Moisture Sensor

File: Moisture_sensor.kicad_sch

MCU

File: MCU.kicad_sch

Input Power

File: INPUT_POWER.kicad_sch

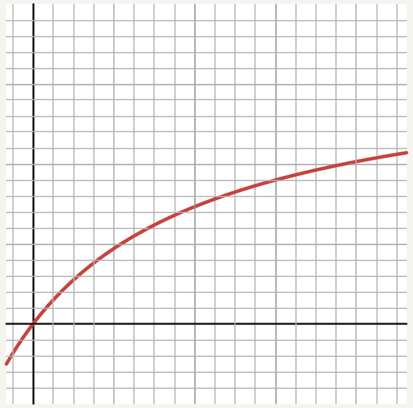
AB – Updated from AI review
AA – Original

Horatio Pistachio

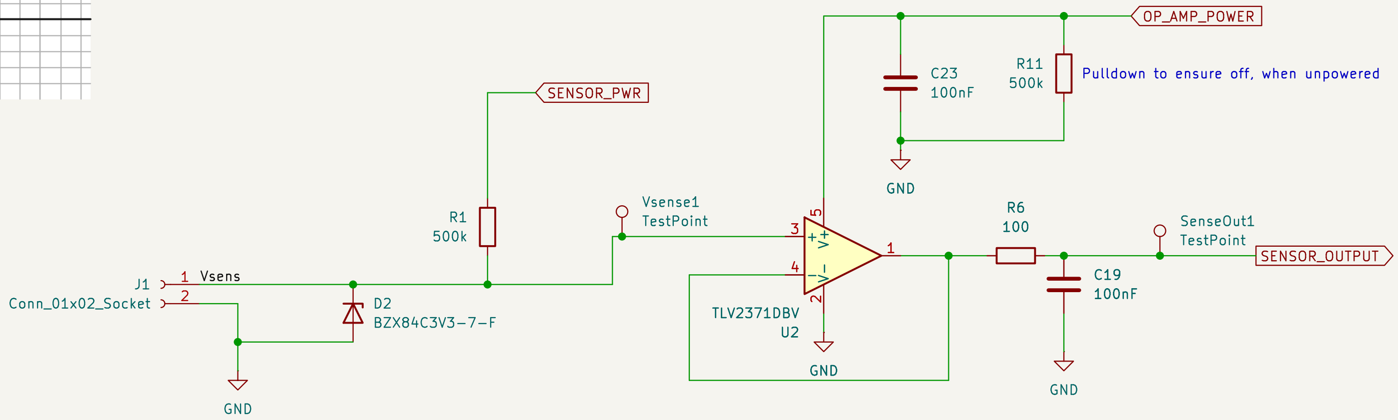
Sheet: /
File: WashingLineMonitor-P0001.kicad_sch

Title: WashingLineMonitor-P0001

Size: A4	Date: 2025-09-14	**Rev: AB**
KiCad E.D.A. 9.0.3		Id: 1/5



DIY sensors look to have a resistance >20M when dry around around 100k when wet
the resistance does creep up over time, likely due to the water electrolising.
The 500k resistor give the voltage vs cloth resistnace plot as seen left



