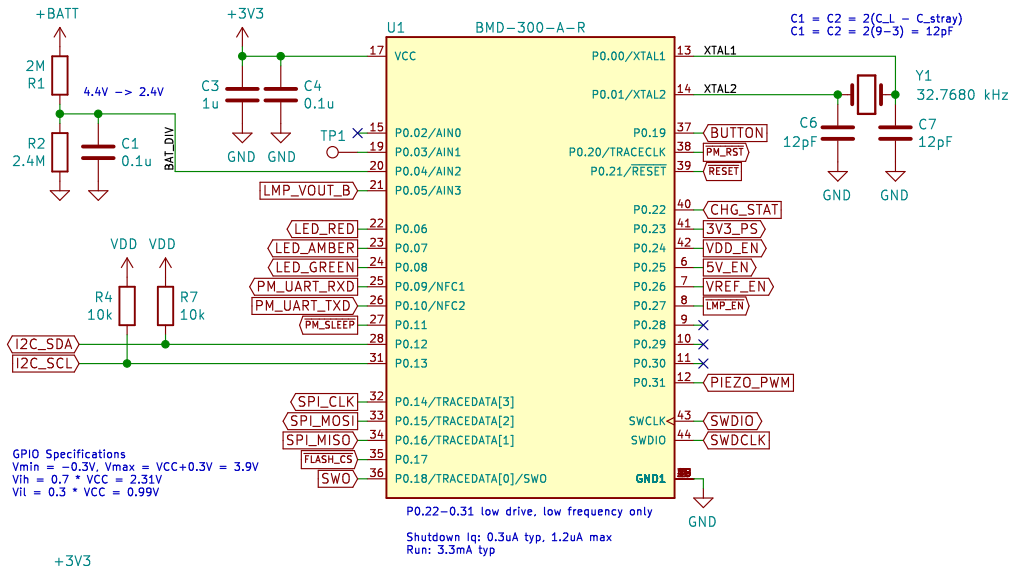
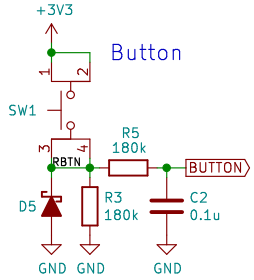
MCU + BLE

