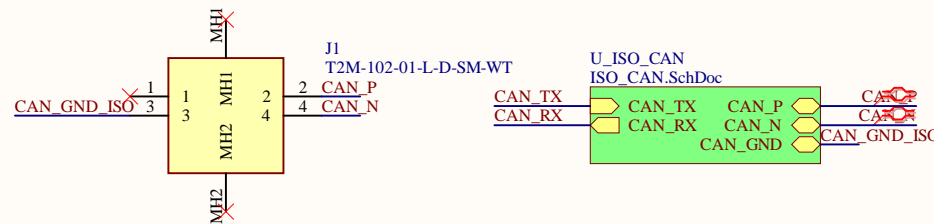
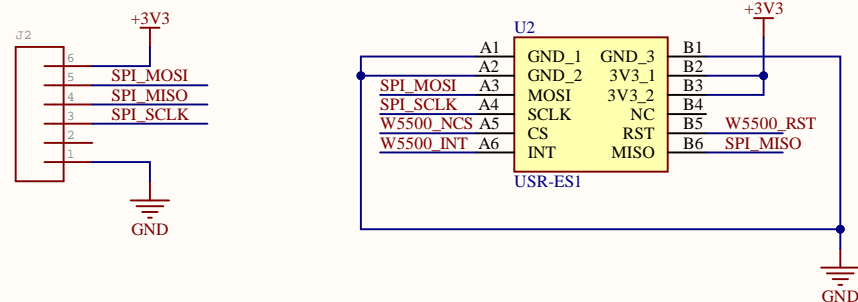


