Camper Ghillie

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2015 F350 / 2018 NL 9’6”

Dec 1, 2019

Camper Ghillie Features

Legend
- Not yet in-scope
- Not yet done
- Not yet designed

--tg Dec 1, 2019

Temperature & Atmospheric Sensors

- Outside – temp, humidity, solar DS18B20 Waterproof case
- Cabin – temp @ ceiling/floor/bed, humidity, baro, VOC air quality BME680
- Basement – temp @ black/gray/fresh/sink vaults and more DS18B20
- Tanks – temp @ black DS18B20
- Furnace – temp @ output port, mostly to detect furnace on/off

Wet Levels

- Water – black/gray/fresh… to see usage by event and over time
- Power – solar output, charger output, battery levels, battery charge rate, battery draw rate, power draw rate. Four shunt setup provides more details
- Propane – with just-filled reset button (still need to validate novel approach)

Crawl Space Freeze Guard

- Small PC fans (12V, 75ma, 26CFS) and mini heaters (bulb or heater elements) to keep crawl space plumping and tanks from freezing while parked at home during mild winter conditions (say to 15F / -10C), Get temp grid online first so that the needs and approaches can be explored

Shower Miser

- Body-perfect hot water – no hot/cold mixing/wasting on inside and outside faucets DS18B20 High temp case x1

