api>

[http://172.16.0.11/emoncms/input/post?node=power1&fulljson={"PULSECOUNT":1}&apikey=4eaed071560b279737c4db67341ffc38](http://172.16.0.11/emoncms/input/post?node=power1&fulljson={)

17. Refrigerator control

<https://www.brewpi.com/fridge-hacking-guide/>

17.5. Dashboard

<http://rpi-ip-address/emoncms/input/api>

[http://172.16.0.11/emoncms/input/post?node=refrigerator&fulljson={"ONOFF":1}&apikey=4eaed071560b279737c4db67341ffc38](http://172.16.0.11/emoncms/input/post?node=refrigerator&fulljson={)

[http://172.16.0.11/emoncms/input/post?node=refrigerator&fulljson={"temp":14.19}&apikey=4eaed071560b279737c4db67341ffc38](http://172.16.0.11/emoncms/input/post?node=refrigerator&fulljson={)

18. Greenhouse thermostat

18.3.2. Wemos firmware

<https://www.hacktronics.com/Tutorials/arduino-1-wire-address-finder.html>

18.5. Dashboard

<http://<rpi-ip-address>/emoncms/input/api>

[http://172.16.0.11/emoncms/input/post?node=greemhouse&fulljson={"ONOFF":1}&apikey=4afb11973ac2b3375ccf3589fca6d32e](http://172.16.0.11/emoncms/input/post?node=greemhouse&fulljson={)

[http://172.16.0.11/emoncms/input/post?node=greenhouse&fulljson={"tempIn":14.19,"tempOut":12.10}&apikey=4eaed071560b279737c4db67341ffc38](http://172.16.0.11/emoncms/input/post?node=greenhouse&fulljson={)

19. 230AC Relay control

19.2.2. Relay

<http://progeny.co.uk/back-emf-suppression/>

19.2.4. Alternative 230VAC relay On/Off construction.

<https://www.instructables.com/ESP8266-5-internet-controlled-switch/>

<https://myesp8266.blogspot.com/2015/04/first-iot-device.html?sref=pi&m=1>

20. Standalone temperature sensor.

20.1.2.1. Wemos firmware.

<http://<device-IP-address>> or

<http://esp8266-webupdate.local/firmware>

20.1.3. Sleep-mode enabled software.

20.1.3.1. Hardware sleep-mode differences and setup.

https://www.wemos.cc/en/latest/d1_mini_shield/battery.html

21. Temperature, Pressure, and humidity sensor.

21.1. Schematic.

https://www.wemos.cc/en/latest/d1_mini_shield/tft_i2c_connector.html

21.2.1. Additional libraries.

21.2.1.1. HP303B.

https://github.com/wemos/LOLIN_HP303B_Library

21.2.1.2. SHT3x

https://github.com/wemos/WEMOS_SHT3x_Arduino_Library

https://www.wemos.cc/en/latest/d1_mini_shield/sht30.html

21.2.3. WEB interface

<http://< IP address>/firmware>.

21.3. Dashboard

<http://172.16.0.11/emoncms/input/post?node=Combi&fulljson={%22temp%22:22.46,%22press%22:100735,%22humid%22:45.64}&apikey=4afb11973ac2b3375ccf3589fca6d32e>

22. IKEA Trådfri controller.

22.2 *Getting the IKEA trådfri modules*

<https://www.ikea.com/gb/en/p/tradfri-led-bulb-e27-250-lumen-wireless-dimmable-warm-white-globe-clear-00517630/>

<https://www.silabs.com/documents/public/data-sheets/mgm210l-datasheet.pdf>

<https://github.com/basilfx/TRADFRI-Hacking/blob/master/MODULES.md#mgm210l>

<https://uk.farnell.com/search?st=mgm210l>

22.3 *Schematic*

<https://www.microchip.com/en-us/product/MCP23017>

22.5.2 WEB interface.

<http://<IP address>/index.html>

23. Troubleshooting

https://www.espressif.com/sites/default/files/documentation/Espressif_FAQ_EN.pdf (document missing as of 2022-12-25)

Can be found here:

<https://github.com/CHERTS/esp8266-devkit/tree/master/Espressif/docs/ESP8266>

23.1.4 USB cables

<https://www.elektormagazine.com/news/review-the-um25c-usb-tester-with-color-lcd-and-bluetooth/18299>

23.4 *emoncms*

<https://github.com/emoncms>

<https://github.com/emoncms/emoncms>