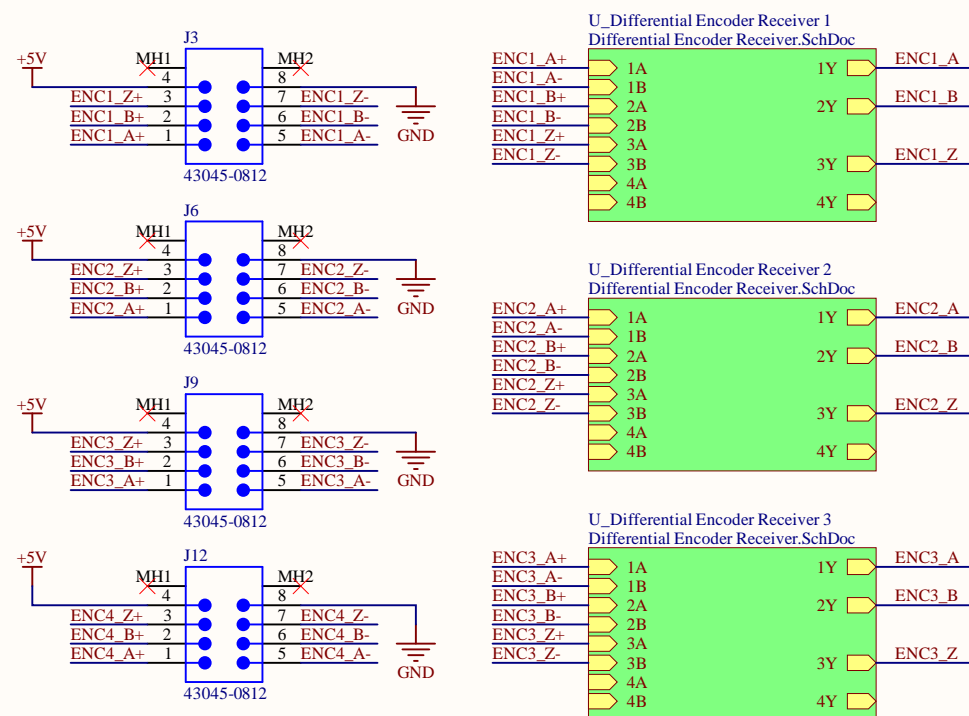
CAN connector + CAN chip



Ethernet W5500 module

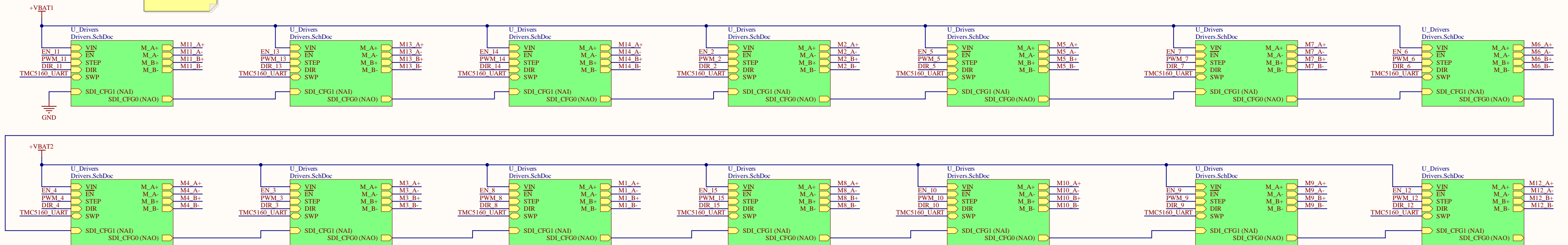


Differential receivers + connectors for encoder inputs

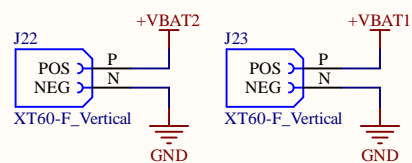


Stepper Drivers

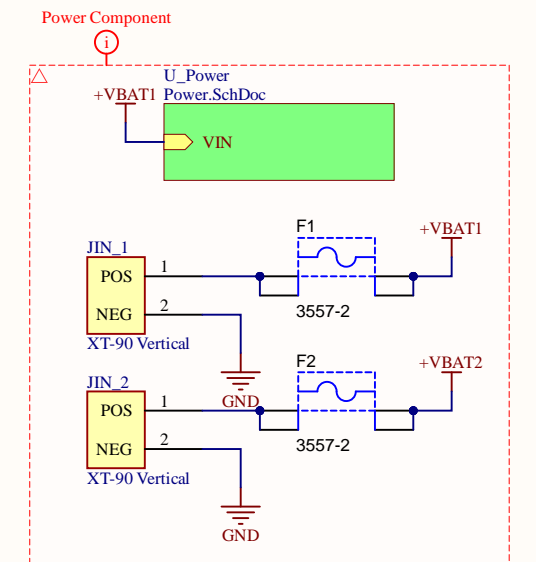
Stepper drivers are daisy chained in clockwise direction



