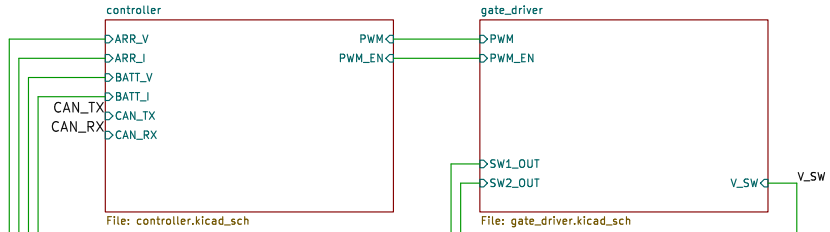

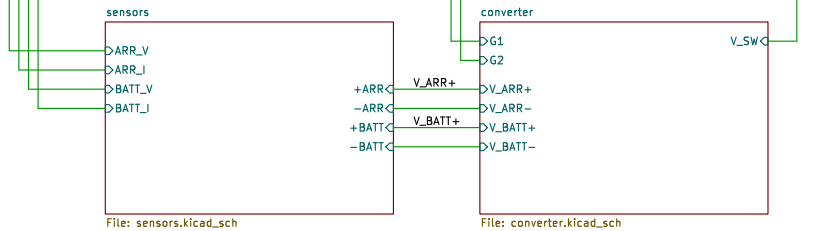

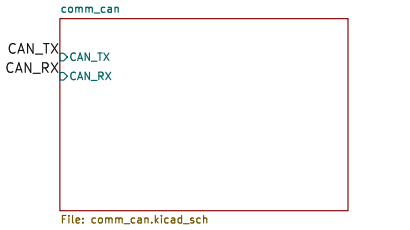

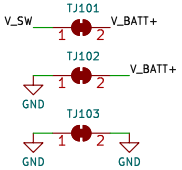

Sunscatter MPPT

v0.2.0rc

Praise the sun. A student design maximum power point tracker, custom built for the Longhorn Racing Solar car. Optimized to run the latest and greatest MPPT algorithms.

Errata

v0.1.1
- Fix for BNC footprint swapping signal and ground.
- Fix for OPA990 footprint, rotating three pins.
- Fix for mislabeling 1uF 2220 switching cap. This should be 2.2uF.
- Fix for bad ground isolation for current sensors.
- Fix for ERROR LED being hooked up to USB_DP and CAN1_TD pin.

v0.2.0rc (summer array testing)
- Revised component symbol->footprint->model listings.
- Updated component suppliers.
- Swapped mounting holes to M3.
- Added I/O power fuse.
- Swapped I/O connectors to XT60PW.
- Removed heatsink and some thermal jumpers.
- Added HF low uF caps on I/O to remove switching noise.
- Added CAN circuitry.
- Removed BNC.

v0.3.0 (next gen)
- Modify converter design based on automation improvements and updated design specifications.
- RTD/PTC thermistors on switches, inductor.
- Convert STM32 Nucleo to bare chip.
- Isolated 12V/12V regulator. 12V to 5V regulator, 5V to 3V3 regulator.

v0.4.0 (final MPPT version)
- Hit board size, cost target of 75x50 mm², <75$/board.

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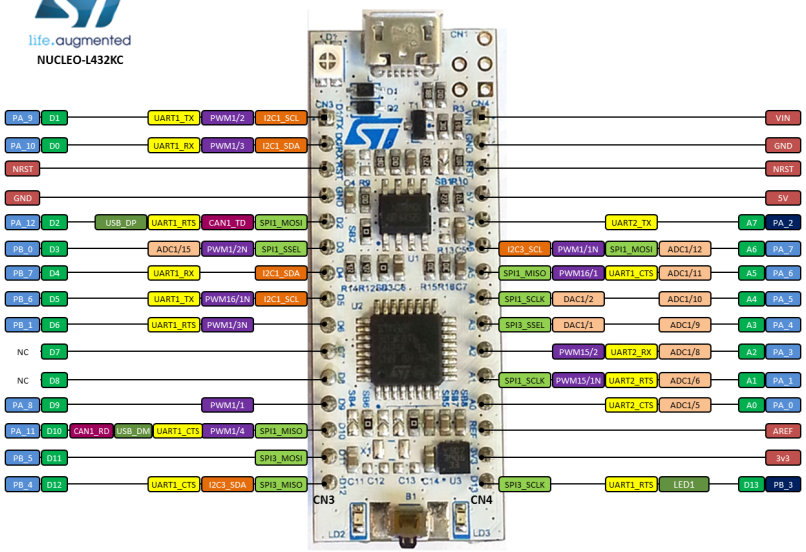
Matthew Yu
LHR Solar

