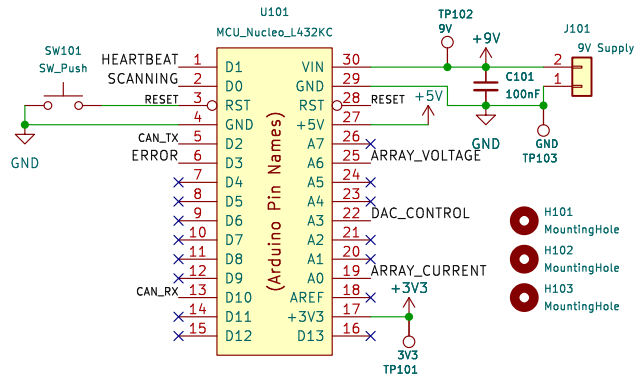
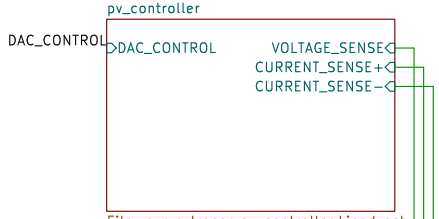
MCU

Powered and controlled by USB through STLink UART.
Requires A7 (PA2) and A2 (PA3) to be reserved.

VIN: 7–12V –> Input
5V0: 5V –> Output on USB/VIN
3V3: 3.3V –> Output always



pv_controller



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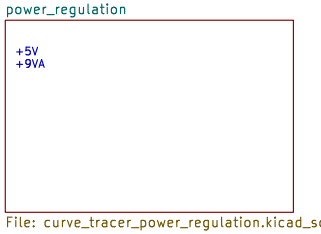
power_regulation



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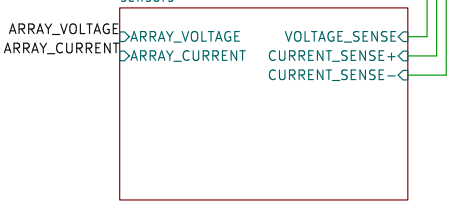
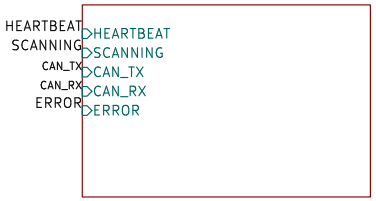
sensors



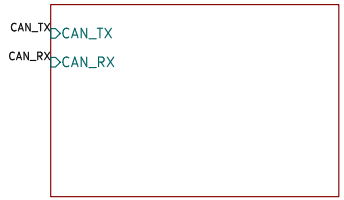
File: curve_tracer_sensors.kicad_sch

leds



File: curve_tracer_leds.kicad_sch

can_driver



File: curve_tracer_can_driver.kicad_sch

I–V Curve Tracer

v1.3.0

Praise the sun. A student designed PCB for characterizing the I–V curves of PV assemblies, from solar cells to solar arrays.

Errata

v1.1.0:
Schematic:
– Reannotated all component labels and reversed rescued schematic symbols.
– Rearranged schematic and cleaned up component positioning.
– Used Array.lib for array–relevant schematic symbols.
– Standardized components lists.
– Added fuse to array input and swapped to a phoenix connector.
– Updated indicator LEDs and added Reset button.
– Standardized current sensor to match that of the MPPT's.
– Merged voltage sensor op amp to the gate amplifier.
– Added connector for 9V power supply.. just in case.

Layout:
– Shrunk layout by 35%.
– Added no fill zones to shield analog, digital, and power sections.

v1.2.0:
Schematic:
– BoM consolidation to JLCPCB components.
– Removed RC filters since current draw caused voltage drift into ADC.
– Changed voltage divider scaling and resistors. See design document.
– Swapped out LT1215 for MAX40075 and fixed gain to 3x.
– CAN_RX corrected to be pin D10, not D9.
– Removed the RC filter to the input of the voltage sensor.
– Removed extraneous diodes.

Layout:
– New layout design. All components are on the same side for easy assembly.
– Back side is solely for testpoints.

v1.3.0
Schematic:
– Hierarchical layout to improve structure.
– Rebuilt and cleared errors for KICAD 7.0.
Layout:
– Rebuilt and cleared errors for KICAD 7.0.

