

### 4.5V BUCK REGULATOR

see doc for calculations:  
[https://docs.google.com/spreadsheets/d/117EJS5MbtJSlwyG-RCYFS4woB5pbUpGjtH0A2-\\_d\\_7l/edit?usp=sharing](https://docs.google.com/spreadsheets/d/117EJS5MbtJSlwyG-RCYFS4woB5pbUpGjtH0A2-_d_7l/edit?usp=sharing)

$V_{BATT\_CURR\_SENSE} = I_{out} \cdot R3 \cdot 100V/V = (5V - 0.02V) \max = 4.98V \max$   
 $I_{L\_max\_sense} = (4.98V) / (20mR \cdot 100V/V) = 2.49A$

$V_{out} = 0.8 \cdot ((R19 + R25) / R19)$

**5V BOOST REGULATOR**  
 $I_{MAX} = 1A$   
 See doc for inductor calculations:  
[https://docs.google.com/spreadsheets/d/1l7EJS5MbtJSIwyG-RCYFS4woB5pbUpGjth0A2-\\_d\\_7l/edit?usp=sharing](https://docs.google.com/spreadsheets/d/1l7EJS5MbtJSIwyG-RCYFS4woB5pbUpGjth0A2-_d_7l/edit?usp=sharing)

**PERIPHERAL BOARD LOAD SWITCH**  
 $I_{LIM} = 460/R7 = 460/500R = 0.92A$  CURRENT LIMIT

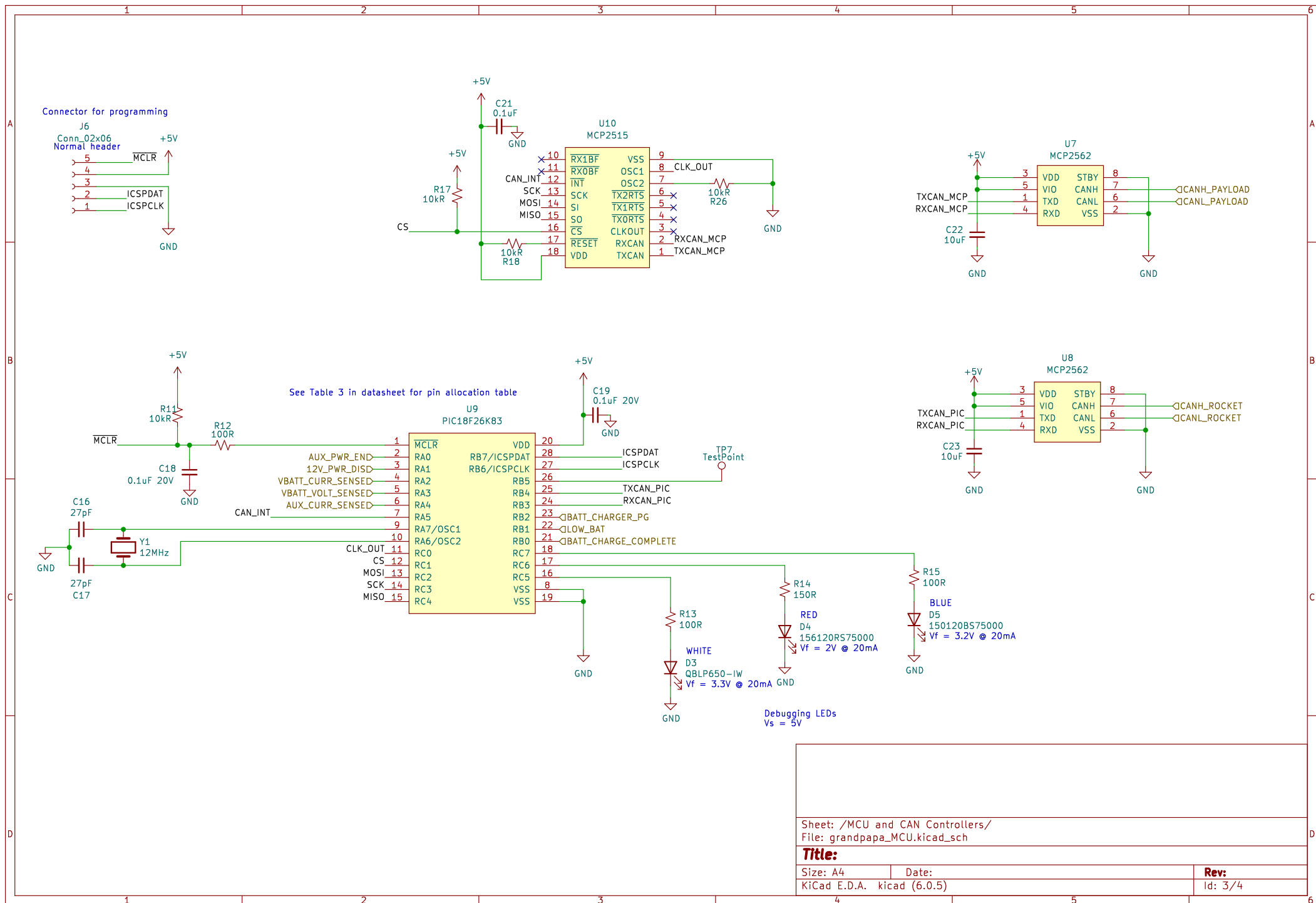
The diagram shows a 5V boost regulator (U1, MCP1642B-50I/MS) and a peripheral board load switch (U5, FPF2124). The boost regulator's input (VIN) is connected to a 3.7V to 4.5V source (+BATT) through a 1.2A fuse (F2) and a test point (TP6). The input is also filtered by a 10uF capacitor (C2). The regulator's output (VOUT) is connected to a +5V output line, which is filtered by a 10uF capacitor (C5) and a 1M resistor (R2). The output is also connected to a test point (TP3). The peripheral board load switch (U5) is controlled by the AUX\_PWR\_EN signal (ENABLE WHEN HIGH (>1.3V)) and the +5V output line. The switch's output (VOUT) is connected to the peripheral board, which is also filtered by a 0.1uF capacitor (C13). The switch is also controlled by a 500R resistor (R7) connected to GND.