Sheet: /
File: mppt.kicad_sch

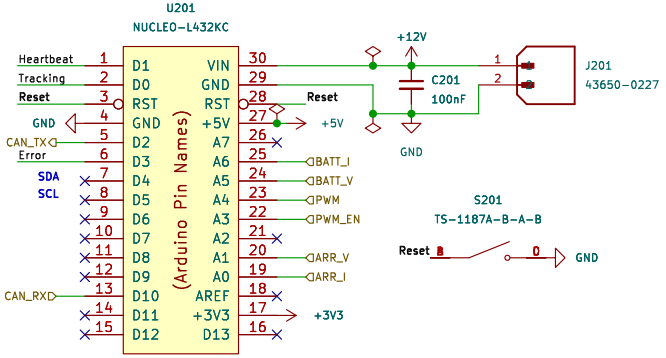
Title: Sunscatter MPPT

Size: A4	Date: 2023-07-21	**Rev: v0.2.0**
KiCad E.D.A. kicad 7.0.6-7.0.6~ubuntu22.04.1		Id: 1/6

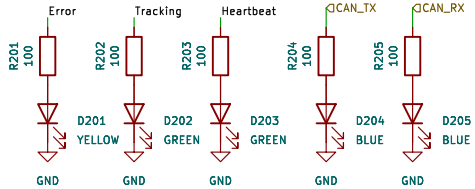


Controller

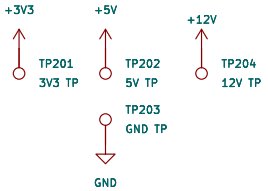
D2 and D10 are reserved for USB and CAN communication.
VIN can accept +7V–12V.
Do not plug in USB while VIN is powered.
USB without VIN input results in -5V backport output on VIN.



LEDs



Testpoints



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Sheet: /controller/
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Size: A4	Date: 2023-07-21	**Rev: v0.2.0**
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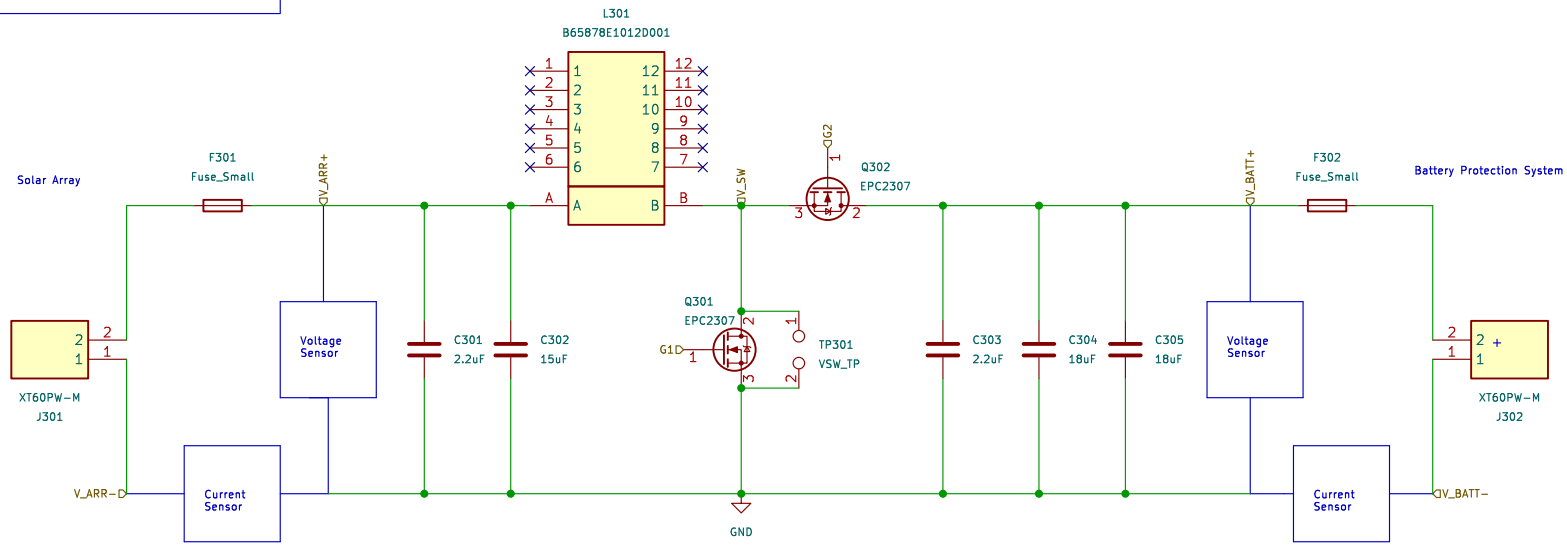
Converter