Gary Hallock
Matthew Yu
Longhorn Racing Solar

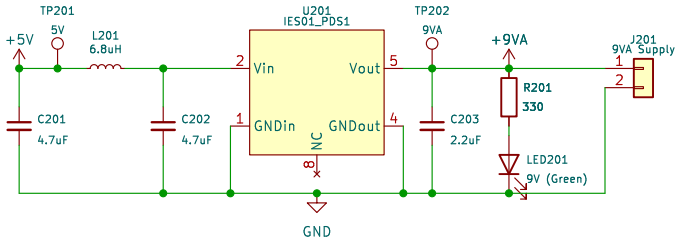
Sheet: /
File: IV Curve Tracer.kicad_sch

Title: Curve Tracer

Size: A4	Date: 2022–06–05	**Rev: 1.3.0**
KiCad E.D.A. kicad 7.0.2–6a45011f42~172~ubuntu22.04.1		Id: 1/6

Power Regulation

5V to 9V power feeding into MOSFET controller.
IES0105S09, compatible with PDS1-S5-S9-M
Cout=2.2uF(IES01)/4.7uF(PDS1)
Imin=12mA
GND is tied across the isolated DC-DC converter to make it non isolated.
This is because the sensor input to the STM32 needs to be relative to GND.
This is probably overkill compared to a normal TI SEPIC converter but
requires less external components.



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Sheet: /power_regulation/
File: curve_tracer_power_regulation.kicad_sch

Title: Curve Tracer

Size: A4	Date: 2022-06-05	**Rev: 1.3.0**
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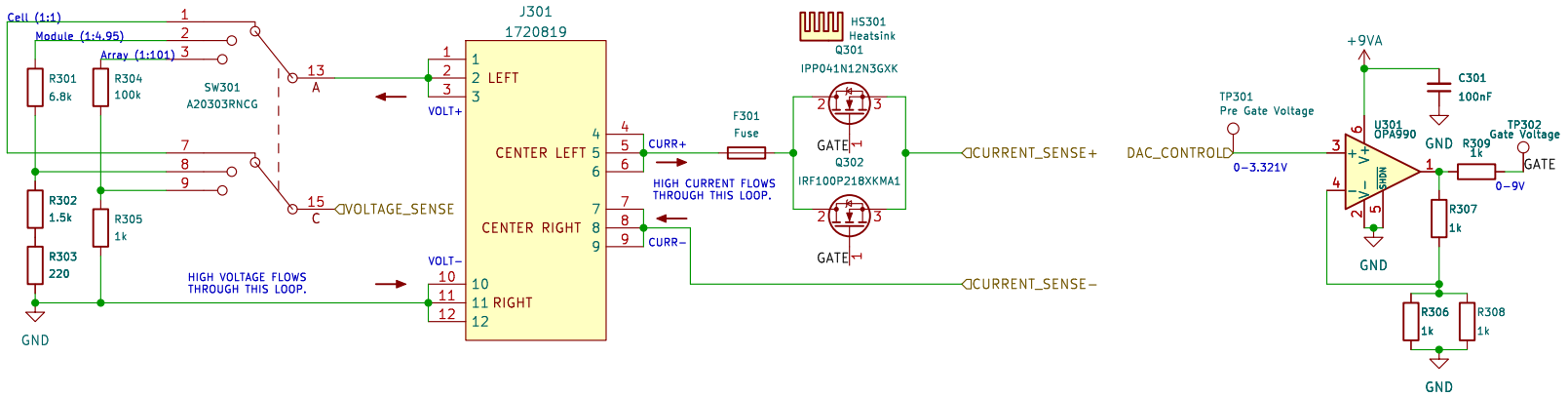
PV Controller

3 modes for the rotary switch:
Cell mode (0–1V),
Module mode (0–5V),
Array mode (0–110V)
Driven by a gate driver tied to two power FETs.