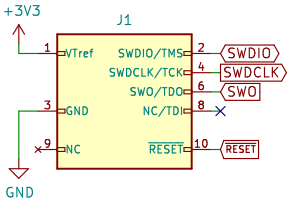
nRF52832



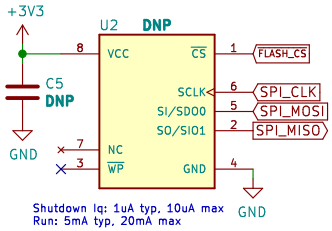
Button



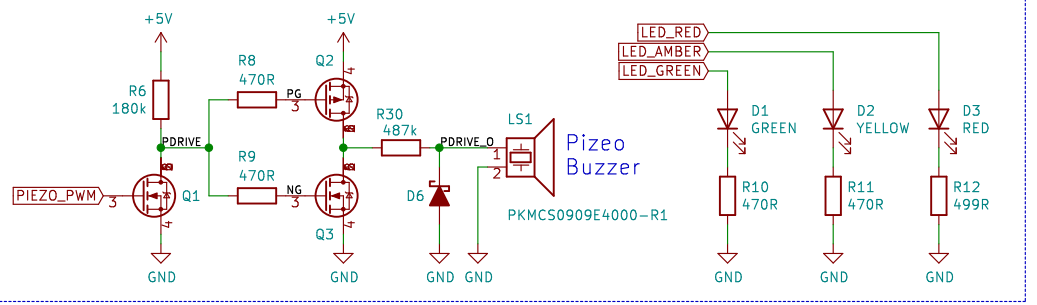
SWD Connector



NOR Flash

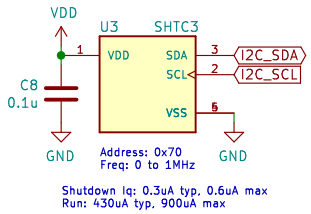


Indication

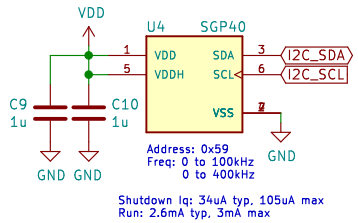


Sensors

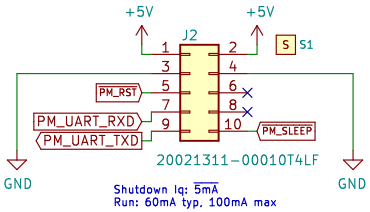
Humidity + Temperature Sensor



VOC Sensor



PM Sensor Connector



Sheet: Potentiostat

Sheet: Power

Power Consumption Rough Max Estimates

Sleep Total Iq:
(2+1+7+1.2+10)uA/85% + 5uA = 30uA max

Sensor/Comm Duty Cycle:
15s/(10*60s) = 2.5%

Run Total:
3.3V: [3.3mA + (2.5%)(2.6+5+0.5+0.5)mA]/85% = 5mA max
5.0V: (2.5%)(100+0.5)mA/85% = 3mA max -> 5mA @ 3.3V

6 months sleep: 6*30*24h * (30e-3)mA = 130mAh
3 days run: 3*24h * 10mA = 720mAh

Max Total: 850mAh
Est. Realistic Total: 500mAh

H1 H2
LOGO1
FID1 FID4
FID2 FID5
FID3 FID6

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Mechatronics Engineering 3B
MTE 380 Design Project
Group 18 / Alex Petkovic

Sheet: /
File: Canary.sch

Title: Project Canary

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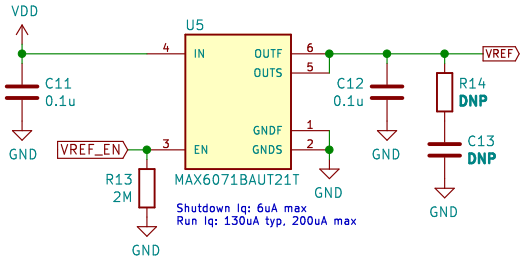
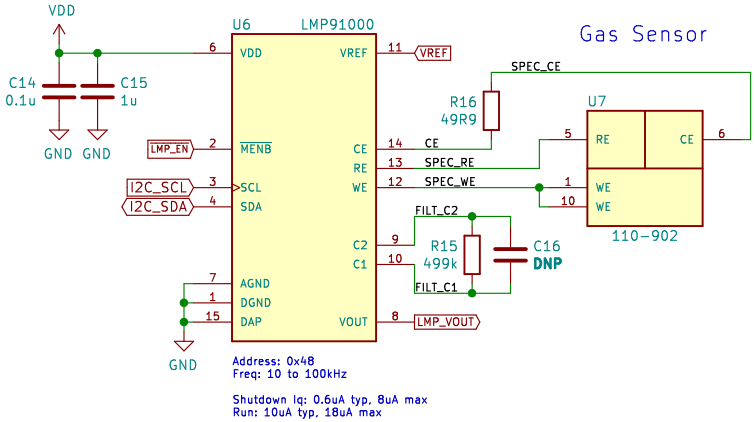
KiCad E.D.A. kicad (5.1.9)-1		Id: 1/3

2.048V Reference



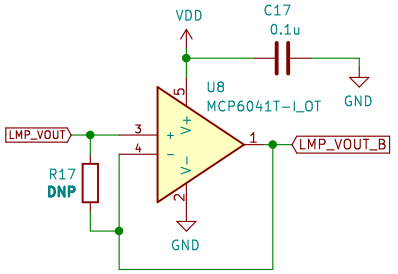
Short 'S' connections to 'F' connections as close as possible to the load

