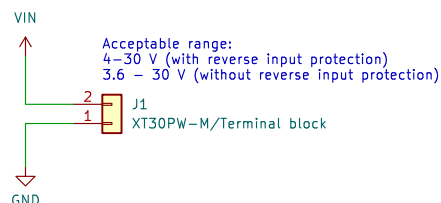
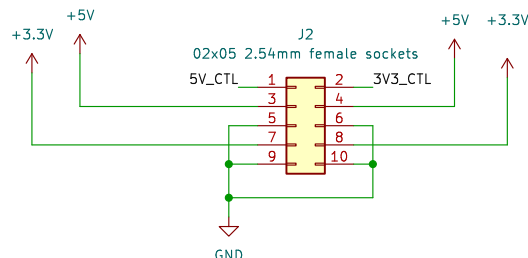


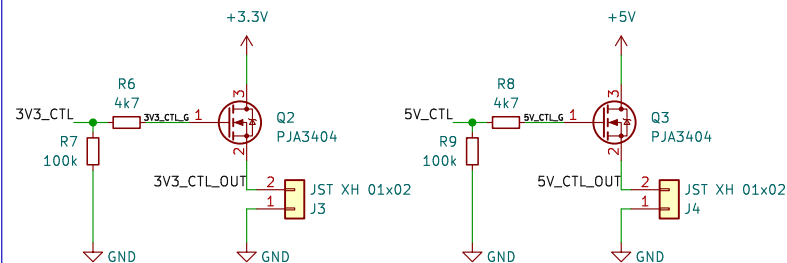
4–30 V input power connector



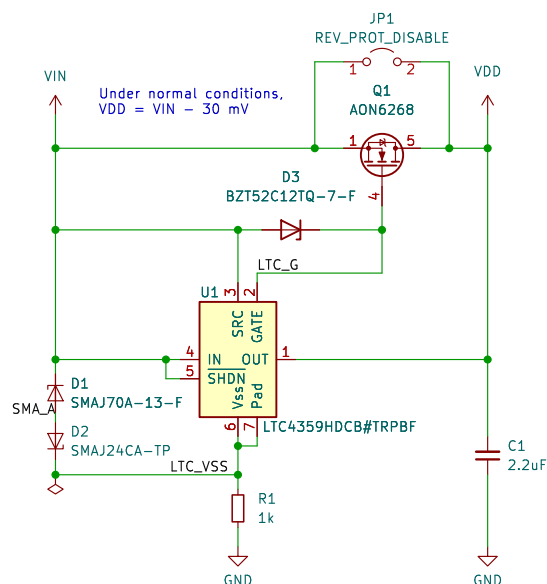
MCU node (Orion) power connector



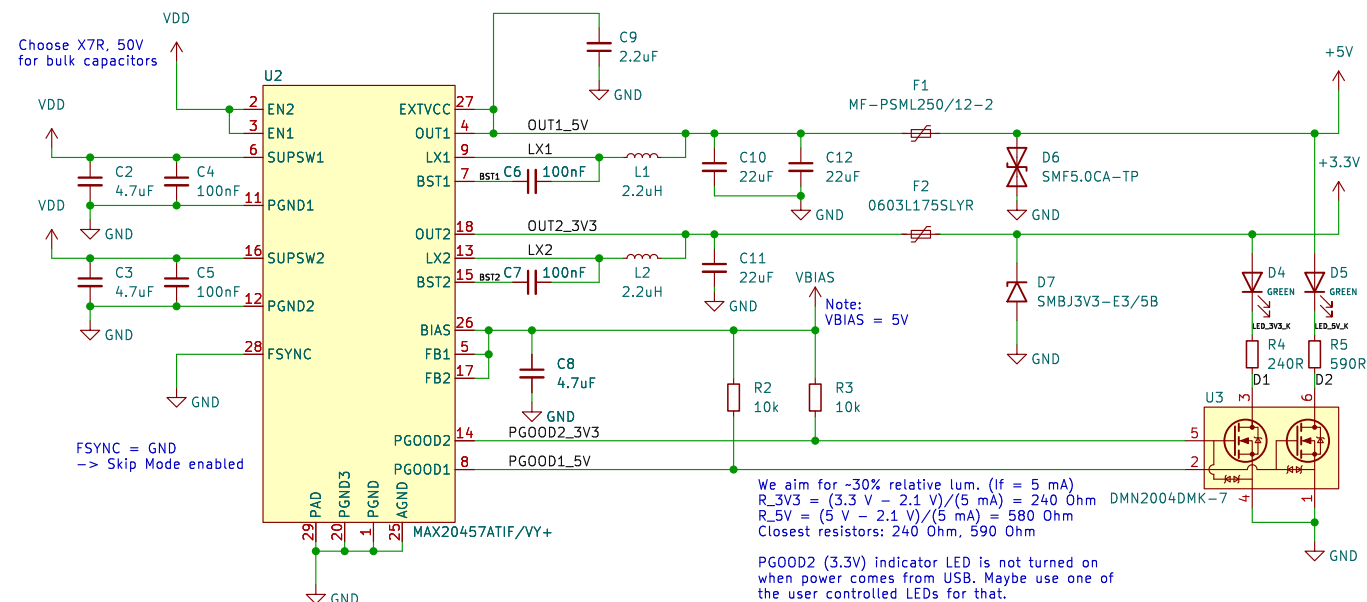
External power control



Reverse input protection (ideal diode)



3.3V / 5V Dual-channel switching regulator



Mounting holes



Power flags/Logo



Input capacitor
 $I_{RMS} = I_{LOAD}/2 = 6\text{ A} / 2 = 3\text{ A}$

Output capacitor:
Max overshoot (VSOAR)
 $L = 2.2\text{ uH}$

BUCK 1:
 $V_{OUT} = 5\text{ V}$
 $C_{OUT} = 22\text{ uF} + 22\text{ uF} = 44\text{ uF}$
 $I_{LOAD,max} = 3.5\text{ A}$
 $V_{SOAR} = I_{LOAD,max} \cdot 2 \cdot L / (2 \cdot C_{OUT} \cdot V_{OUT}) = 61.25\text{ mV}$

BUCK 2:
 $V_{OUT} = 3.3\text{ V}$
 $C_{OUT} = 22\text{ uF}$
 $I_{LOAD,max} = 2\text{ A}$
 $V_{SOAR} = I_{LOAD,max} \cdot 2 \cdot L / (2 \cdot C_{OUT} \cdot V_{OUT}) = 60.61\text{ mV}$

