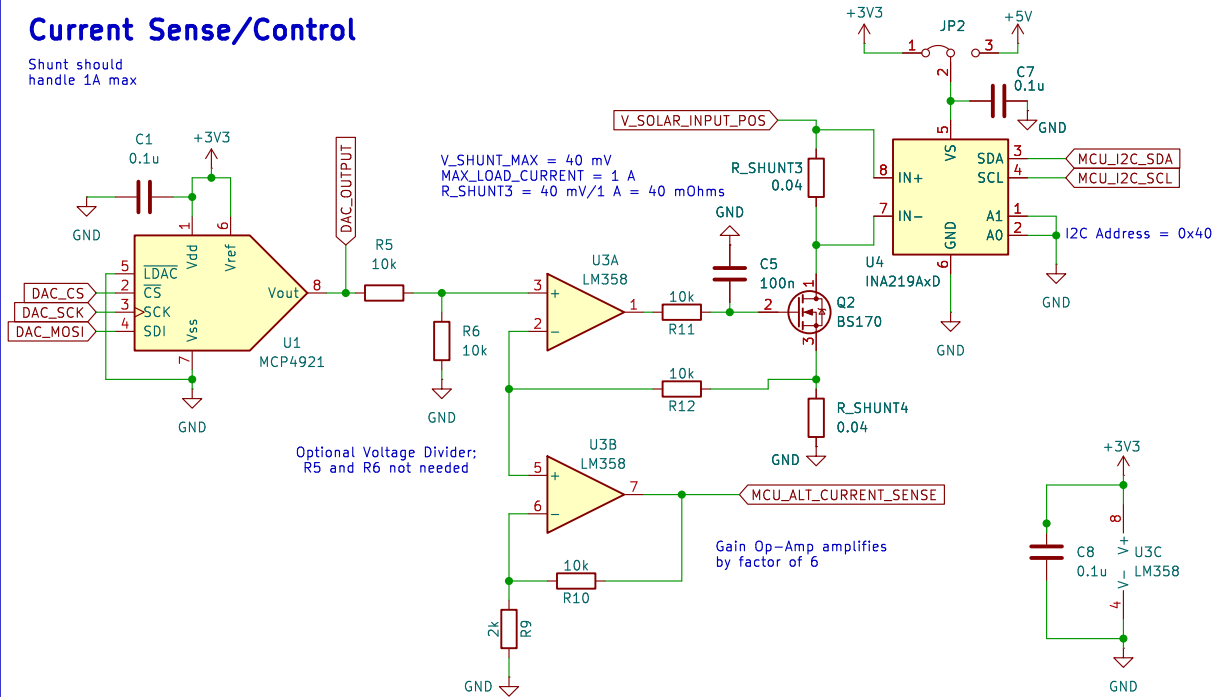
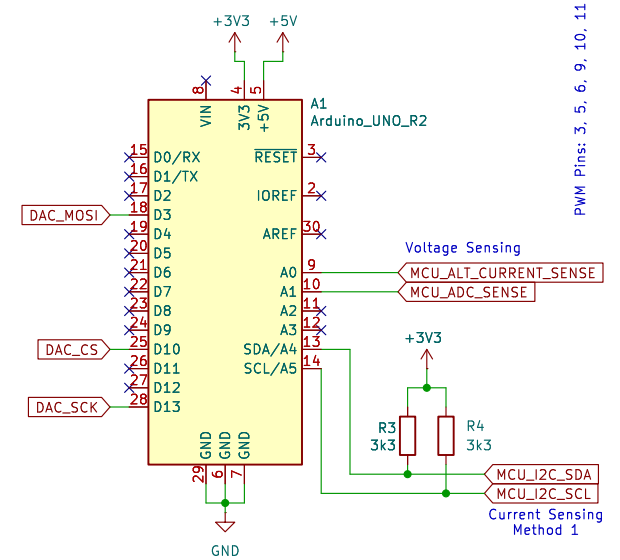


Current Sense/Control

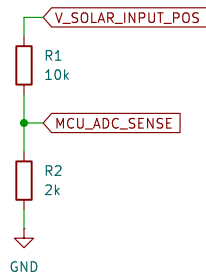
Shunt should handle 1A max



Microcontroller: Measure ADC voltage, control current, output to computer for logging



Voltage Divider: Sense the total cell/panel voltage



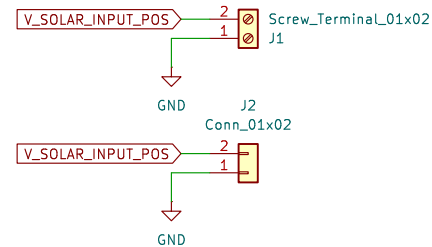
Voltage Divider:
Max Input Voltage = 20V (safe over-estimate)
Max Output Voltage = 3.3V (to microcontroller)
Target Ratio = $3.3/20 = 0.165$
Minimum Sum for 5mA leakage = $20V/0.005 = 4k_ohm$
Let $R_{Top} = 10k$
 $V_{out} = V_{in} \times (R_{Bottom}) / (R_{Top} + R_{Bottom})$
Thus, $R_{Bottom} = 1976\ ohms$

$V_{out} = 3.3$
 $V_{in} = 20$
 $R_{top} = 10000$
 $I_{leakage} = 0.005$
 $min_sum = V_{in} / I_{leakage}$
 $R_{bottom} = (V_{out} \times R_{top}) / (V_{in} - V_{out})$

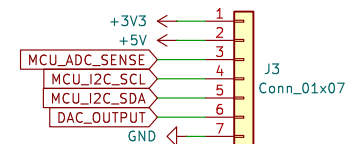
Real Divider Ratio = $2k / (10k + 2k) = 0.16666$

Rev 0 Perfboard = 9.68k, 2.18k, so ratio = 0.183811

Solar Cell/Panel Hook-Up



Microcontroller Pin Breakout for Debugging



TODO: maybe add driver to apply voltage to panel shortly

A short story explaining this project

This solar panel load tester is design to apply a known, consistent, variable load to solar cells and/or panels in order to characterize their I-V and P-V curves. It uses two methods for current sensing: a current sense shunt resistor and precision current sense IC, AND, a MOSFET in its linear region with an op-amp and another shunt resistor.

The microcontroller will log information about the total panel/cell voltage and current over UART for plotting and analysis.

This schematic will first be built on a perfboard, and will likely be manufactured into a PCB shortly thereafter.

Sheet: /
File: panel-tester-hardware.kicad_sch

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Size: USLetter Date: 2024-05-18
KiCad E.D.A. 8.0.3

Rev: Rev 1
Id: 1/1