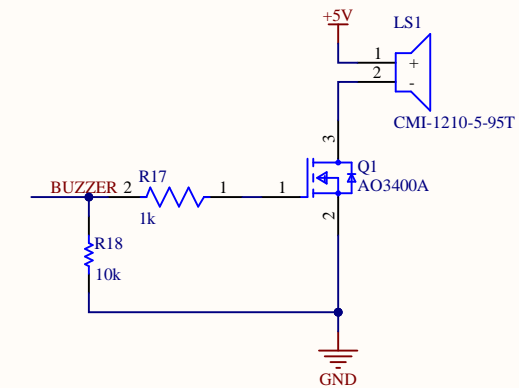
ESC Power Connectors



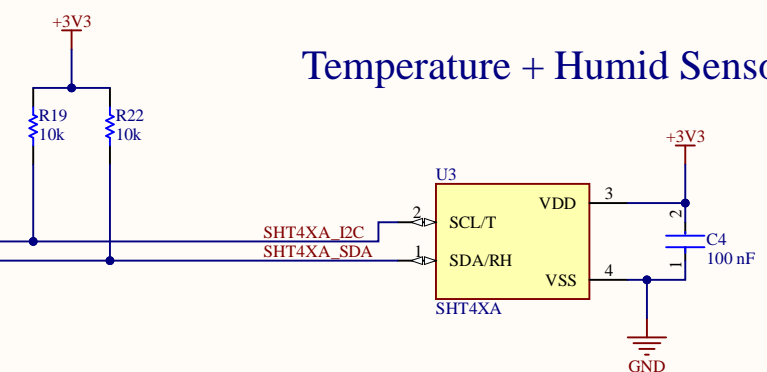
Battery Connectors and Buck Converter

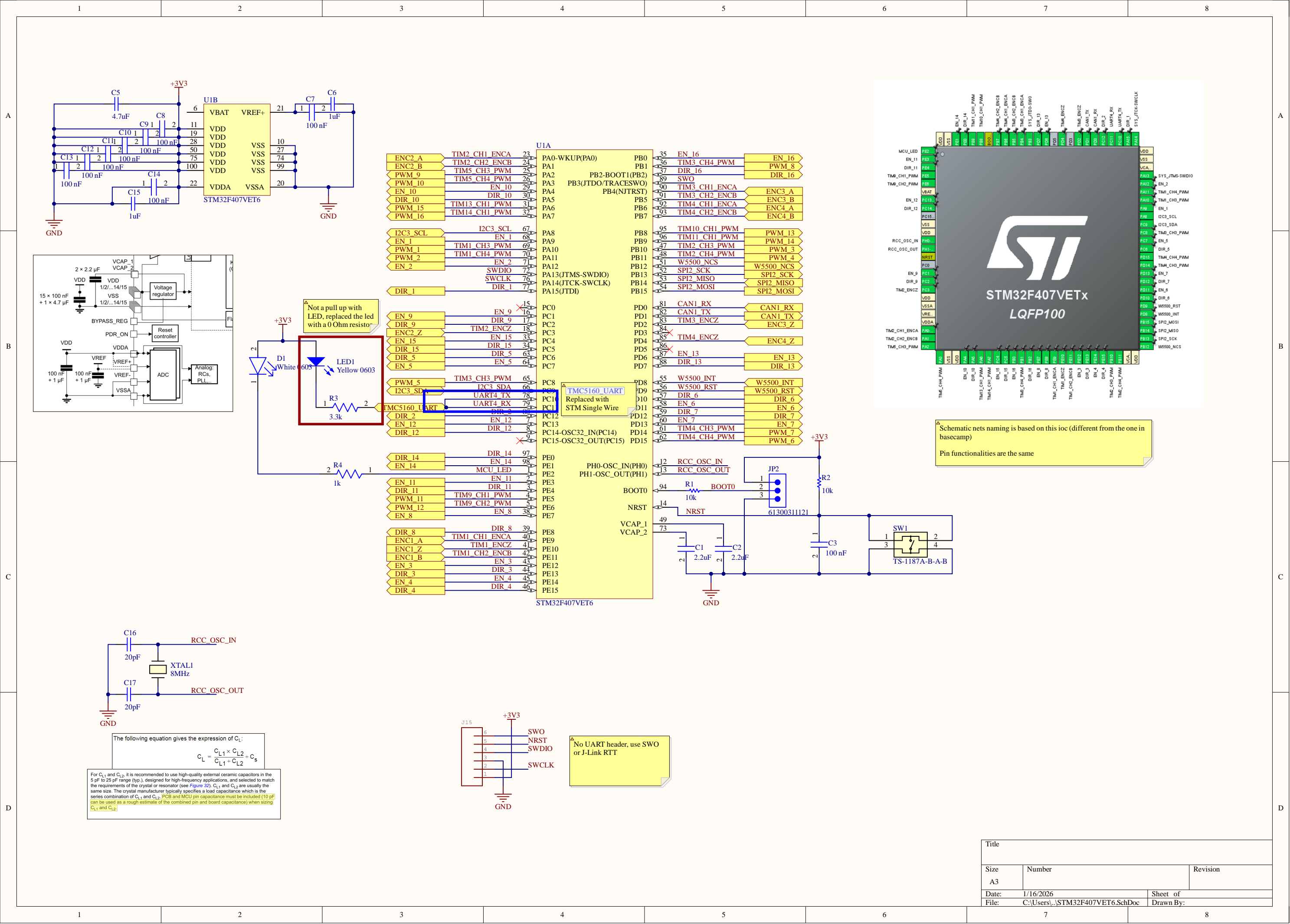


Buzzer for very serious stuff

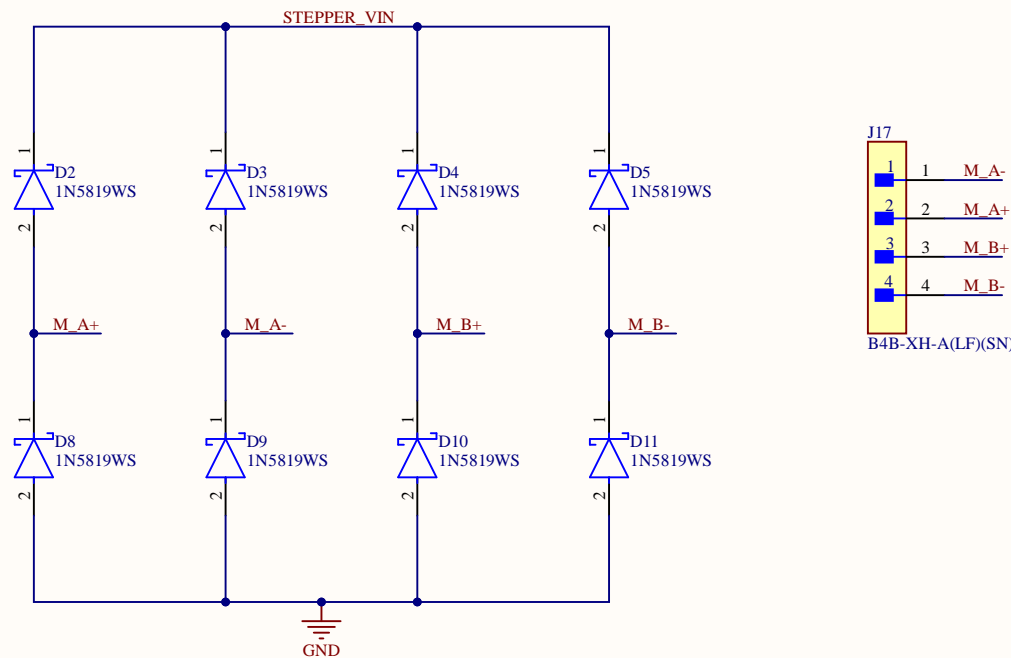
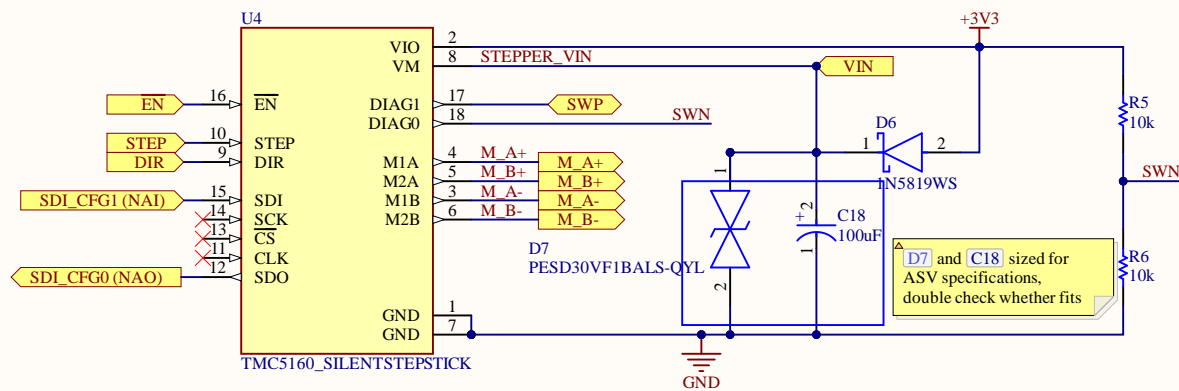


