Urban AirQ / Making Sensor

**Technical Report Sensor Kit**

Within the execution of Urban AirQ / Making Sensor project we developed a sensor kit that could answer to the citizen request during the air quality pilot study.

This document will be structure in the following sections:

* Background
* Technical Requests and Specs of the kit
  + Sensors
  + Boards
* Code
* Production Line
* Issues
* First tests

**Background**

Many of the technical choices we made for the development of the kit are based on the ASCL project: <http://www.hindawi.com/journals/js/2016/5656245/>.

Starting from that experience and the hardware that has been used, we decided to use similar electronic parts but also to improve and integrate more functions.

From ASCL we kept:

* The main board, Arduino Uno. It’s open-hardware board for fast-prototyping applications. Nowadays it represents the simplest approach to electronic and programming on the market. We opted for Arduino Uno with the idea that anyone should be capable to reproduce and adapt our kit for his own application.
* The NO2 sensor

Some of the technical aspects that we wanted to improve are:

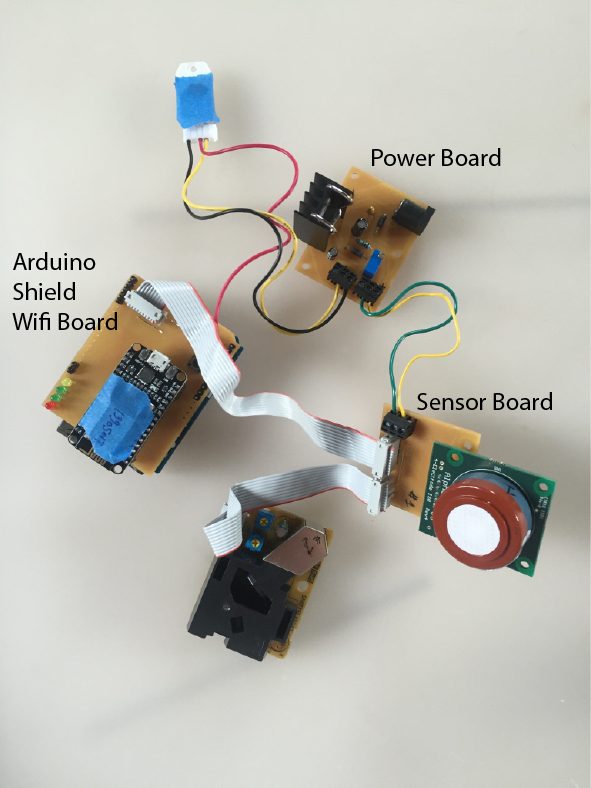
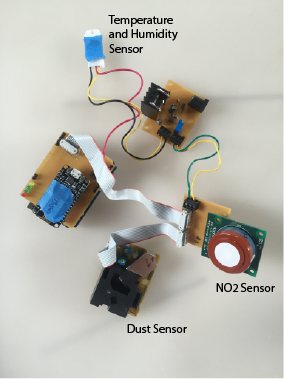
* 9V battery supply for portable application and 5V USB power for stationary application.
* SD card data logger shield
* transparent acrylic case

**Technical Requests and Specs**

General requests:

* Modular solution: a kit that is assembled by smaller parts (boards). These parts should be easily plugged, swapped and modified.
* Wireless data collection: the idea is independent from physical support or memory limitation while the kit is running.
* Power supply: stable and fast power management.

The Kit is so composed by five boards and four sensors.

**Sensors**

- NO2 🡪 NO2-B42F and NO2-B43F, Alphasense

- Particulate Matter 🡪 PPD42NS, Shinyei

- Temperature and Humidity 🡪 DHT22, Aosong Electronics Co.

**NO2 Sensor – NO2-b42F/ NO2-b43F**

To get full sensor performance, low noise interface electronic is necessary. Alphasense offers indeed also a support circuit (ISB) that can be used to optimize the reading of low ppb levels and guarantee low noise environment. For time and resource matter, we decided to buy the sensors already soldered on their ISB (Individual Sensor Board).

Sensor Datasheet: <http://www.alphasense.com/WEB1213/wp-content/uploads/2016/07/NO2-B43F.pdf>

ISB Datasheet: <http://www.alphasense.com/WEB1213/wp-content/uploads/2016/06/ISB.pdf>

References: <http://www.alphasense.com/index.php/products/nitrogen-dioxide-2/>

Note: the pdf documents can also be found in the github repo.