Core:
- Existing:
  - PQ 26/25 N97 TDK core (871-B65877A0000R097)
  - Associated bobbin (871-B65878E1012D001)
  - Used 21 AWG wiring
  - Thinnest material gap
  - 175uH, ~9 turns
  - Likely core and conduction loss: 5% of P_TRANSFER, mostly core loss
- Proposed:
  - PQ 20/16 N95 Ferroxcube core (1779-1173-ND)
  - Associated bobbin (1779-1380-ND)
  - Use 19 AWG wiring
  - Use thicker material gap, ~0.3 to ~0.5 mm
  - Use ~15-30 turns to hit 250 uH target
  - Anticipated core and conduction loss: ~1 W



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Title: Sunscatter MPPT	
Size: A4	Date: 2023-07-21
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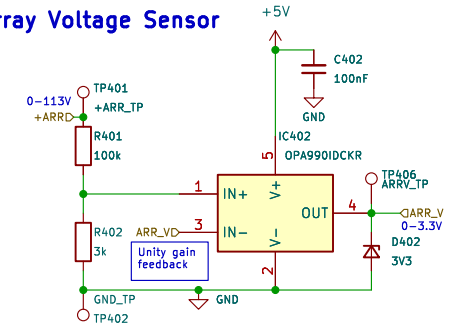
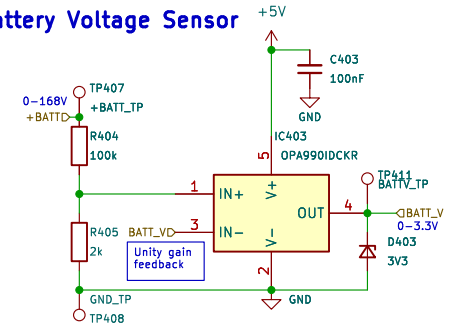
	Rev: v0.2.0