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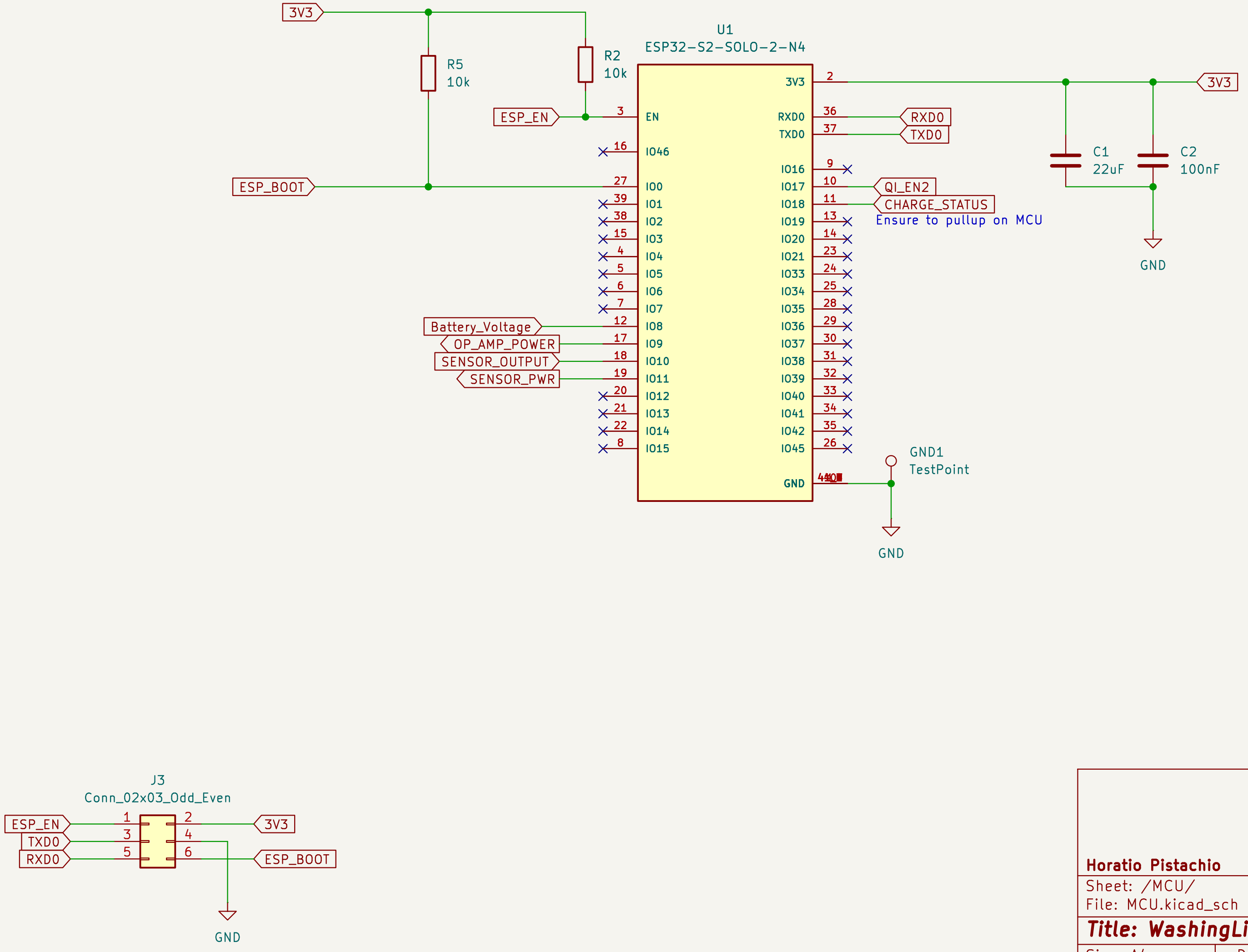
Sheet: /Moisture Sensor/

File: Moisture_sensor.kicad_sch

Title: WashingLineMonitor-P0001

Size: A4	Date: 2025-09-14	**Rev: AB**
KiCad E.D.A. 9.0.3		Id: 2/5



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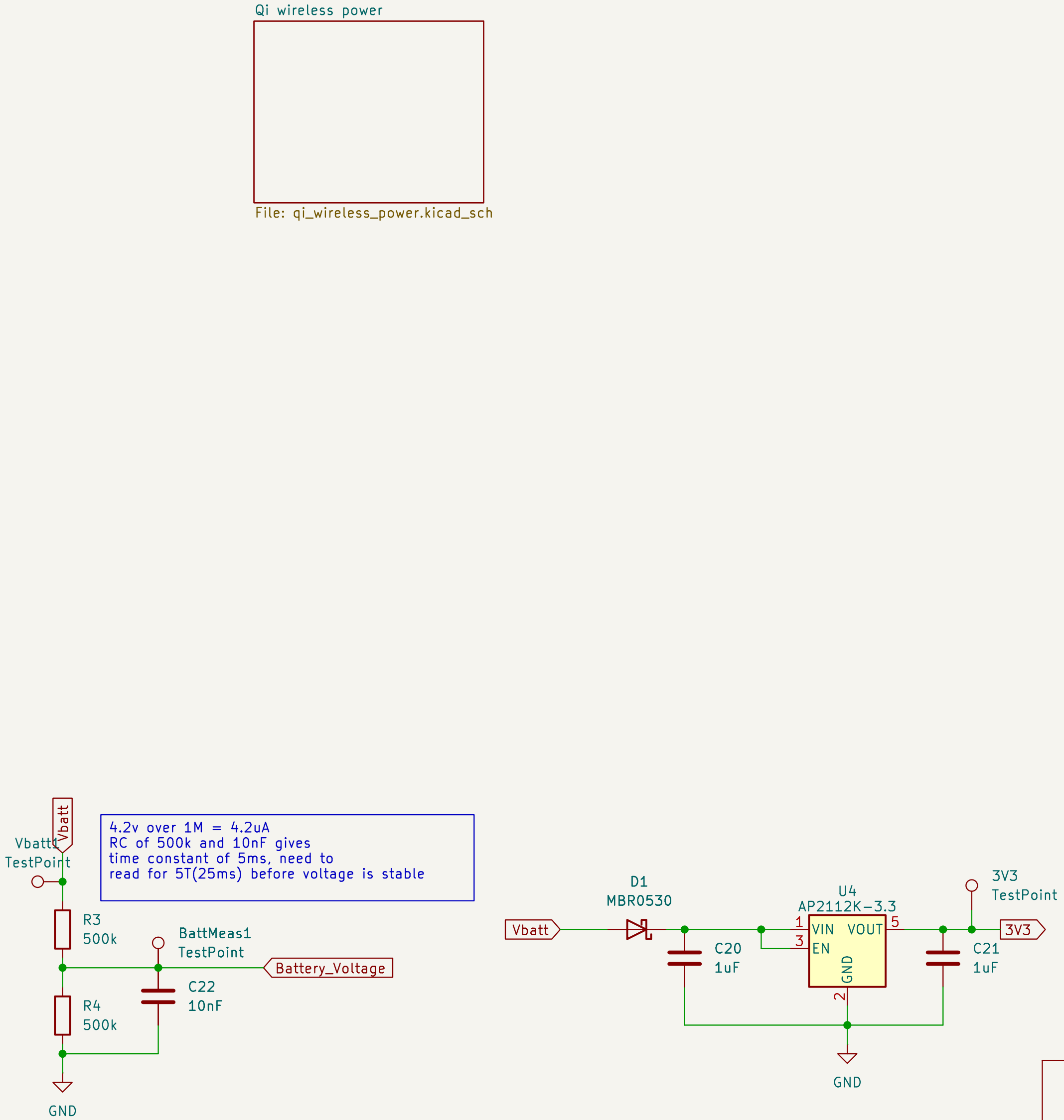
Sheet: /MCU/
File: MCU.kicad_sch