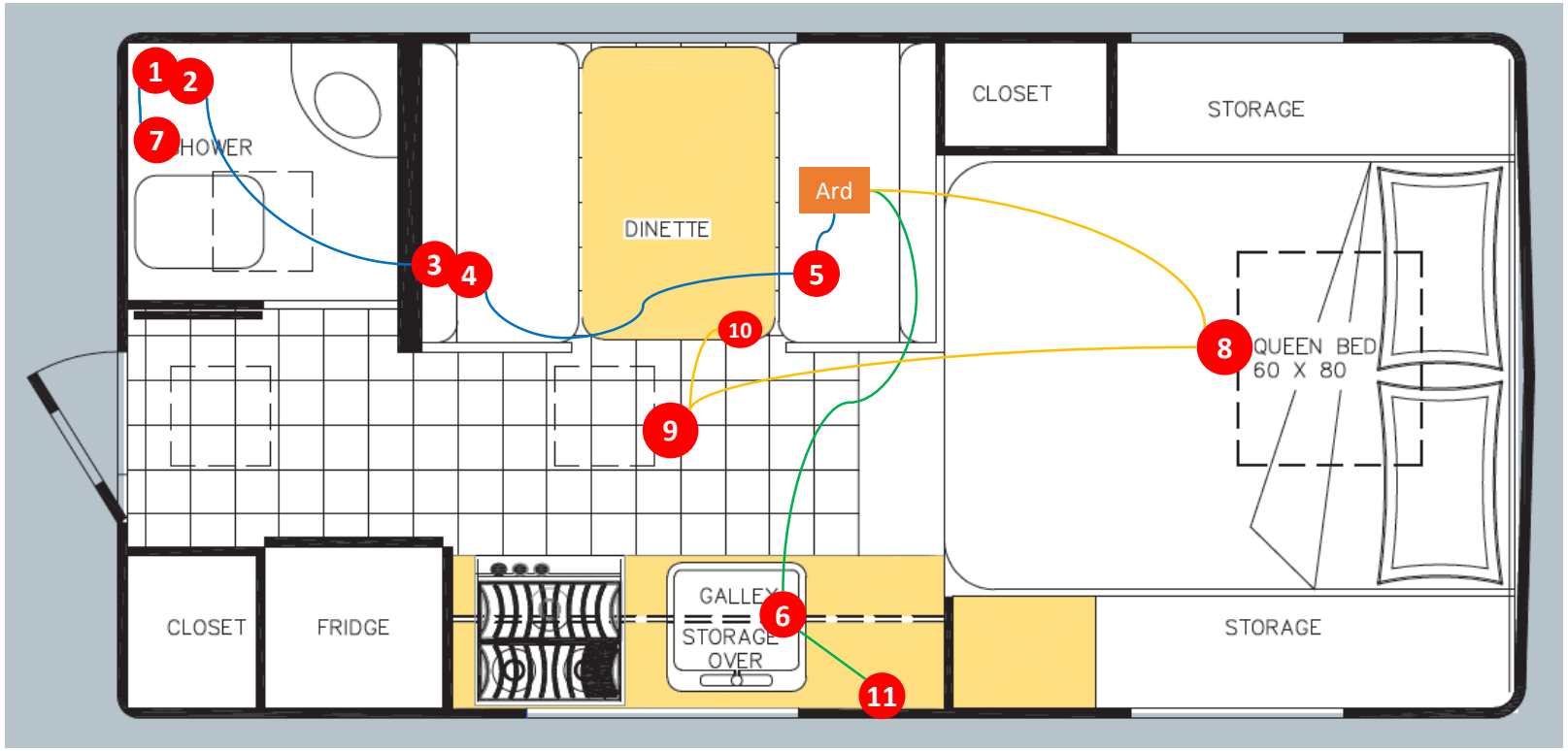
Other

- Atmospheric gas monitors – above and beyond VOC air quality
- G forces, spill monitors, security alarm, other

Generic Attributes

- **Data-log and store locally, uplift telemetry to cloud via WiFi for analysis**
- E-mail alerts (e.g. water vaults approaching outside freezing temps)
- In-cabin audible and LCD-display alerts
- Trending and prediction to empty/full where appropriate
- *Use ESP8266 with WiFi to start, turn on extreme power conservation features*
- *Consider ESP32 to gain Bluetooth and more GPIO. Needs more power ☹*
- *Avoid Raspberry PI due to power draw*