Potentiostat AFE



Gas Sensor

Potentiostat Output Buffer



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Sheet: /Potentiostat/ File: Potentiostat.sch	
Title: Project Canary	
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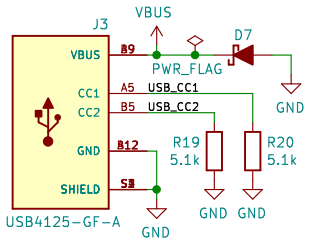
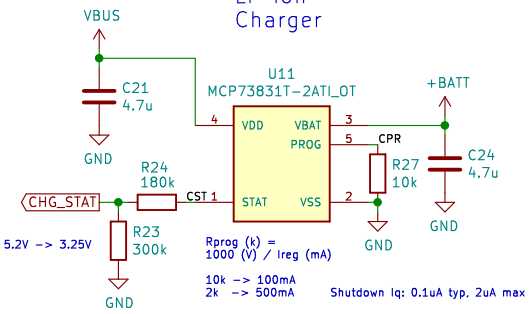
Battery

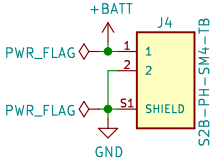
USB C



Li-ion Charger

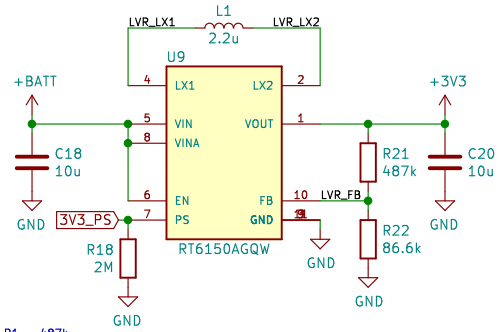


Li-ion Battery



Power Regulation

Buck/Boost Converter

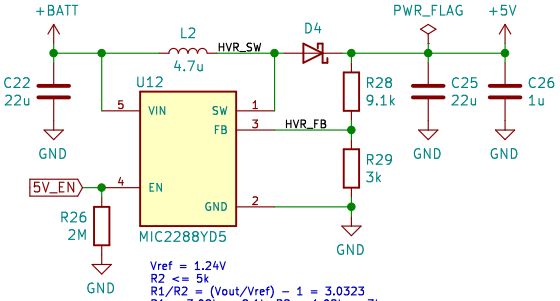


R1 = 487k
Fb = 500mV
R2 = R1 / (Vout/Fb - 1) = 86.964k
Cff = [(487k/R1) * 20] -20 (pF) = 0 pF
L = 2.2uH @ 3.3Vo & 2.5-4.2Vin [1.5uH < L < 4.7uH]
Cin & Cout recommended -> 10µF/X7R/1206

PS: Pull low for power save mode and pull high for fixed switching frequency operation.

Efficiency:
85% @ 1-3mA PSM
25% @ 1-3mA FFM

Boost Converter

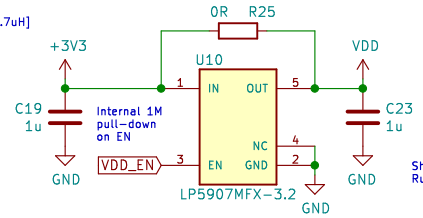


Vref = 1.24V
R2 <= 5k
R1/R2 = (Vout/Vref) - 1 = 3.0323
R1 = 3.09k or 9.1k, R2 = 1.02k or 3k

85% > D = 1-(Vin/Vout) =1-(3/5) = 0.4
Recommended L @ 5V = 4.7uH
Vo < 6V -> Cout = 22uF = Cin

Shutdown Iq: 0.1uA typ, 1uA max
Run efficiency: 85% (-0.5mA res div)

3.2V LDO



Shutdown Iq: 0.2uA typ, 1uA max
Run Iq: 250uA typ, 425uA max @ 250mA

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