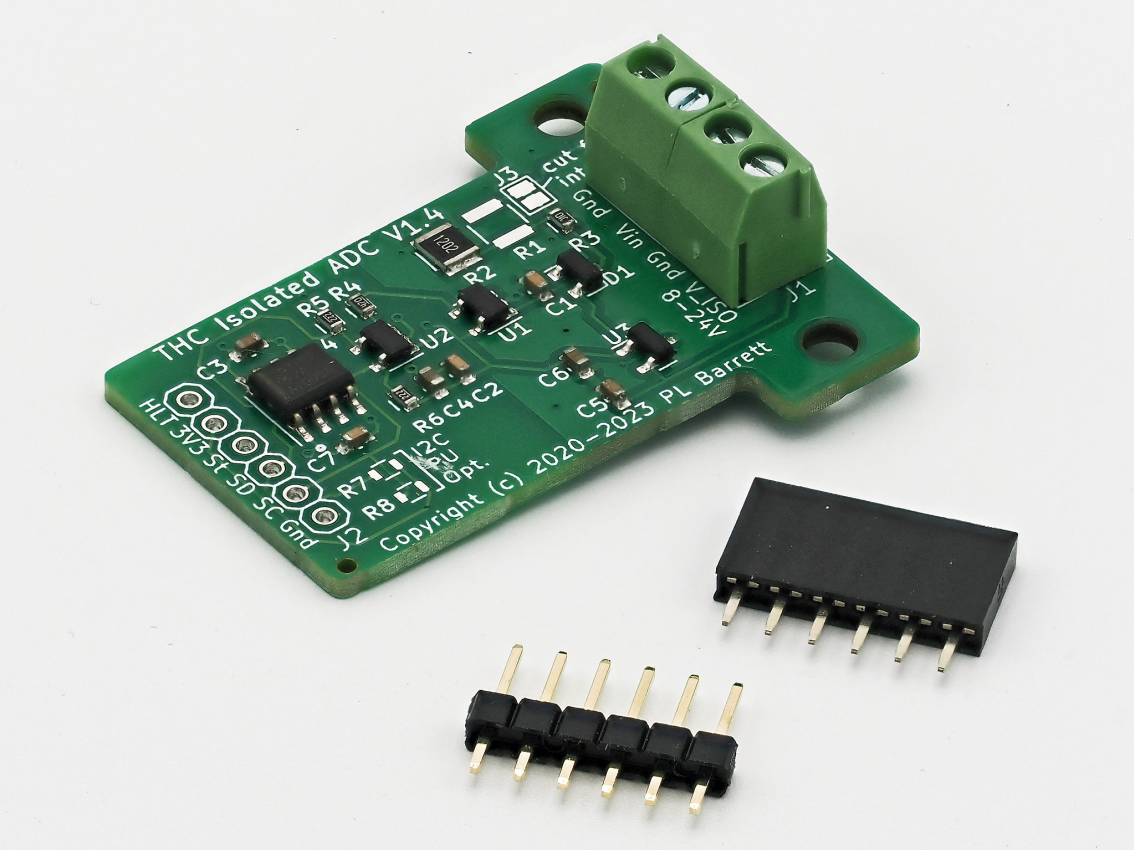
GrblHAL THC Isolated ADC for Torch Height Control
User Manual