Sensor Positions and Wiring

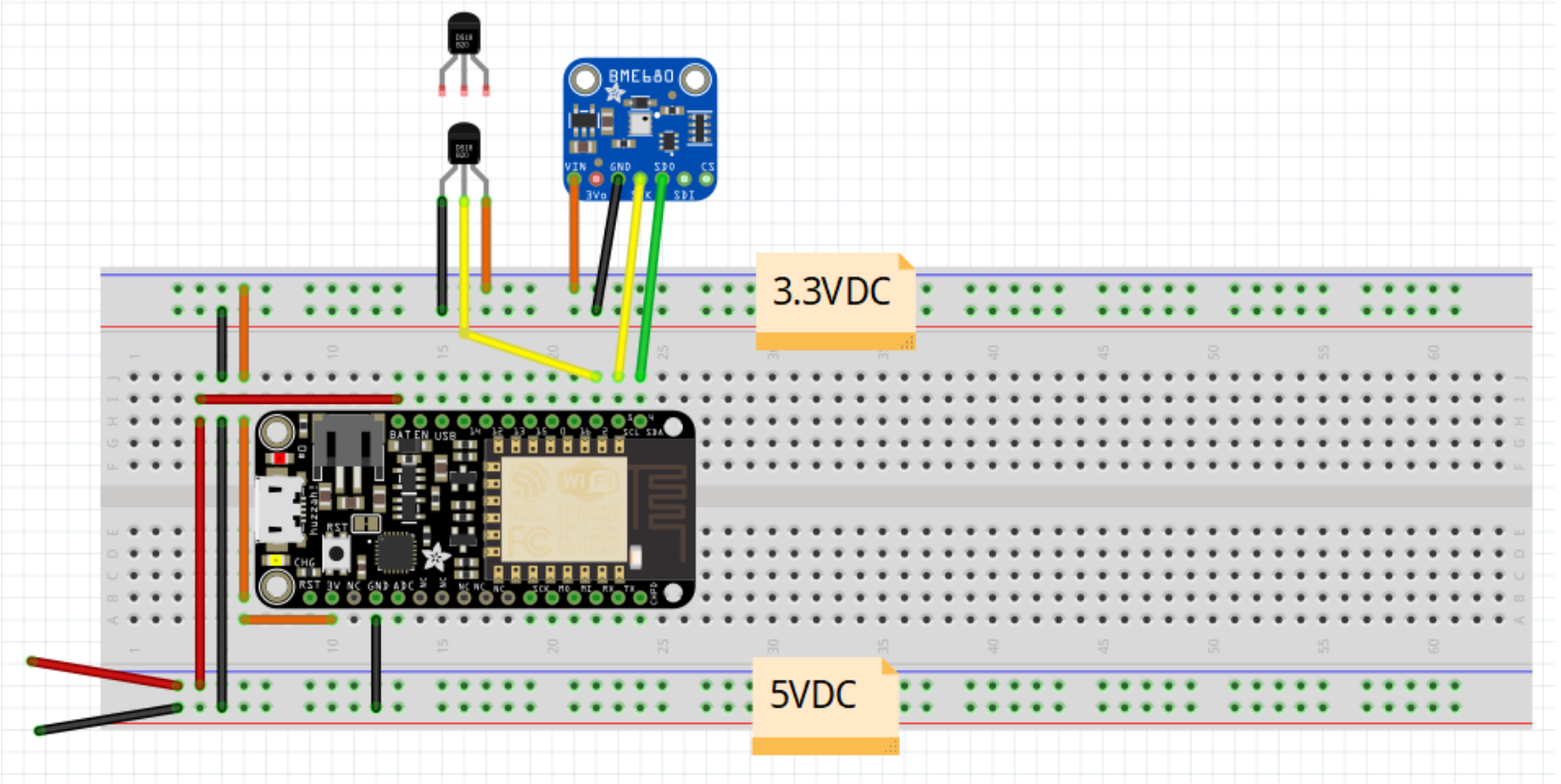


1) Black vault down-low air
2) Black tank surface at 1/4 full position *
3) Gray vault down-low air
4) Fiberglass inner surface near gray vault **
5) Fresh vault down-low air
6) Sink vault air
7) Heater vent output (using 1 of 2 two-inch basement vents) ***
8) Bedroom head-high air TO BE WIRED
9) Cabin head-high air
10) Cabin ankle-high air TO BE WIRED
11) Outside air circa propane vent ****