**Particulate Matter Sensor - PPD42NS**

Sensor Datasheet: <http://www.seeedstudio.com/wiki/images/4/4c/Grove_-_Dust_sensor.pdf>

References: <http://takingspace.org/wp-content/uploads/ShinyeiPPD42NS_Deconstruction_TracyAllen.pdf>

Note: the pdf documents can also be found in the github repo.

**Temperature and Humidity – DHT22**

Sensor Datasheet: <https://www.sparkfun.com/datasheets/Sensors/Temperature/DHT22.pdf>

Note: the pdf documents can also be found in the github repo.

**Boards**

- Main board 🡪 Arduino Uno

- Wifi Module 🡪 ESP8266

- Shield -> designed and produced in Fablab Amsterdam

- Sensor Board -> designed and produced in Fablab Amsterdam

- Power Board -> designed and produce in Fablab Amsterdam

The image below shows the general block diagram of the kit.

**Main board**

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**Wifi module**

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**Shield**

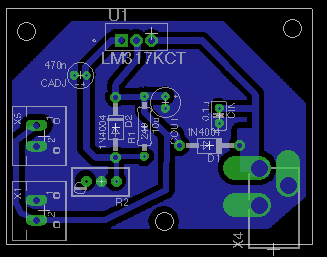
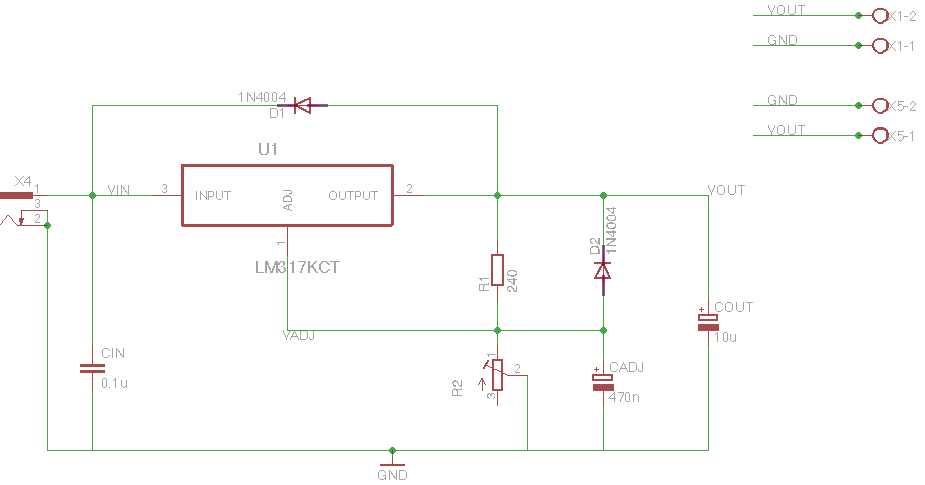
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**Sensor Board**