**Convolved Payload Power Path 101**

- 12V supply power is provided from the rocket (only while on the pad prior to flight)
- U1 regulates the 12V supply down to 4.5V, which is what our battery charger IC can take
- Our battery charger takes 4.5V in and charges the battery, as well as passing the 4.5V supply onward to supply power to everything else. When it loses that external source, it switches its output to drain battery power instead — that’s why +BATT varies between 3.7V (battery voltage) and 4.5V (charger pass-through)
- +BATT supplies U2, which boosts the voltage up to a smooth 5V
- 5V is always supplied to the MCU and CAN hardware
- U5 controls the flow of power into the other boards hooked up to GrandPapa, to stop them from turning on and drawing power when we don’t need them to

**SHEET METADATA:**

Sheet: /Power Supplies & Regulators/ File: grandpapa_Power.kicad_sch	
<b>Title:</b>	
Size: A4	Date:
KiCad E.D.A. kicad (6.0.5)	Rev: Id: 2/4



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LIPO charge voltage = 4.1V, 4.121V MAX
Fast charge current = 1000V/Rprog1 = 1000/2kOhm = 500mA
Timer disabled
Charger always enabled
THERM curr = 50uA, shutdown happens at 1.24V and 0.25V

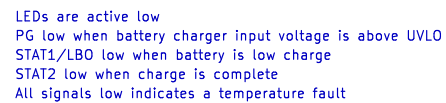
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Timer disabled
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$$\begin{aligned} \text{VBATT\_CURR\_SENSE} &= I_{\text{out}} \cdot R_3 \cdot 100\text{V/V} = (5\text{V} - 0.02\text{V}) \text{ max} = 4.98\text{V max} \\ I_{\text{max\_sense}} &= (4.98\text{V}) / (20\text{m}\Omega \cdot 100\text{V/V}) = 2.49\text{A} \end{aligned}$$



Rev:  
Id: 4/4