** See water thermal-mass aspects*
*** See surface v free air diffs, consequences for water line mounts*
**** Mostly to see propane furnace on/off*
***** Minor concern about propane tank cooling effects*

Sensors equalized to +/- 0.1F of each other, about 0.1F steps, about +/- 1.0F accuracy over well below freezing to near boiling temp

ESP8266 Arduino Fritzing Diagram (Copy)



Sensors

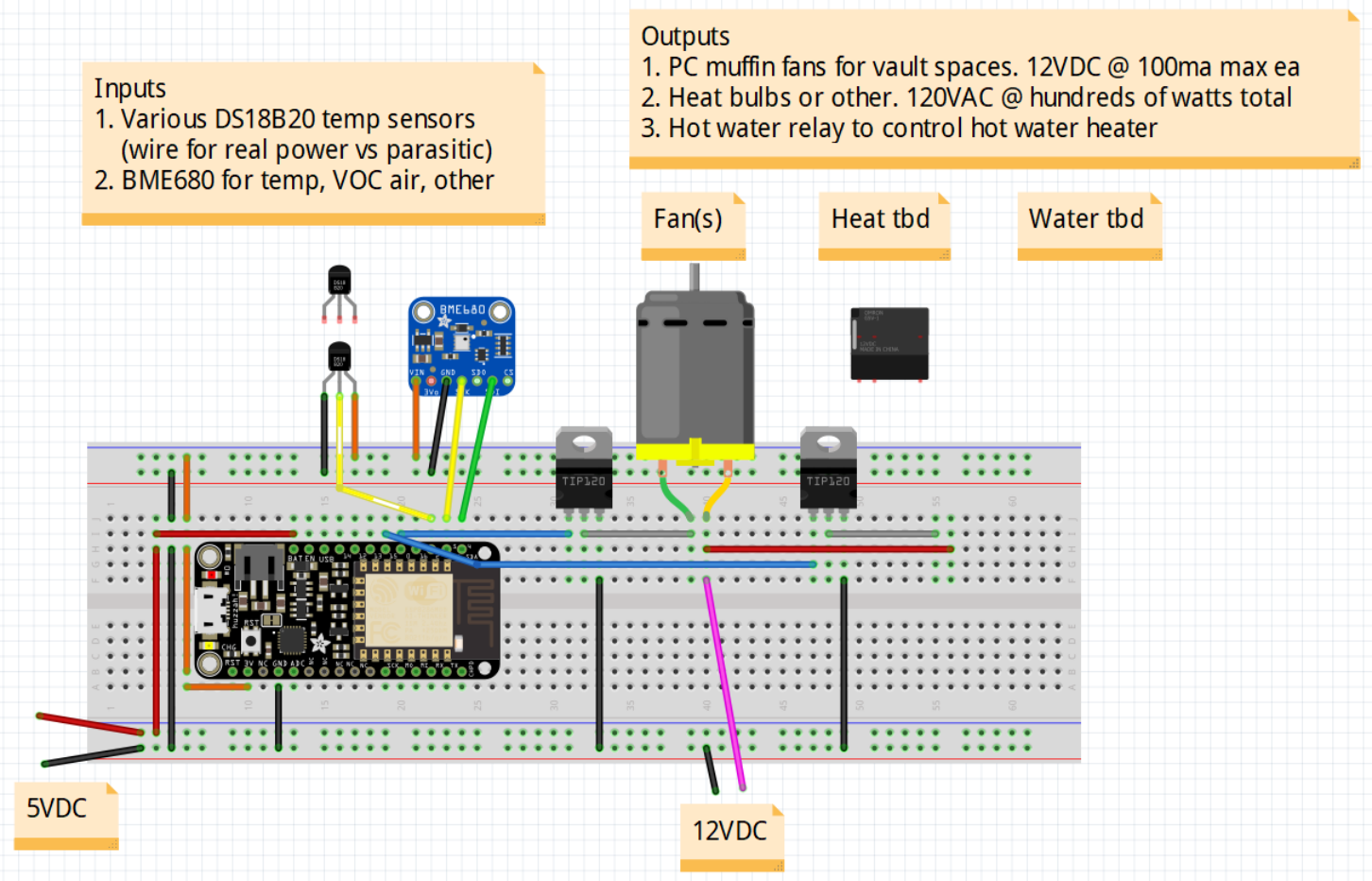
- DS18B20 temp sensors x11
- BME680 for humidity, barometric, altitude and VOC-gas sensing x1
- Simple low-voltage 24ga wires around camper