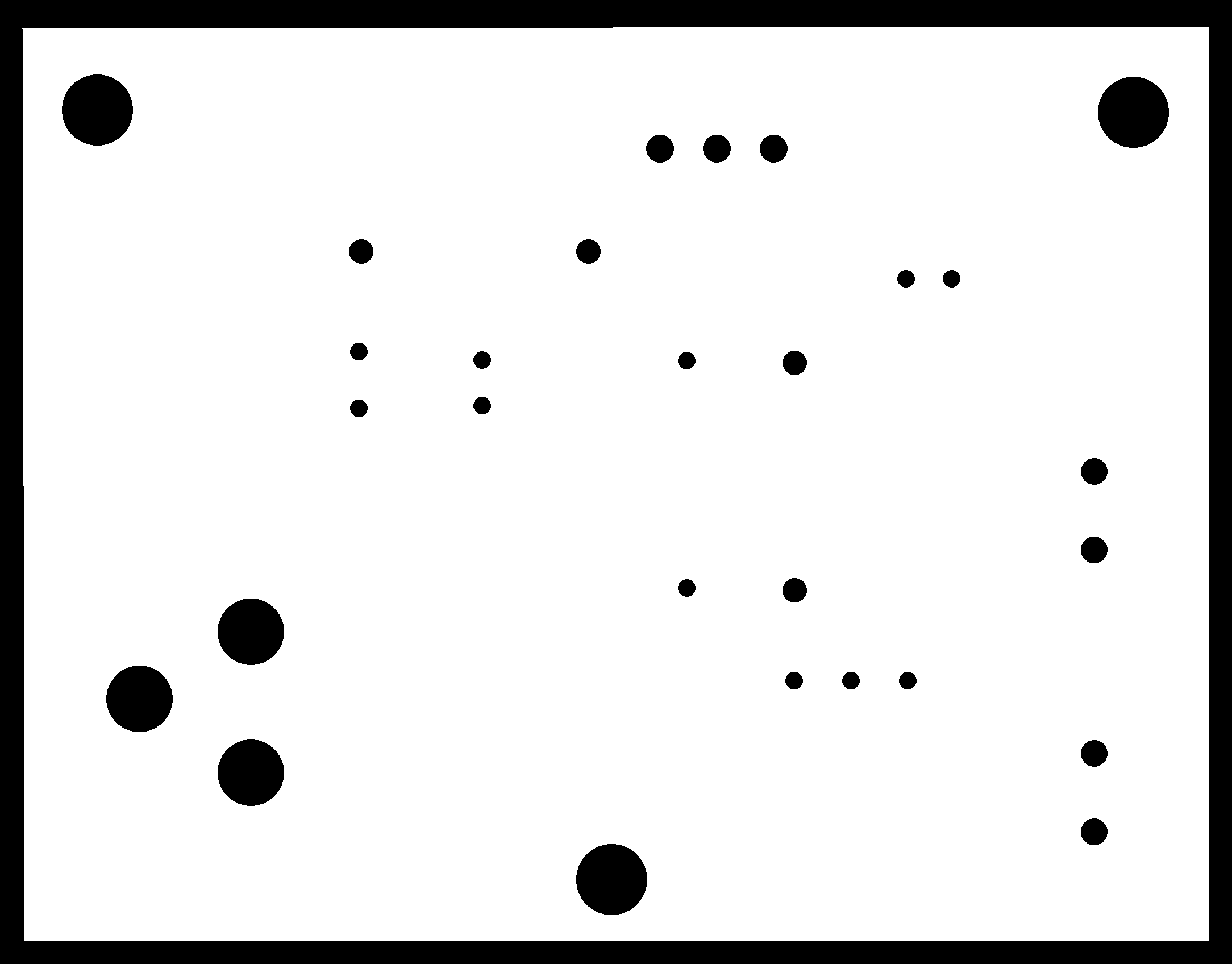
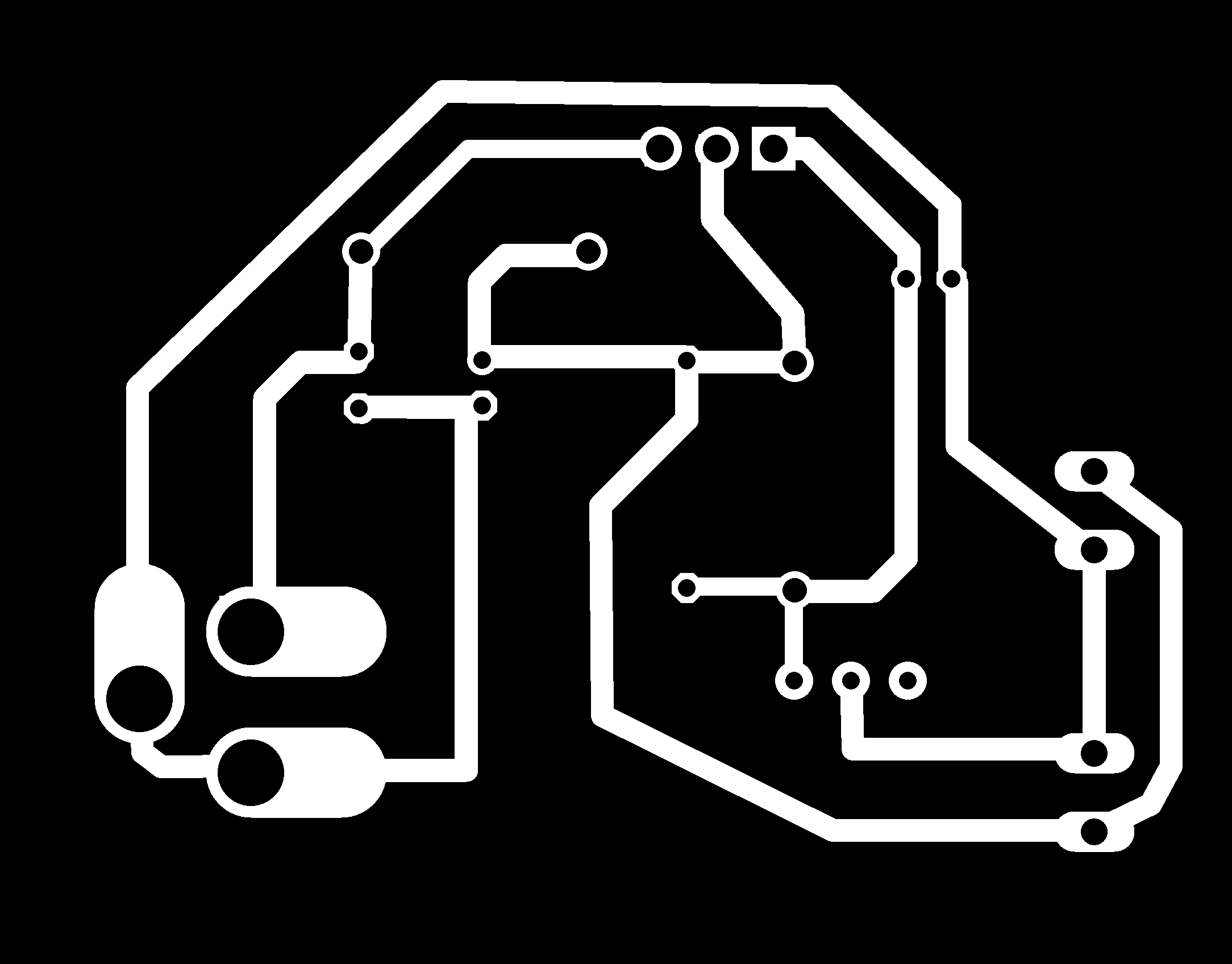
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**Power Board and Power Management**