Temperature + Humid Sensor





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Addressing multiple slaves with UART mode

https://www.analog.com/media/en/technical-documentation/data-sheets/TMC5160A_datasheet_rev1.17.pdf

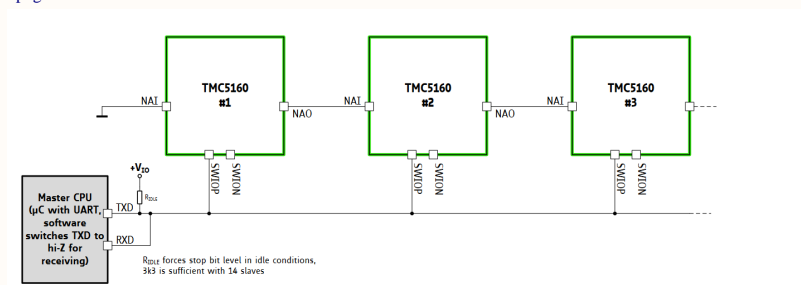
5.3 UART Signals

The UART interface on the TMC5160 comprises four signals:

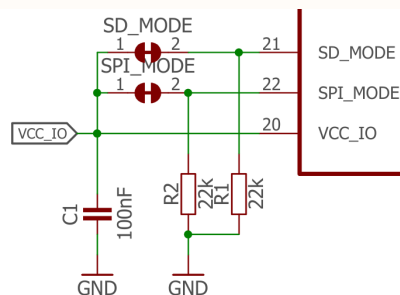
TMC5160 UART INTERFACE SIGNALS	
SWP	Non-inverted data input and output
SWN	Inverted data input and output for use in differential transmission. Can be left open in a 5V IO voltage system. Tie to the half IO level voltage for best performance in a 3.3V single wire non-differential application.
SDI_CFG1 (NAI)	Address increment pin for chained sequential addressing scheme
SDO_CFG0 (NAO)	Next address output pin for chained sequential addressing scheme (reset default=high)

In UART mode (SPI_MODE low and SD_MODE low) the node checks the single wire SWP and SWN for correctly received datagrams with its own address continuously. Both signals are switched as input during this time. It adapts to the baud rate based on the sync nibble, as described before. In case of a read access, it switches on its output drivers on SWP and SWN and sends its response using the same baud rate.

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SD_MODE and SPI_MODE jumpers must be cut to enable UART mode (schematic from TMC5160 github)

Circuit protection

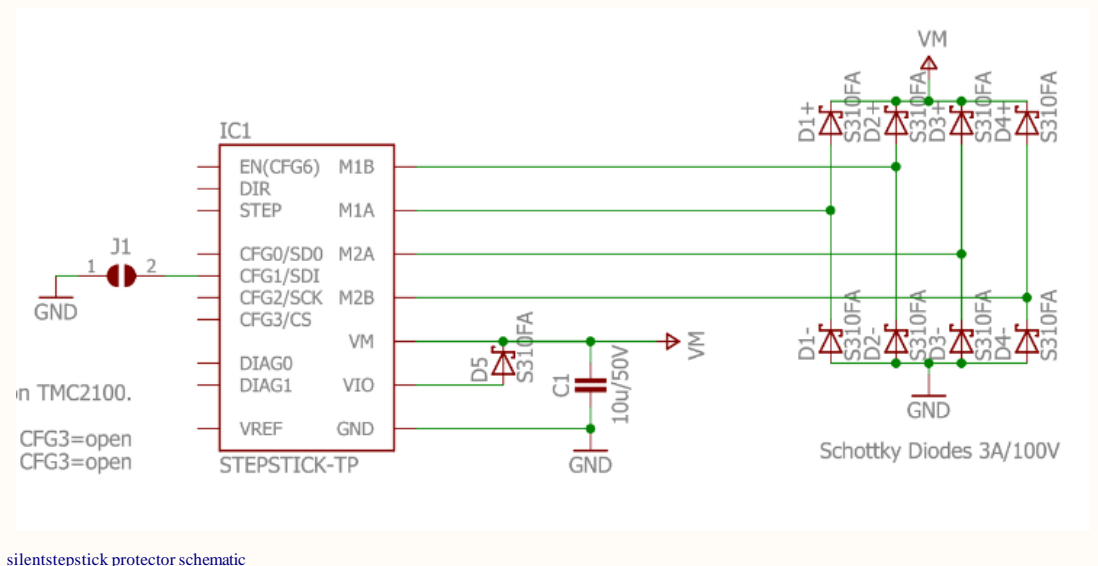
Powering

The motor supply voltage VM is a strong power supply with a high voltage. Always ensure that there cannot occur voltage spikes on power up. Further Information: [Pololu - Understanding Destructive LC Voltage Spikes](#).