ESP8266 Arduino

- Wi-Fi to home LAN
- Sensor data streamed to Adafruit MQTT Service every 15 seconds
- Live MQTT dashboards
- Data download to MS-Excel for better analysis and graphing

Adafruit has a free/paid MQTT service. I'm trying to stay at the free feed count and data quantity level, in part by cramming all sensor data into a CSV string and treating it as a single feed bound for MS-Excel --tg

ESP8266 Arduino Fritzing Diagram 2 (Copy)

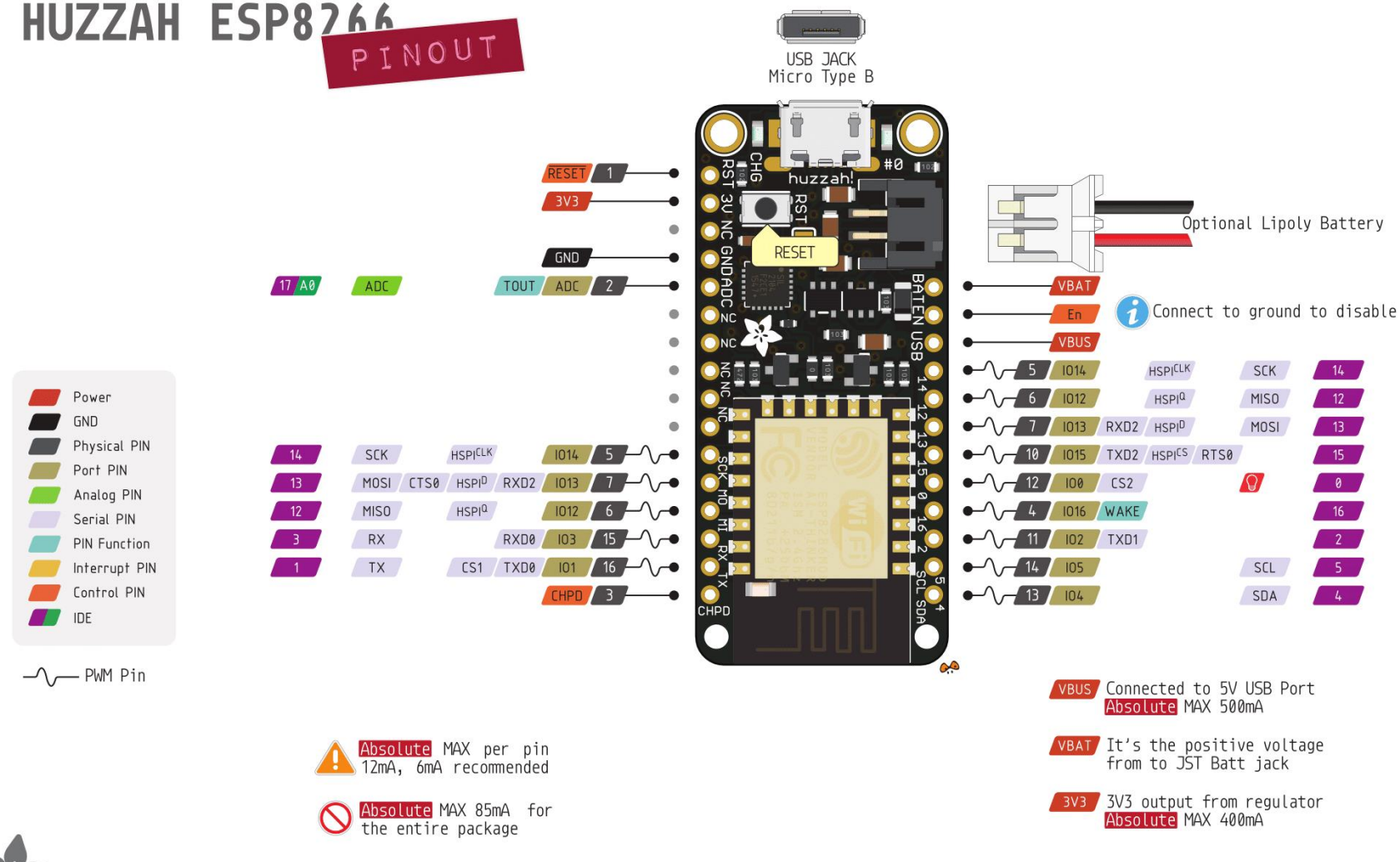


Future intentions…

- Add micro PC fan(s) to aid heating in the basement/vault spaces during below freezing weather
- Add water heater sensing and control for Shower Miser feature