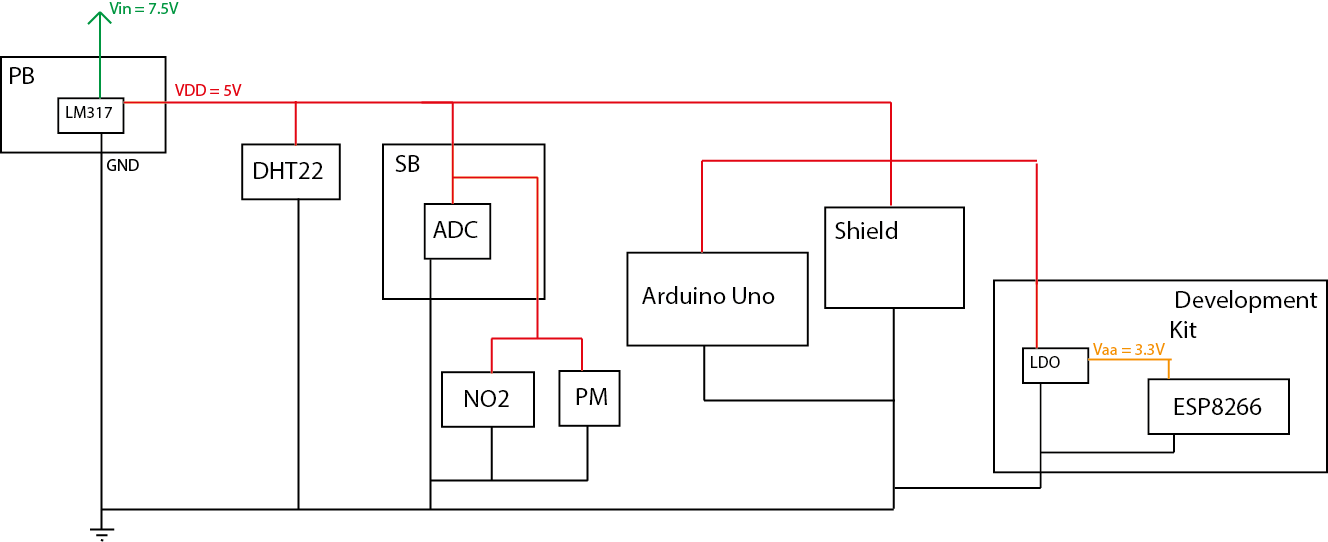
Schematic and Layout



Machine files



Power Management block diagram



**Power Board and Power Management**

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