Title: WashingLineMonitor-P0001

Size: A4 | Date: 2025-09-14 | Rev: AB
KiCad E.D.A. 9.0.3 | Id: 3/5



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Sheet: /Input Power/
File: INPUT_POWER.kicad_sch

Title: WashingLineMonitor-P0001

Size: A4	Date: 2025-09-14	**Rev: AB**
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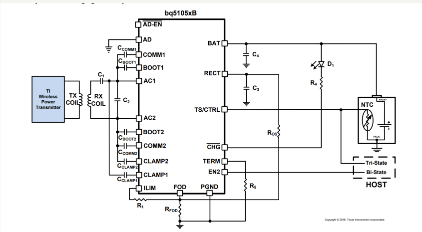
From BQ51050BRHL datasheet application example
Assuming L's (inductance in setup) and Ls (free space inductance)
are the same at 100khz
L's = 13 uH (WR483245)
R = 0.2 ohm(WR483245)
fS is 100 kHz +5/-10%
fD is 1 MHz ±10%
hence:
C1 = 19uF ~= 10uF + 4.7uF + 4.7uF
C2 = 1.95 nF ~= 1nF + 1nF
Q = 408 (>77 therefore good)

$$C_1 = \frac{1}{(2\pi \times fs)^2 \times L'_s}$$

$$C_2 = \left((f_D \times 2\pi)^2 \times L_s - \frac{1}{C_1} \right)^{-1}$$

$$Q = \frac{2\pi \times f_D \times Ls}{R}$$



Battery charging
Kilm = 314 Aohm(BQ51050)
Ibulk = 500mA (0.5c of a 1000mAh battery)
%Ibulk = 10 (cut off once we are charging at 10% of max)
Rfod = 200ohm (BQ51050)
Kterm = 240 Ohm/%

R1 = 428 ohm ~= 430 ohm
Rterm = 2.4kohm

Rfod is tuneable and reccomended to start at 20k and change if needed

8.3.4.3 *Battery Charge Current Setting Calculations*

8.3.4.3.1 R_{ILIM} Calculations

The bq5105x includes a means of providing hardware overcurrent protection by means of an analog current regulation loop. The hardware current limit provides an extra level of safety by clamping the maximum allowable output current (for example, a current compliance). The calculation for the total R_{ILIM} resistance is as follows:

$$R_1 = \frac{K_{ILIM}}{I_{BULK}} - R_{FOD} \qquad R_{ILIM} = R_1 + R_{FOD} \qquad I_{BULK} = \frac{K_{ILIM}}{R_{ILIM}} \quad (1)$$

Where I_{BULK} is the programmed battery charge current during fast charge mode. When referring to the application diagram shown in Figure 32, R_{ILIM} is the sum of R_{FOD} and R_1 (the total resistance from the ILIM pin to PGND).