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Sheet: /pv_controller/
File: curve_tracer_pv_controller.kicad_sch

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Size: A4	Date: 2022-06-05	**Rev: 1.3.0**
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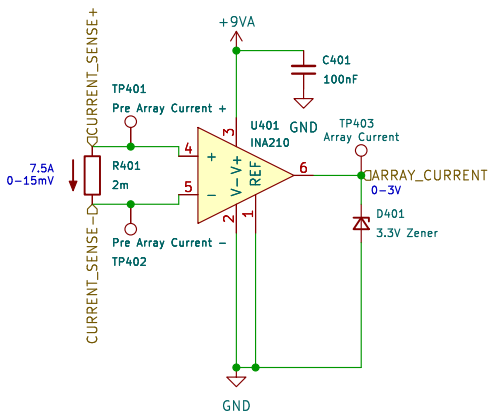
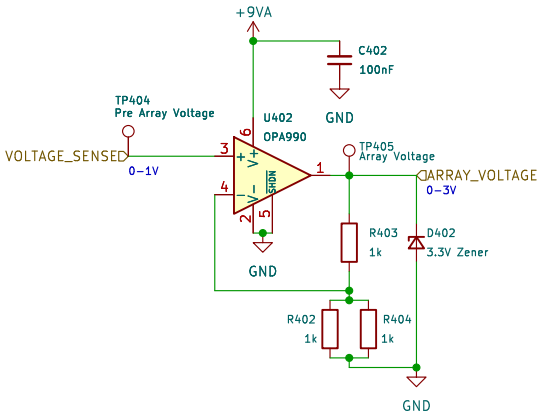
Sensors

Voltage and current sensor that feed into the PV controller.
Used for characterizing the PV configuration.
8A support through current sense resistors.
[1V/5V/110V] support for voltage sensor scaling.

Current Sensor



Voltage Sensor



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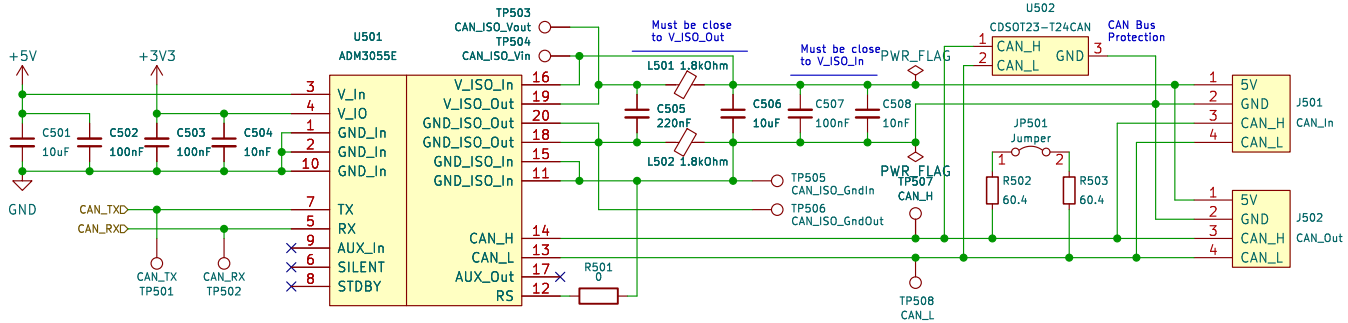
Sheet: /sensors/ File: curve_tracer_sensors.kicad_sch	
Title: Curve Tracer	
Size: A4	Date: 2022-06-05
KiCad E.D.A. kicad 7.0.2-6a45011f42~172~ubuntu22.04.1	Id: 4/6

Rev: 1.3.0

CAN

Isolated CAN chip.



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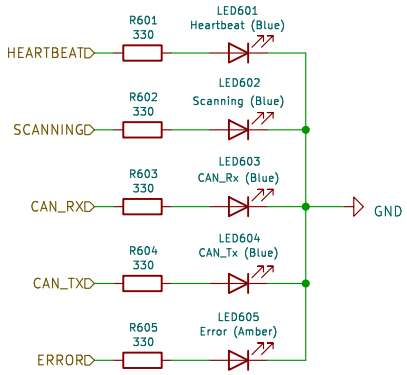
Sheet: /can_driver/
File: curve_tracer_can_driver.kicad_sch

Title: Curve Tracer

Size: A4	Date: 2022-06-05	**Rev: 1.3.0**
KiCad E.D.A. kicad 7.0.2-6a45011f42~172~ubuntu22.04.1		Id: 5/6

LEDs

Status LEDs for at-a-glance information



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Sheet: /leds/
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Title: Curve Tracer

Size: A4	Date: 2022-06-05	**Rev: 1.3.0**
KiCad E.D.A. kicad 7.0.2-6a45011f42~172~ubuntu22.04.1		Id: 6/6