Inductor selection:
 $\eta = 90\%$ (efficiency)
 $f_{sw} = 2.1\text{ MHz}$
 $V_{IN} = 29\text{ V}$

BUCK 1
 $I_{OUT} = 3.5\text{ A}$
 $V_{OUT} = 5\text{ V}$
 $D = V_{OUT}/(V_{IN,max} \cdot \eta) = 0.154$ (duty cycle)
 $L_{MIN} = (V_{IN} - V_{OUT}) \cdot D / (f_{sw} \cdot I_{OUT} \cdot L_{IR}) = 1.68\text{ uH}$

BUCK 2
 $I_{OUT} = 2\text{ A}$
 $V_{OUT} = 3.3\text{ V}$
 $D = V_{OUT}/(V_{IN,max} \cdot \eta) = 0.102$ (duty cycle)
 $L_{MIN} = (V_{IN} - V_{OUT}) \cdot D / (f_{sw} \cdot I_{OUT} \cdot L_{IR}) = 1.94\text{ uH}$

We choose $L = 2.2\text{ uH}$

Nominal input: 4–30 V (5.1 V min for 5V output)
Absolute maximum ratings: –40 V to 36 V
Output (fused): 5V @ 2.5 A and 3.3 V @ 1.75 A
Author: Vincent Nguyen

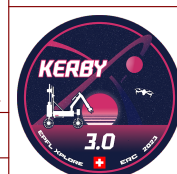


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File: orion_power.kicad_sch

Title: 3.3V/5V Dual-channel Switching Regulator

Size: A4
KiCad E.D.A. kicad 7.0.1

Project Kerby



Rev: 1
Id: 1/1