Version 1.0



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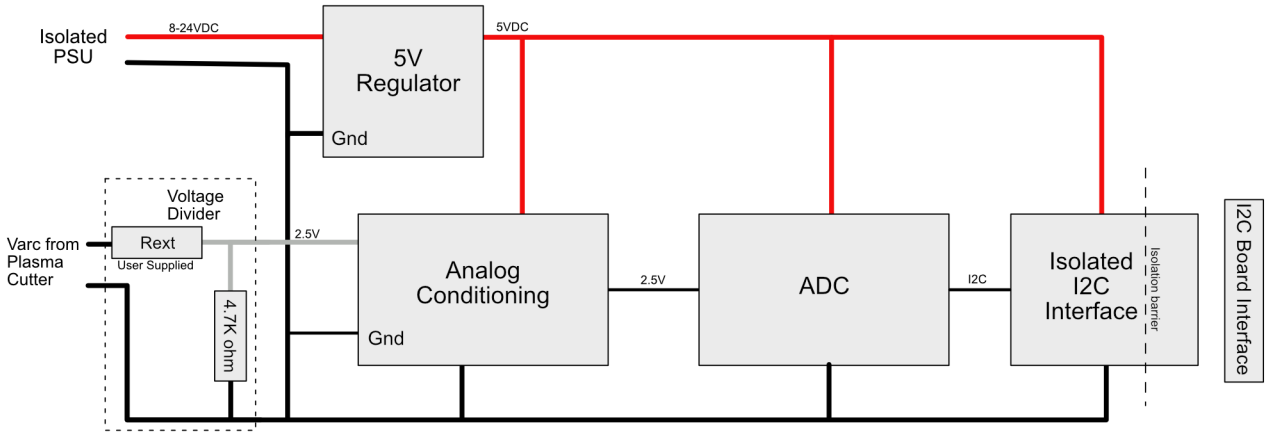
Introduction

The THC Isolated ADC is designed to plug into the I2C port on either the T41U5XBB or PicoCNC. It contains an isolated 12 bit ADC, 5V voltage regulator, voltage divider and analog conditioning circuitry.



THC Isolated ADC block diagram.

User Supplied Resistor

The THC Isolated ADC uses a voltage divider to reduce the Plasma Arc Voltage (Varc) down to approximately 2.5V so that the signal may be conditioned and converted to digital. This uses 2 resistors in a voltage divider configuration. The lower of the two is mounted on the PCB and has a value of 4.7K Ohms. The upper one is user supplied and the value is dependent on the Plasma Cutter output voltage (Varc). Consult the following table for the correct value

Varc (volts)	Rext (ohms)	Resistor Wattage
100V	183.3K	½ W
50V	89.3K	½ W
20V	32.9K	½ W
10V	14.1K	½ W
5V	4.7K	½ W

You may substitute the nearest standard 1% resistor value. If your Plasma Cutter has an Arc Voltage that is not in the table, you may use the following formula to calculate the value of Rext:

Rext = 4700 * (Varc/2.5 – 1)

Select the nearest standard value 1%, 1/2W resistor.

Note: you do not need better than 1% accuracy because you can adjust the expected value in the Plasma THC plug-in in grblHAL.

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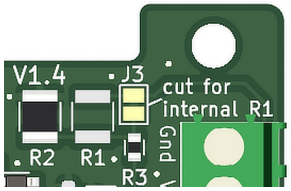
A SMD pad for an on-board external resistor is provided. (yes, we get the irony of that.) You may solder a 1206 SMD resistor on the R1 footprint and avoid having the external resistor. Use the same above process for selecting the value of the external resistor. You will need to cut the trace between pads labeled J3 where it says “cut for internal R1”.