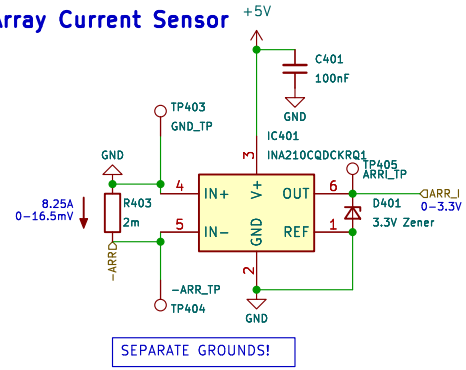
Array Voltage Sensor



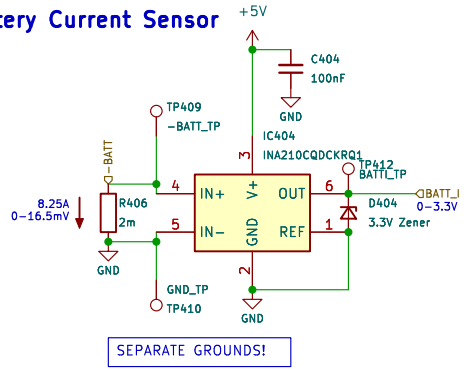
Battery Voltage Sensor



Array Current Sensor



Battery Current Sensor



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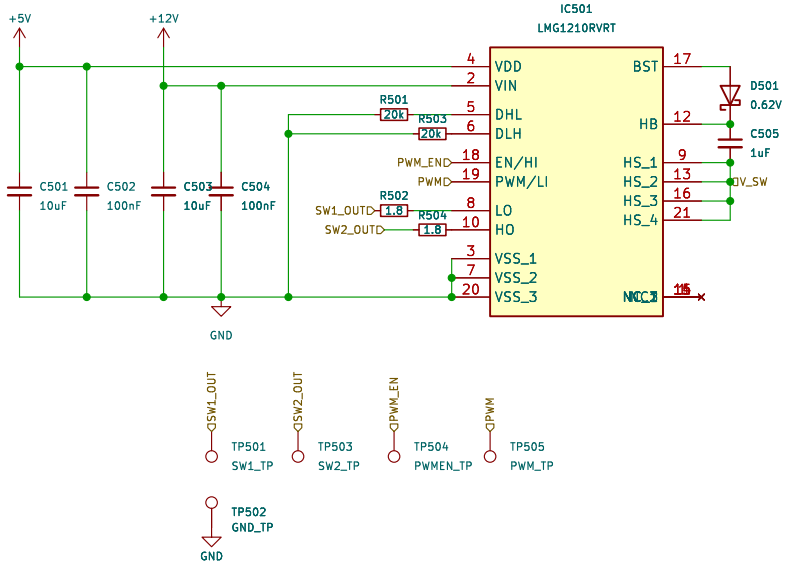
File: sensors.kicad_sch

Title: Sunscatter MPPT

Size: A4	Date: 2023-07-21	**Rev: v0.2.0**
KiCad E.D.A. kicad 7.0.6-7.0.6~ubuntu22.04.1		Id: 4/6

Gate Driver



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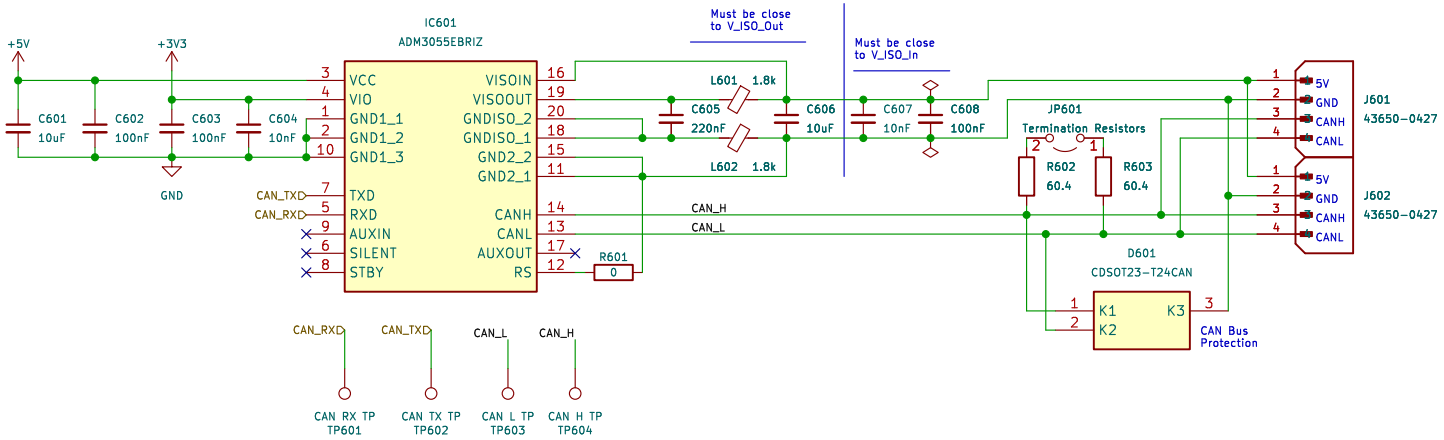
CAN



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Size: A4	Date: 2023-07-21	**Rev: v0.2.0**
KiCad E.D.A. kicad 7.0.6-7.0.6~ubuntu22.04.1		Id: 6/6