8.3.4.3.2 Termination Calculations

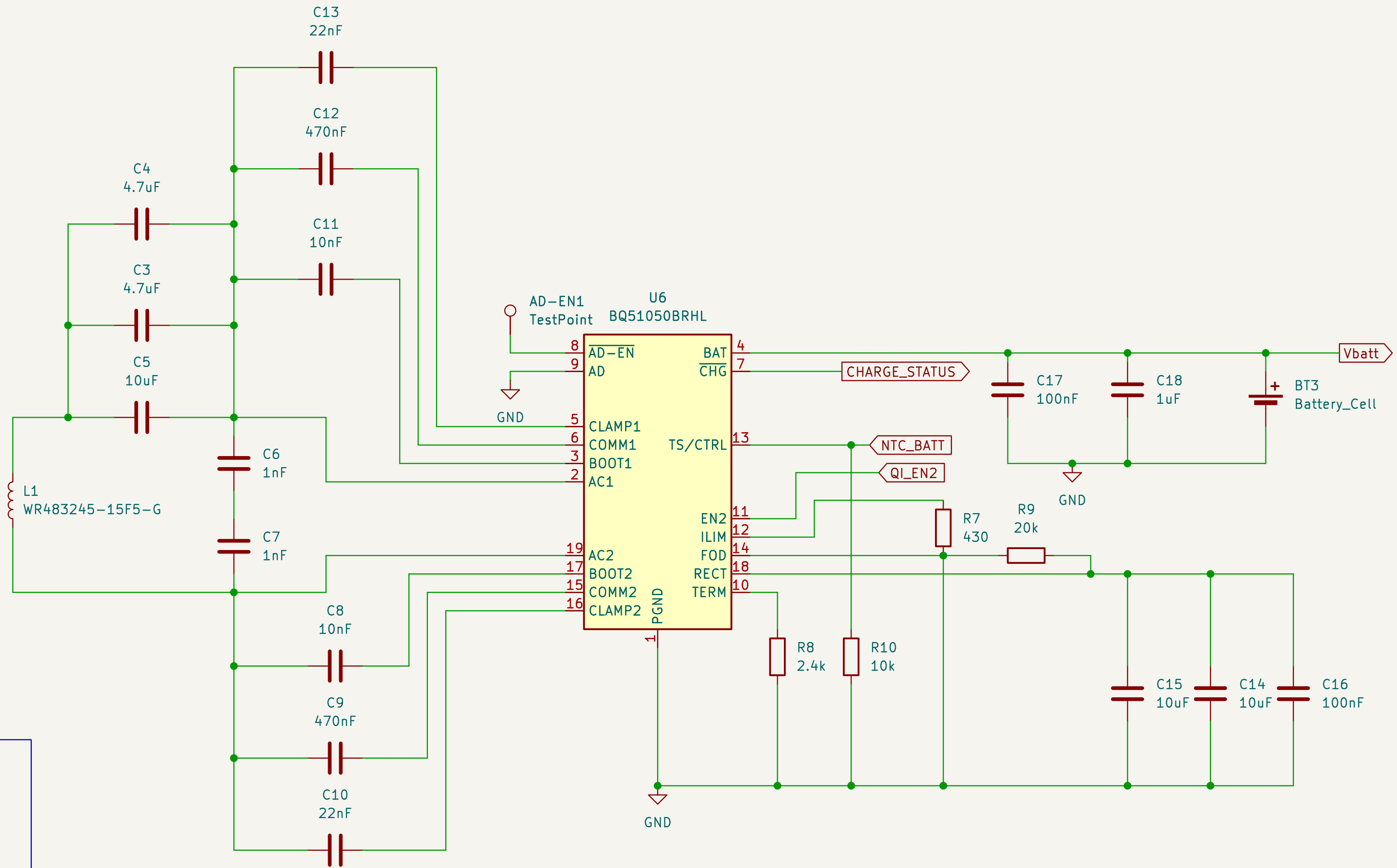
The bq5105X includes a programmable upper termination threshold. The upper termination threshold is calculated using Equation 2:

$$R_{TERM} = K_{TERM} * \%I_{BULK} \qquad \%I_{BULK} = \frac{R_{TERM}}{K_{TERM}} \quad (2)$$

The K_{TERM} constant is specified in *Electrical Characteristics* as 240 Ω/%. The upper termination threshold is set as a percentage of the charge current setting (I_{BULK}).

For example, if R_{ILIM} is set to 314 Ω, I_{BULK} will be 1 A (314 ÷ 314). If the upper termination threshold is desired to be 100 mA, this would be 10% of I_{BULK}. The R_{TERM} resistor would then equal 2.4 kΩ (240 × 10).

Termination can be disabled by floating the TERM pin. If the TERM pin is grounded the termination function is effectively disabled. However, due to offsets of internal comparators, termination may occur at low battery currents.



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Sheet: /Input Power/Qi wireless power/
File: qi_wireless_power.kicad_sch

Title: WashingLineMonitor-P0001

Size: A4	Date: 2025-09-14	Rev: AB
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