A **100uF capacitor (low ESR)** near every SilentStepStick driver is recommended for best performance and for supply voltages $\geq 24V$ or $\geq VM_{max}/2$ ¹ a suppressor diode (**TVS diode**) for over-voltage protection.

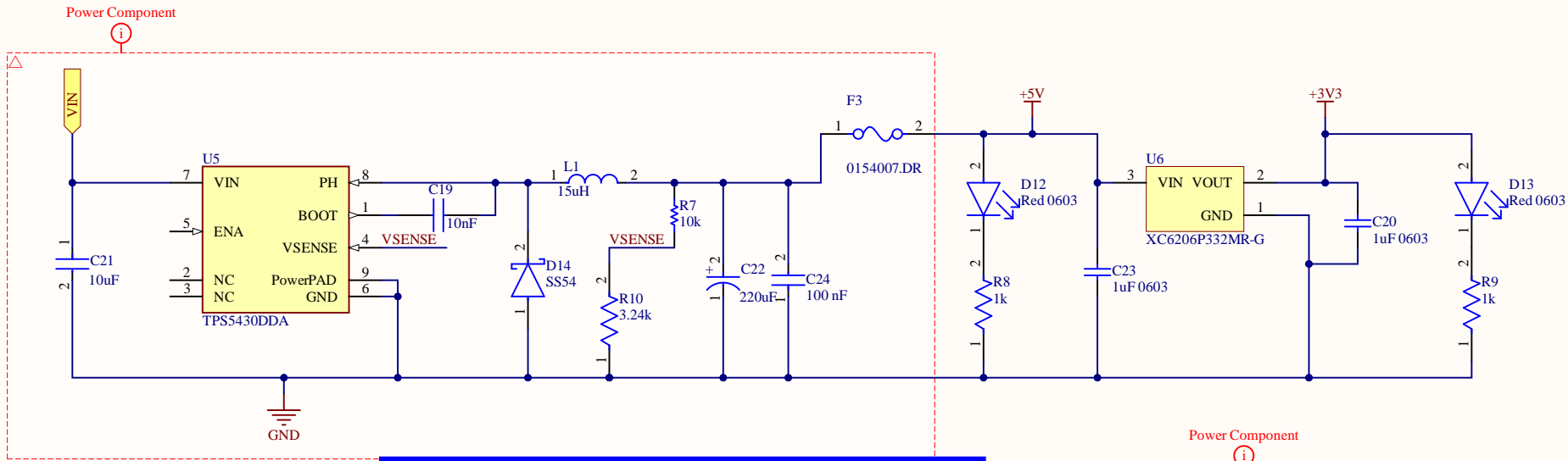
Only after the logic supply voltage VIO is present and stable, the driver inputs (STEP, DIR, EN, CFG...) can be driven with a high level.

If the motor is running/moving, then it is not allowed to switch off the power supply. Always make sure that the motor stands still and the motor outputs are deactivated on shutting down, otherwise the driver IC can get damaged (because of back EMF). An **emergency stop** can be realized, when the EN pin is set to VIO (high). This will switch off all motor output drivers and will put the motor into freewheeling.