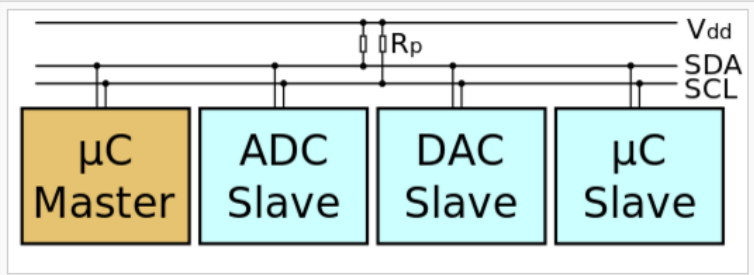
Helper Diagrams

feather HUZZAH ESP8266 PINOUT

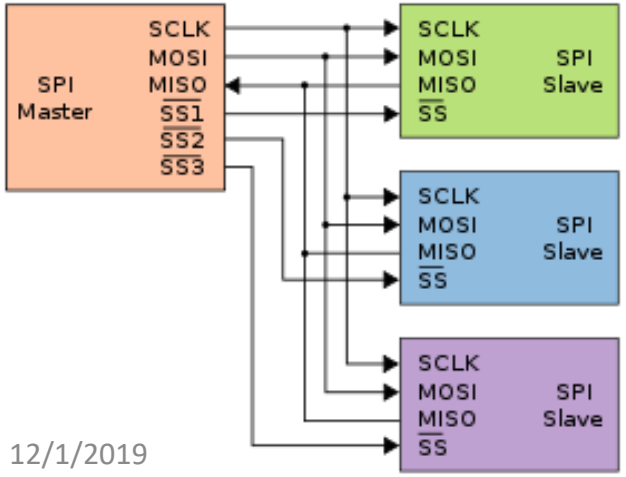


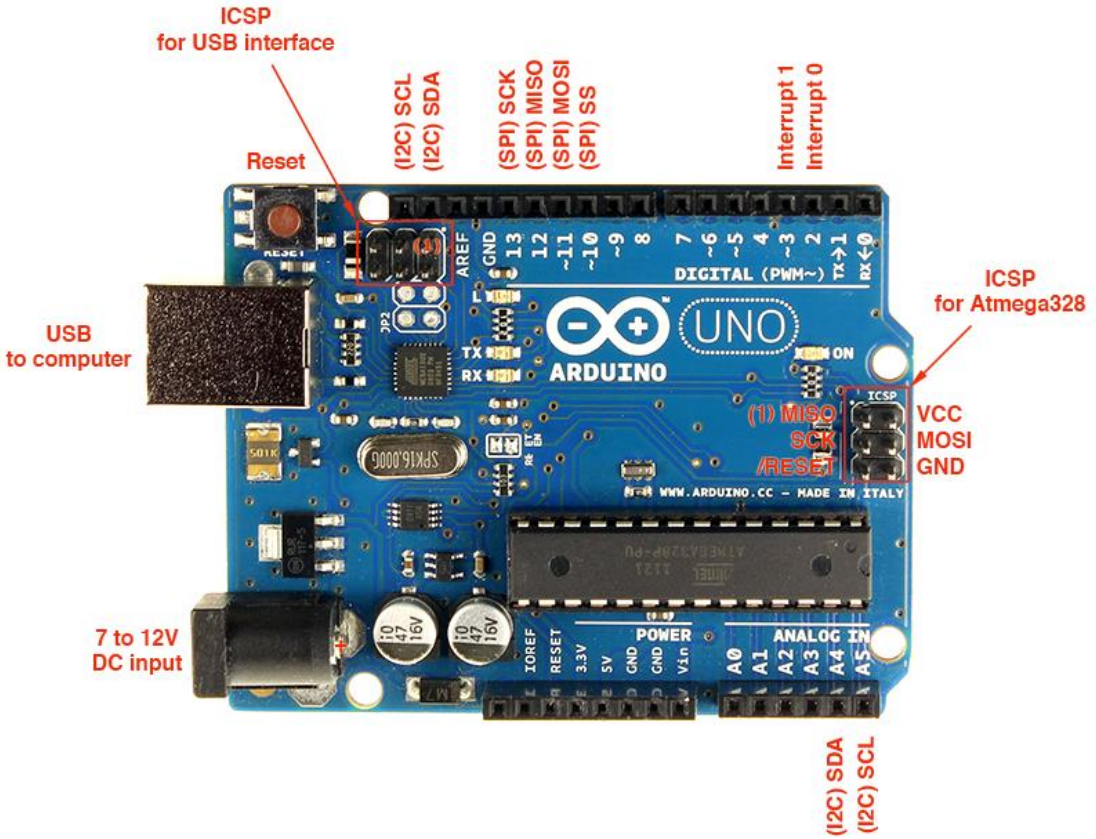
0 Boot on Low + Red LED
~~1 Serial TX~~
2 Boot on Low + Blue LED + Pull-Up
~~3 Serial RX~~
4 I2C SDA
5 I2C SCL
~~6-11 Flash~~
12 SPI MISO
13 SPI MOSI
14 SPI SCK
15 SPI SS / Boot on High + Pull-Down
16 Connect to RESET for Deep Sleep Wake + Pull-Down
17 ADC

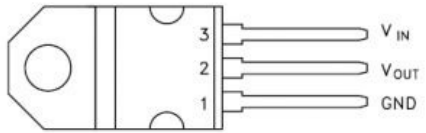
I2C	SPI	UART	Dallas OneWire
• Slow • Fewer lines • Addressable devices • Interrupt line • More complicated to use • Master/slave “bus” • Falling / rising edge differences between parts ☹	• Fastest • More lines • Easier to use • Point to point • More robust HW/SW	• Slow/Slowest	• Slowest • Simple but robust • Very long wire runs possible compared to I2C and SPI • In theory GND + Signal with parasitic powering off Signal, but adding V+ makes things more robust



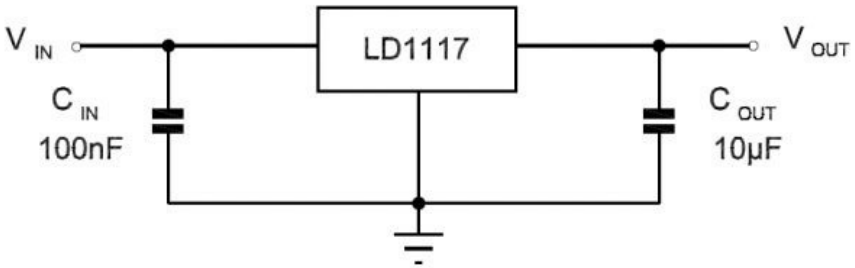
A sample schematic with one master (a microcontroller), three slave nodes (an ADC, a DAC, and a microcontroller), and pull-up resistors R_p







TO-220



- 120Ω on LD1117**v1.2** out to maintain min load. No need on **v3.3**
- 100nf = 0.1uf