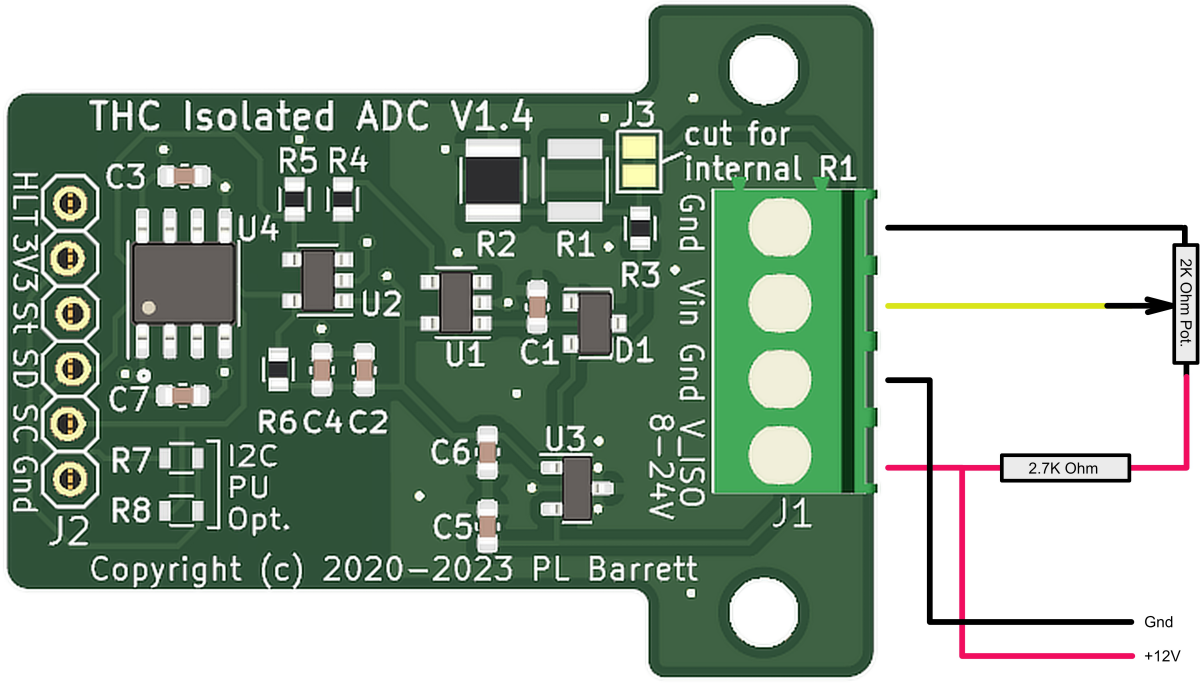
Note, allowing a Varc higher than 10V onto the PCB may bring EMI onto the ADC board. This can result in ADC disruption and possibly damage. Because of that, we do not recommend use of an internal R1.



Installing and Testing

Insert and solder the proper connector (6x1 pin header or 6x1 socket) on the ADC, depending on what you have soldered in the I2C header on the breakout board PCB. Insert the ADC board onto the breakout board.

Use the following diagram to make a test jig. The 2K Ohm pot and 2.7K resistor form a voltage divider to bring 12V down to 5V, at most. You can use any combination of resistor and potentiometer that make the Vin voltage no higher than 5V.



Test set up for ADC input

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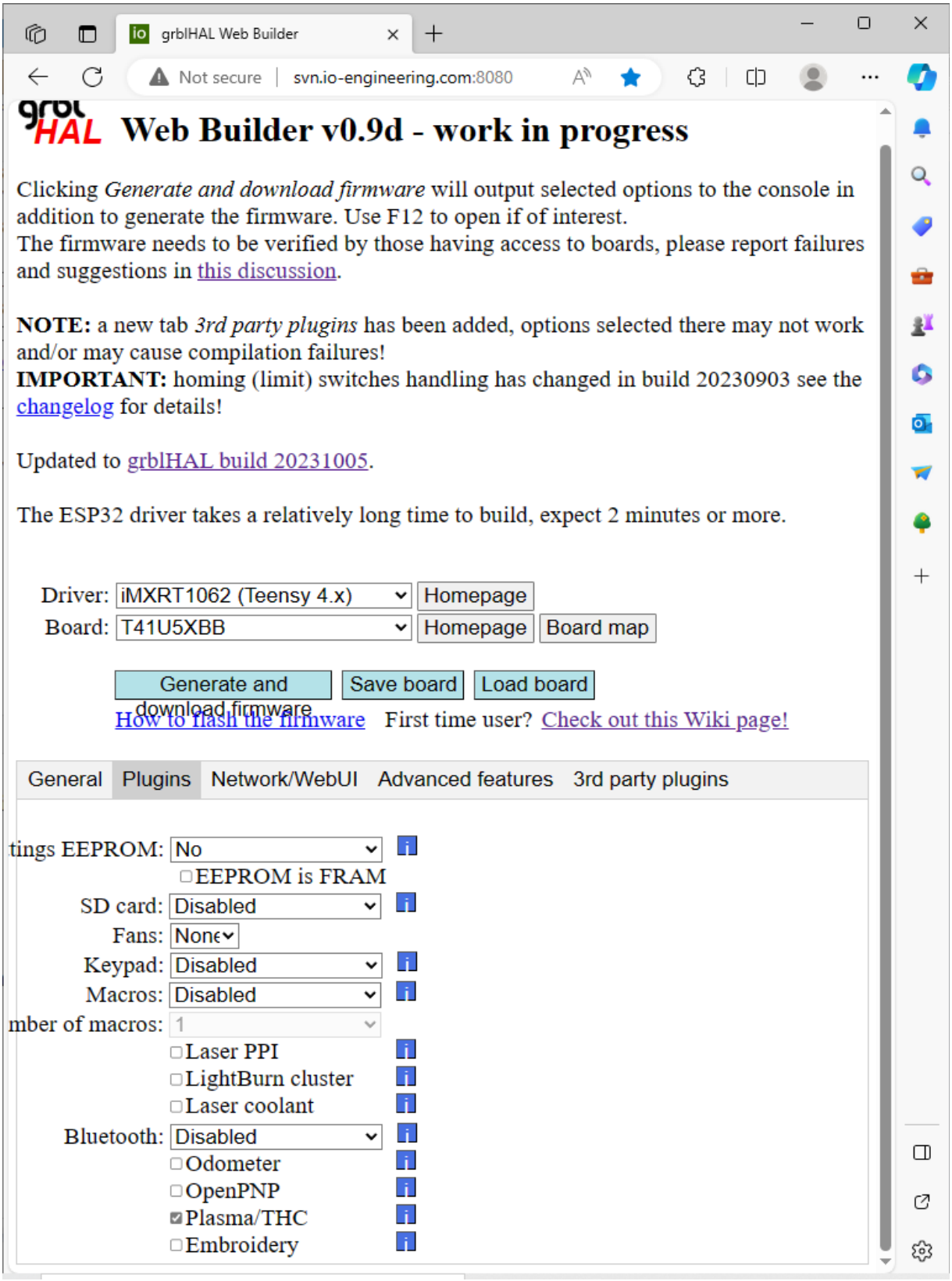
Make sure you have built grblHAL with the Plasma/THC plugin. If using the Web Builder, check Plasma THC on the Plugins page.



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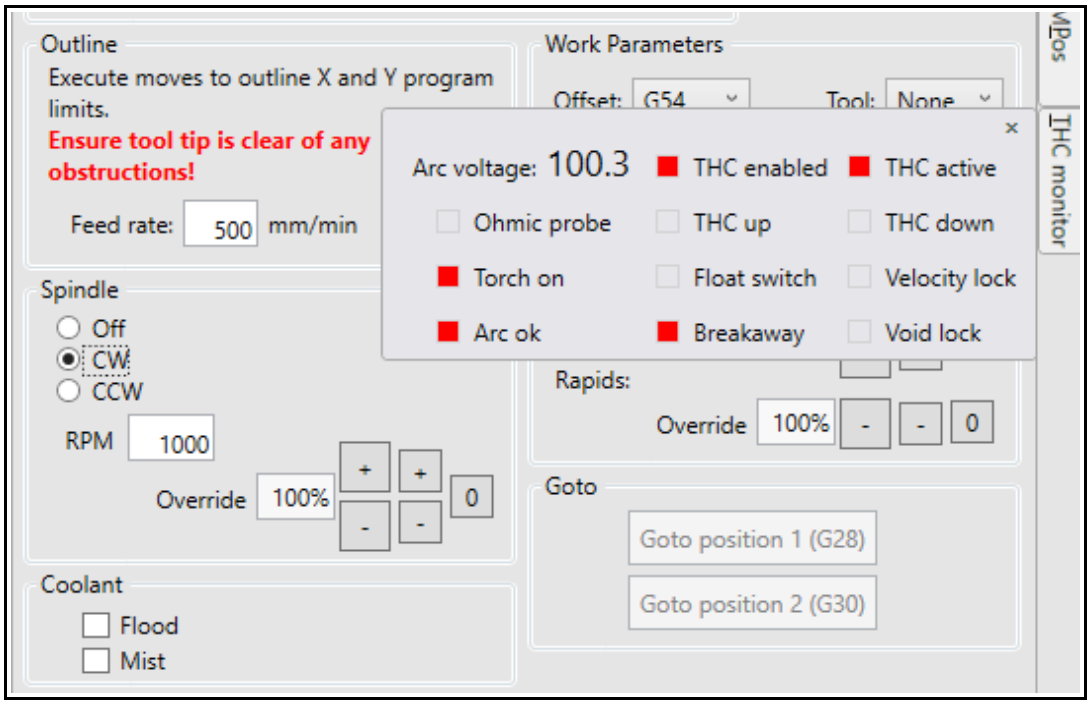
Make sure you have at least version 2.0.44 of ioSender installed (or edge version 2.0.44p4). A plasma fly-out will appear on the right edge of the ioSender window. Click on it and you should see the following:



Adjust the potentiometer and you should see the voltage change. If you have an Arc Voltage of 0, verify the voltage going into the Vin pin. You may need to adjust several of the Grbl plasma settings

Mode ($350) set to 1, external arc voltage

Voltage Scale ($361) set to a value that yields 100V

<note to self – expand setting section>

For other settings, look at the THC/Plasma plugin github repo (https://github.com/grblHAL/Plugin_plasma/).

The THC Isolated ADC is part of the evolving grblHAL plasma capabilities. As such, things may change. The github Plugin_plasma repo has Issues and Discussions pages. These are the best places to get questions answered and report bugs or other problems.

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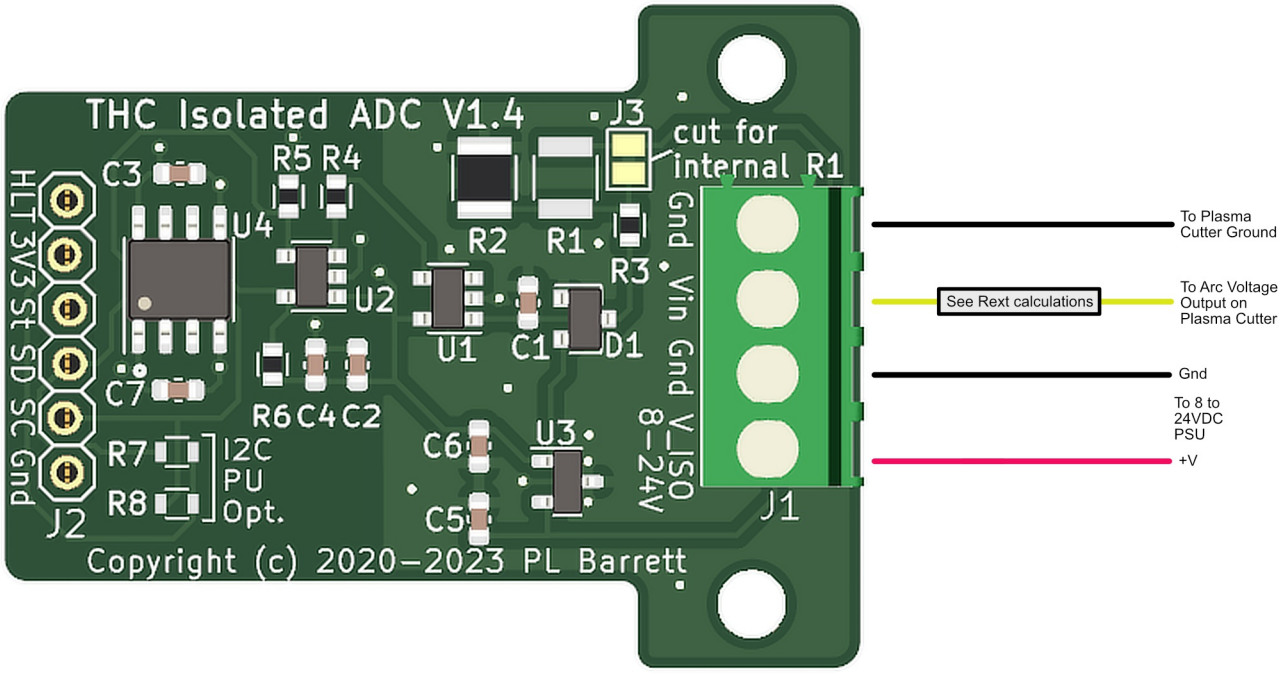
Connecting to Plasma Cutter.

The external resistor needs to be connected between the Plasma Cutters Arc Voltage output and the Vin pin on the ADC. You need to use shielded wire and insulate the resistor pins (shrink wrap is a good choice). The 8-24V power supply only needs to deliver 25 mA.



Plasma Cutter ADC input Connections

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I2C Resistors

The THC Isolated ADC has pads for I2C Pullup Resistors (R7 and R8). These are for the interface to the processor on the breakout board. They are not needed for use with the T41U5XBB. If you need them, consult with the manufacturer of the processor to which you are interfacing for help in determining their values.

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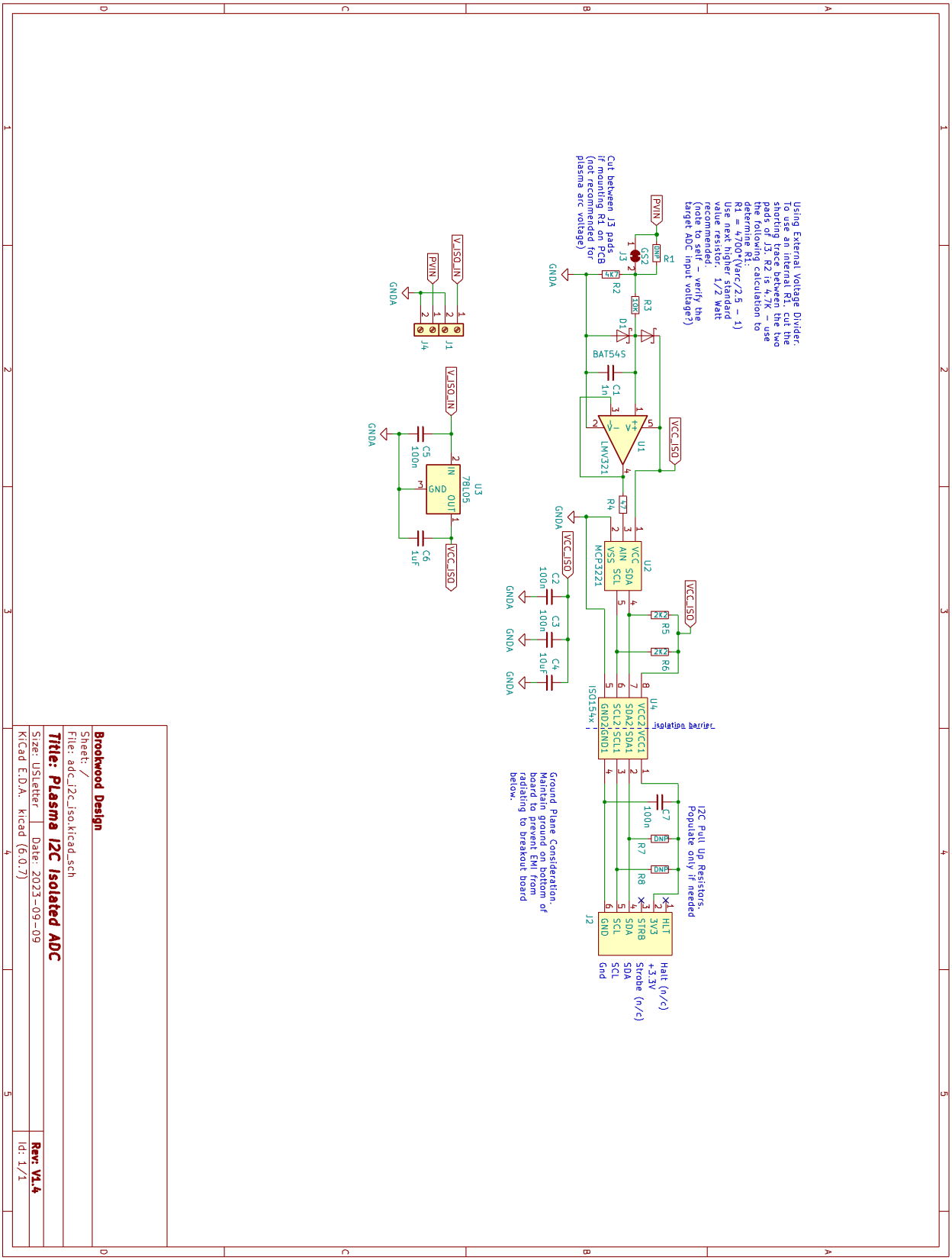
Schematic



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