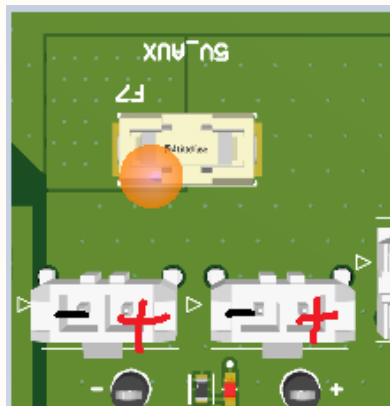


silentstepstick protector schematic

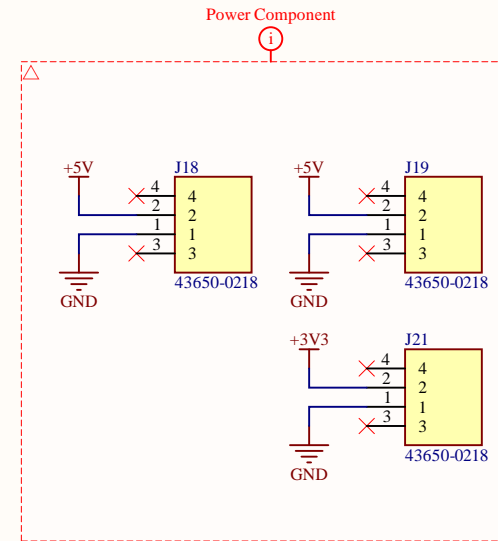
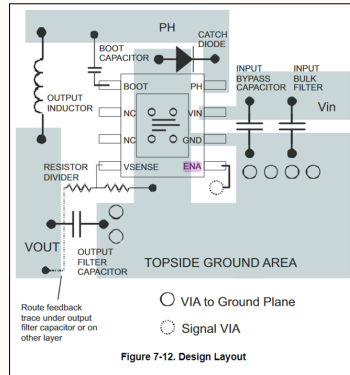
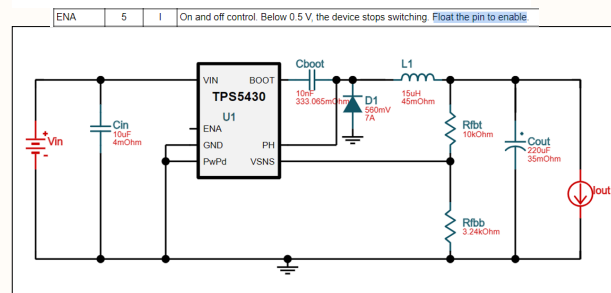
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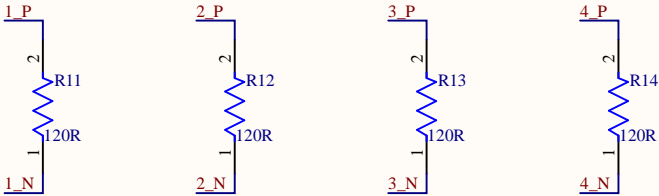
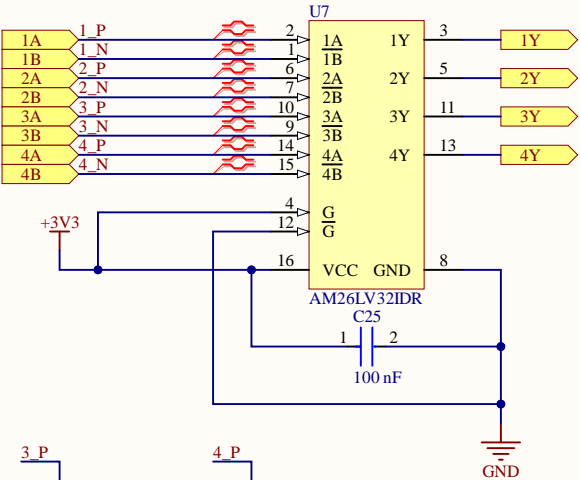
Connector standard for power (clip side -> GND)



Schematic + layout references



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⚠ Might have to change all the terminating resistors to 1k ohms - No data on the stepper motor's website.
<https://www.quantumdev.com/how-to-use-termination-resistors-when-installing-rotary-incremental-encoders/>

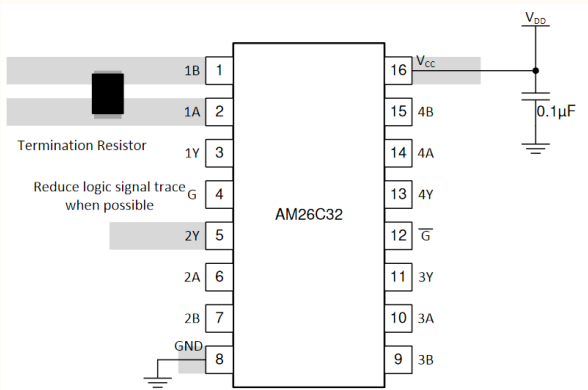


Figure 8-3. Trace Layout on PCB and Recommendations

⚠ (!!OLD!!) Change to Low Voltage version now (it was AM26C32IDR)

7.3.3 Active-High and Active-Low

The device can be configured using the G and \overline{G} logic inputs to select receiver output. The high voltage or logic 1 on the G pin, allows the device to operate on an active-high and having a low voltage or logic 0 on the \overline{G} enables active low operation. These are simply a way to configure the logic to match that of the receiving or transmitting controller or microprocessor.

⚠ G is Active Low config
Output is pulled up to 3v3 to interface with STM32

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File:	C:\Users\...\Differential Encoder Receiver	Submitted By:

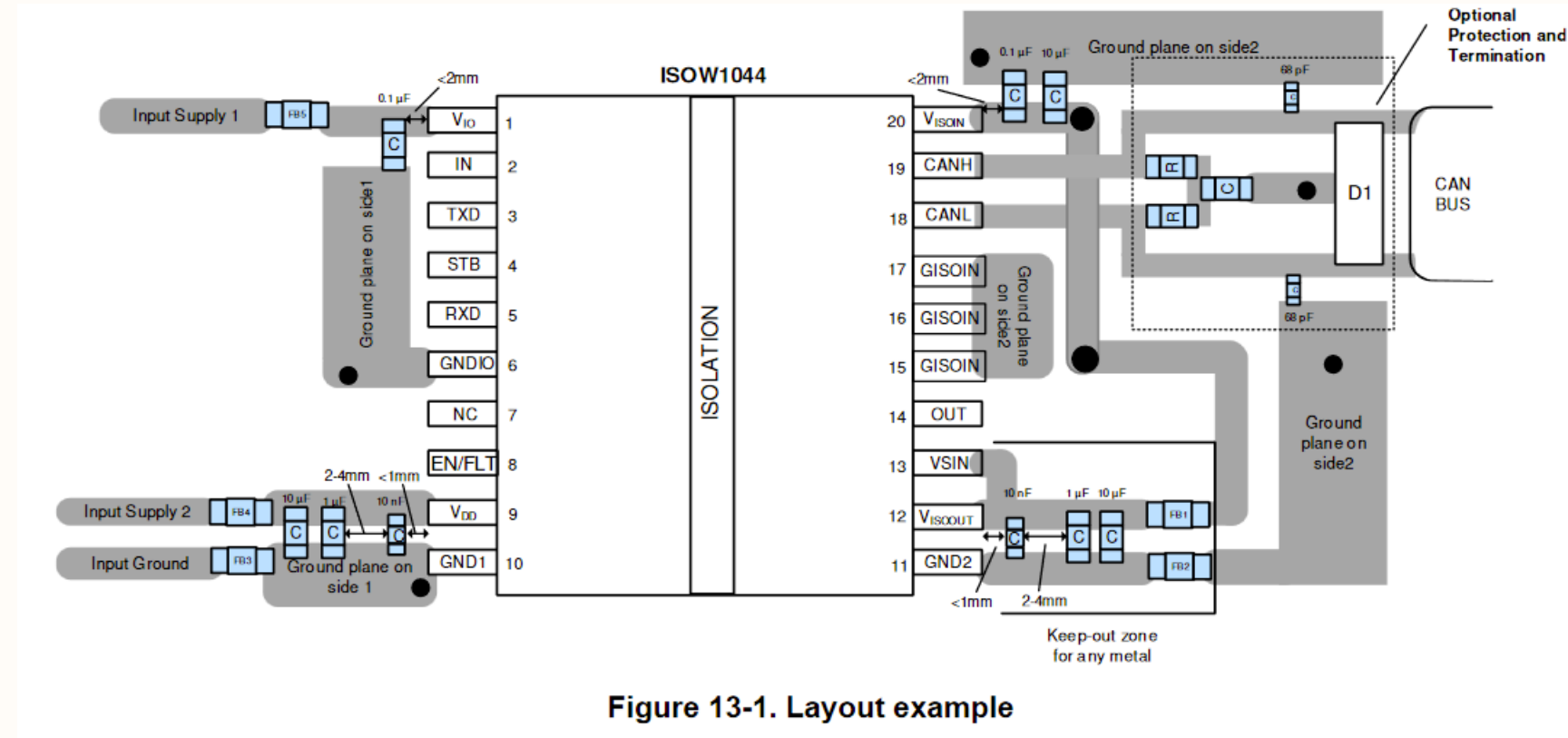
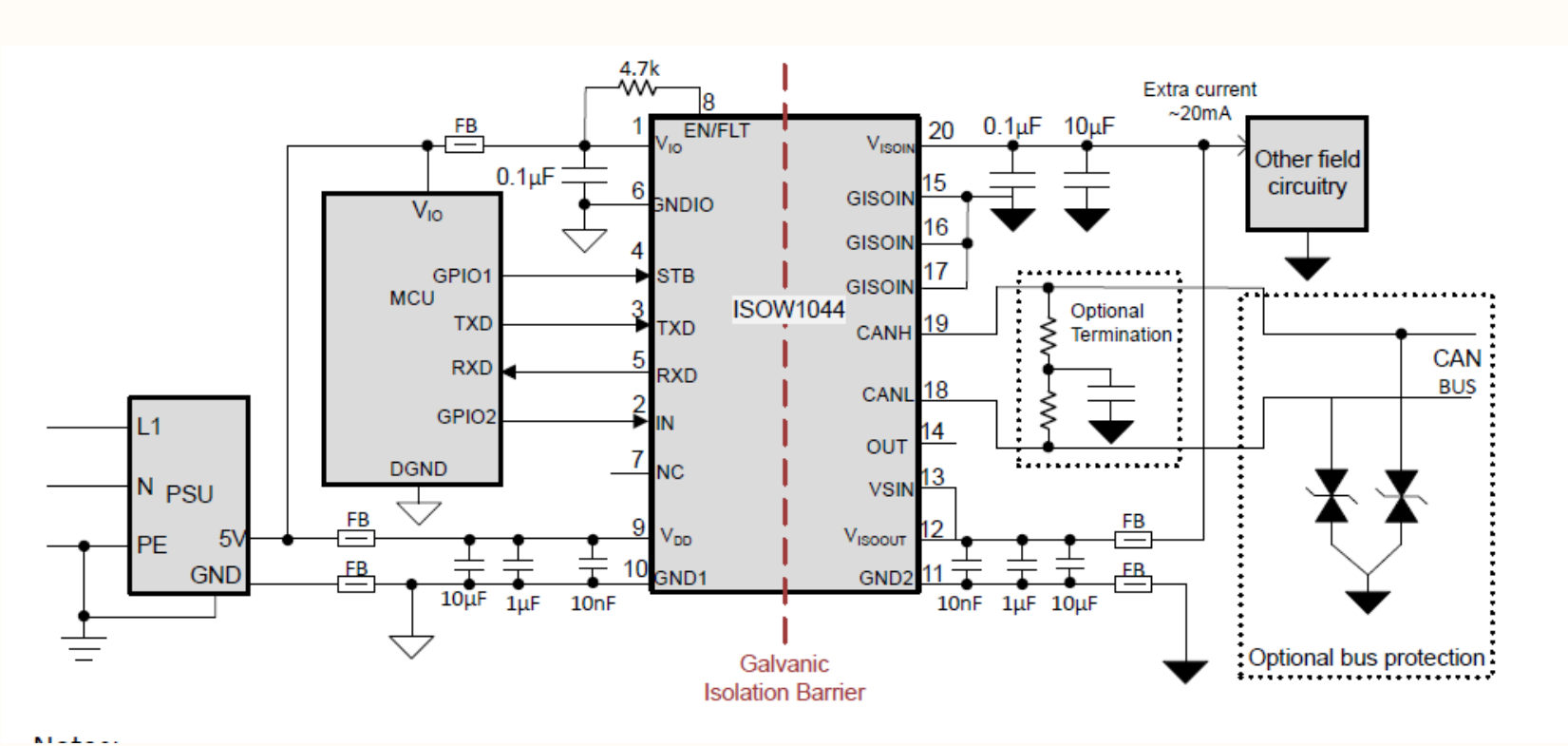
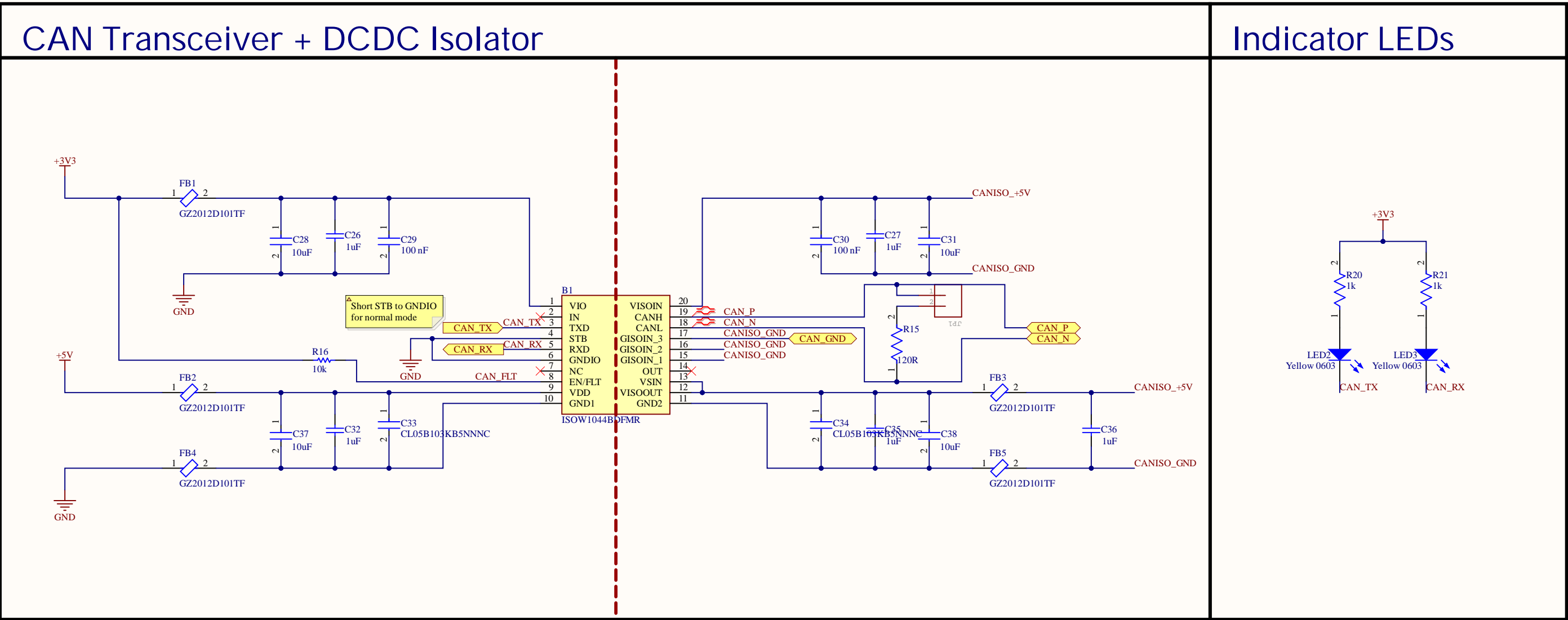


Figure 13-1. Layout example

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File:	C:\Users\ISO_CAN\SchDoc	Drawn By: