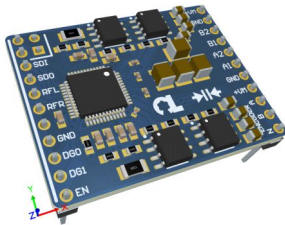


OSV - OL MOTOR DRIVER



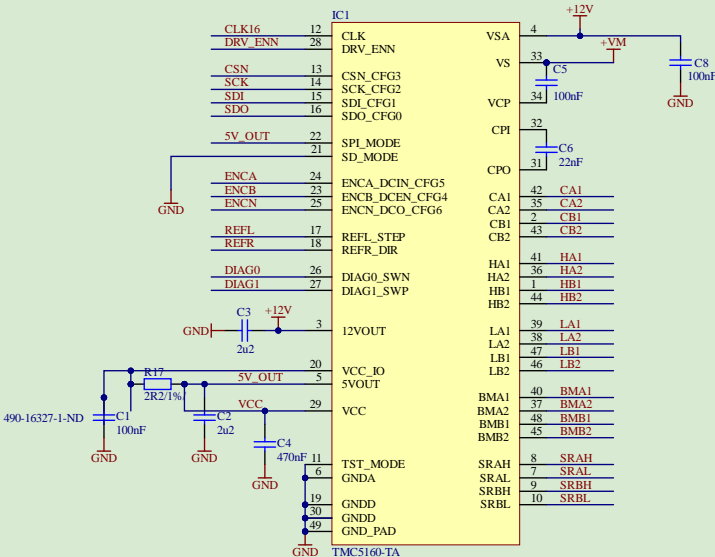
OVERVIEW:

This board can control up to 2x DC Motors / Actuators or 1x Bipolar stepper motor with voltages as high as 55V (Maximum suggested nominal voltage 48V) and phase currents up to 2.8 A. The motor control can be done via a microcontroller with SPI communication. The board can correct the motor drive by receiving an ENCODER signal (ENCA, ENCB, ENCN). The board can detect LIMIT DRIVE by receiving two logic signals generated by limit switches (REFL, REFR). The board provides 2 digital output signals for system diagnostic (DIAG1, DIAG0). To function, this board needs 2 voltage rail inputs (+12V and +VM (12-48V)). Additional filtering should be added on host board.

TMC5160A CONFIGURED FOR SPI CONTROL - DUAL SUPPLY OPERATION

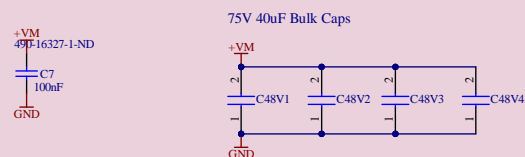
+VM = 12-55V Motor Supply (5.6 A MAX), 12V = TMC5160A Supply (40mA MAX)

WARNING: DRIVING +VM ABOVE 48V NOMINAL IS NOT RECOMMENDED



BOARD MOTOR SUPPLY VOLTAGE DECOUPLING CAPACITORS

NOTE: The hosting board of this module should integrate at least 400uF between +VM and GND

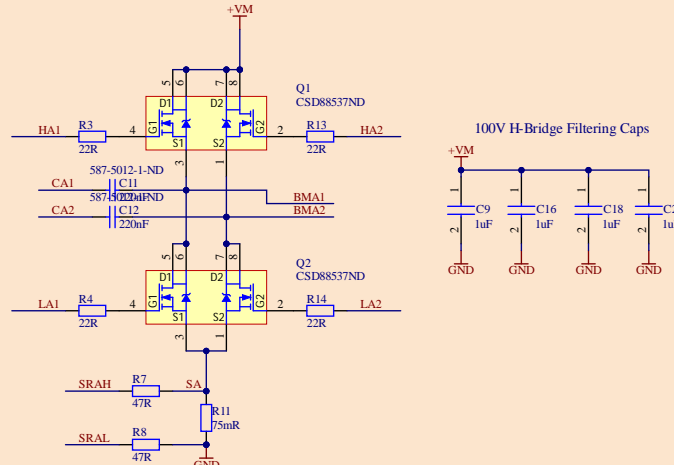


NOTES:

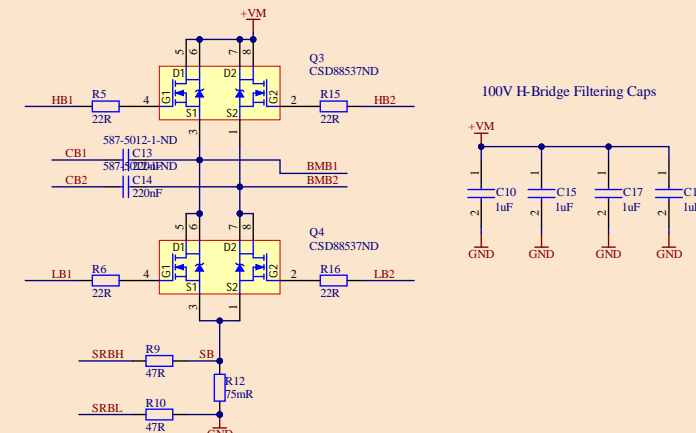
This board was developed after Trinamic's TMC5160, BOB design and updated to fit the OSV-OL project needs. Updates included change of switching mosfets, capacitors, pinout, routing and EMI-SI optimization. The Design is based on a 4-Layer Stackup and should not be changed to a lower amount as specified in TMC5160A application note.

Check the design for maximum, minimum and nominal voltage-current before using it in your system. Check the design and TRINAMIC website. TRINAMIC TMC5160A DATASHEET to understand if this design can be used as it is by your system. This design does not take advantage of specific TMC5160A functionalities and it is specifically designed to fit the needs of OSV-OL as of the design release date.

BMA PHASE BRIDGE WITH DECOUPLING CAPACITORS NEXT TO HIGH SIDE MOSFET



BMB PHASE BRIDGE WITH DECOUPLING CAPACITORS NEXT TO HIGH SIDE MOSFET



DISCLAIMER:

The design, schematic, attached documents and other materials ("Material") contained and linked in this project are intended to facilitate the design of an electronics system controller for a prototype reproducible medical device to be used, if required, during the Covid-19 pandemic or similar emergency situations. The Material is not itself a medical device. The Material has not been tested and has not been approved for use in humans or animals by any regulatory authority of any country.

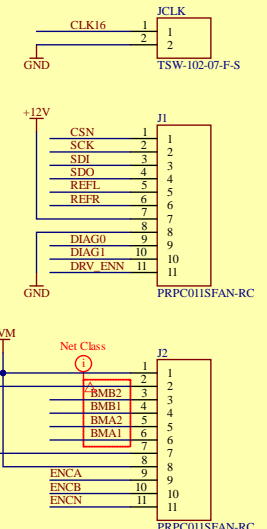
By using the Material, you are agreeing to the following disclaimer. OpenLung / Open Source Ventilator / Open Source Ventilator Velocity team / Designer offers the Material as-is and as-available, and makes no representations or warranties of any kind whatever concerning the Material, whether express, implied, statutory, or other. This includes, without limitation, warranties of merchantability, fitness for a particular purpose, non-infringement, absence of latent or other defects, accuracy, or the presence or absence of errors, whether or not known or discoverable.

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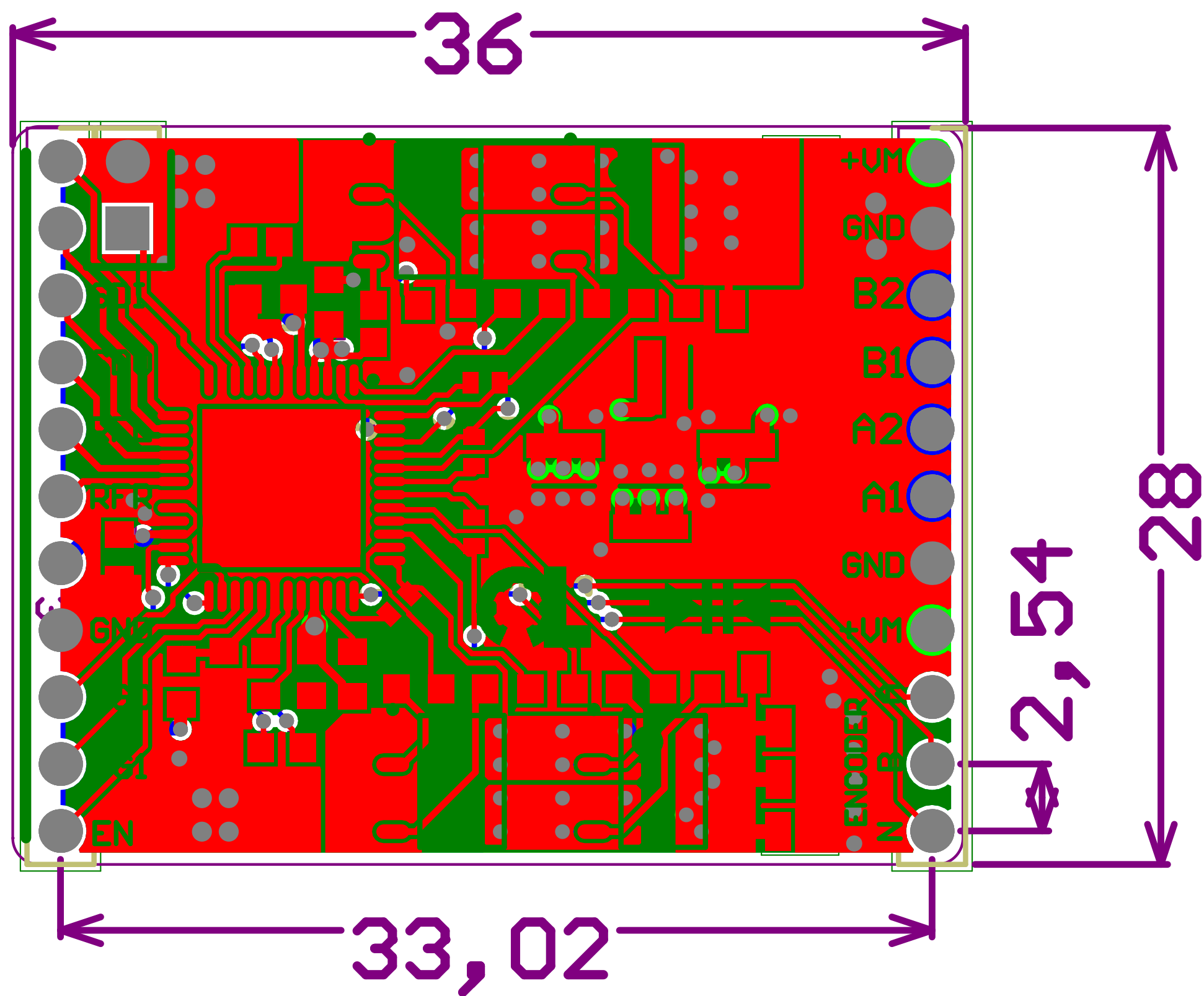
Any ventilator system that has not been approved by a competent medical device regulatory authority may not deliver to the user the ability to properly monitor and control tidal volume, inspiratory pressure, inspiratory:expiratory ratio, heart rate, nor provide the user with the ability to monitor and control positive-end expiratory pressure (PEEP), peak inspiratory pressure (PIP) or to adapt to individual patient requirements. Inability to monitor and/or control any of these factors can cause death or serious permanent injury.

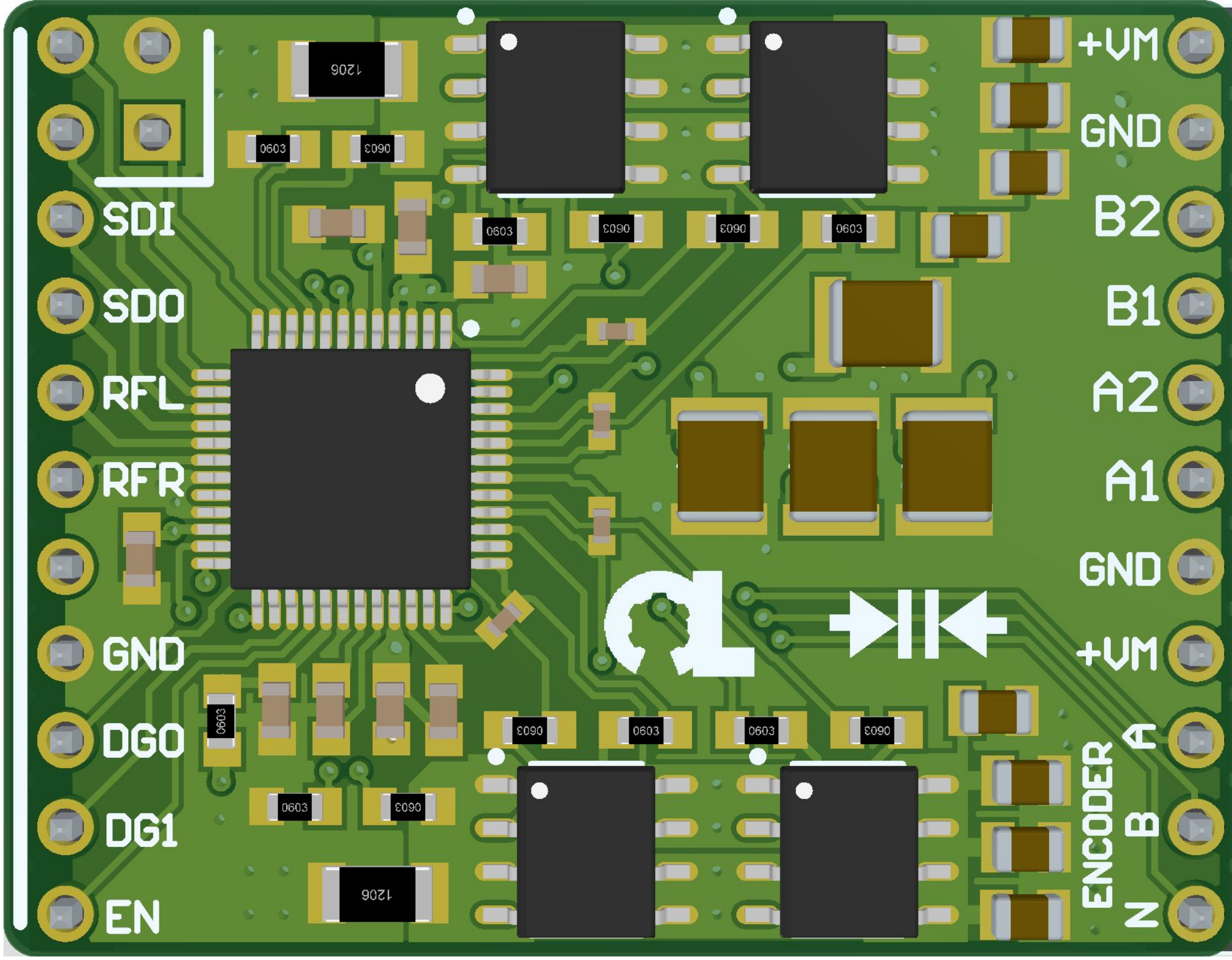
The disclaimer of warranties and limitation of liability provided above shall be interpreted in a manner that, to the extent possible, most closely approximates an absolute disclaimer and waiver of all liability.

CONNECTORS



Title OSV-OL TMC5160A MOTOR DRIVER		
Size A3	Number	Revision 3
Date: 4/10/2020	Sheet 1 of 1	Drawn By: Nadim Conti
File: C:\Users\...OSV-OL_MOT-DRIV_SchDoc		





+VM

GND CSN

GND

CLK16 SCK

OSV - OL

B2

STEPPER DRIVER

SDI

B1

SDO

A2

Driver: TMC5160A

RFL

A1

+VM: 12 - 55V

RFR

GND

I_{ph}, RMS: 2.8A

12V

+VM

GND

ENCODER
A
B
Z

Designer

DG0

Nadim Conti

DG1

EN

A

B

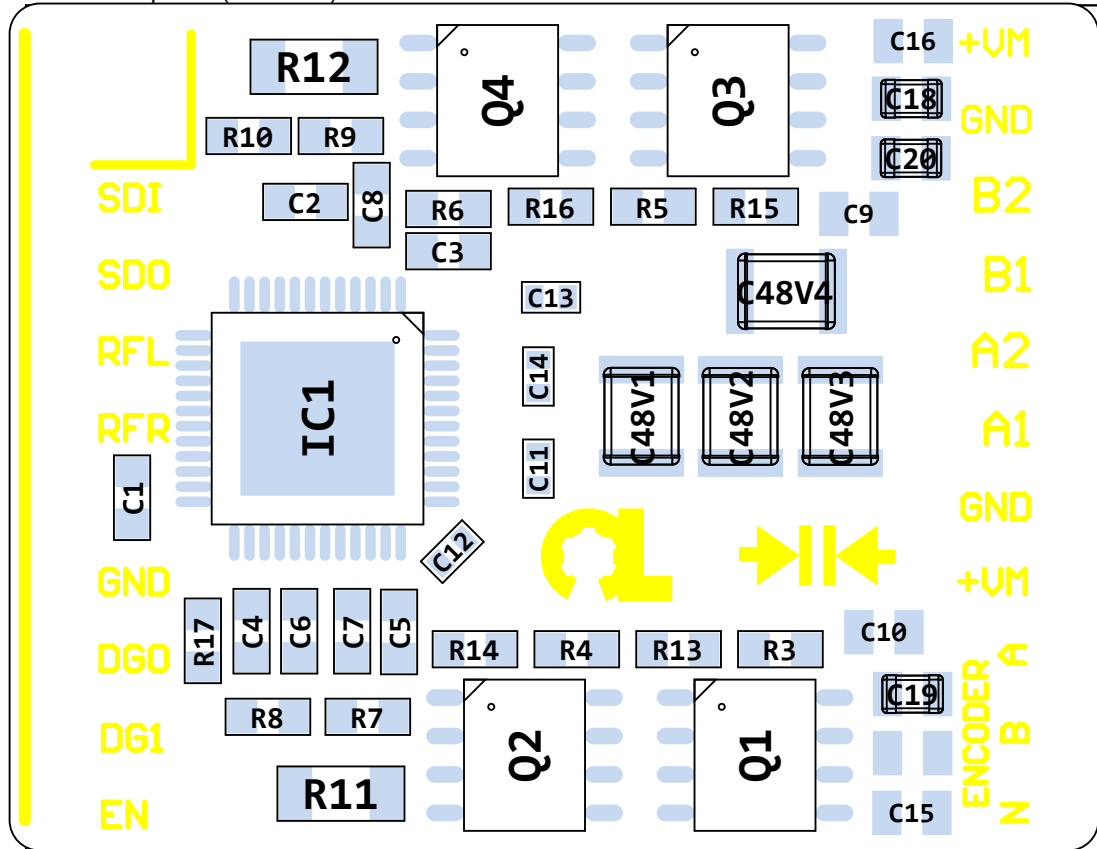
C

D

1

1

View from Top side (Scale 4:1)



2

2

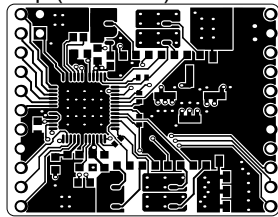
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3

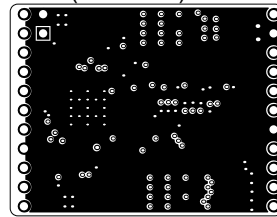
4

4

Top (Scale 1:1)



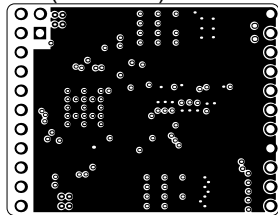
GND (Scale 1:1)



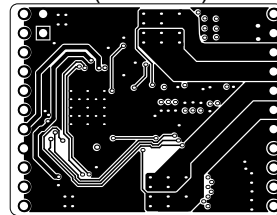
5

5

VM (Scale 1:1)



Bottom (Scale 1:1)



6

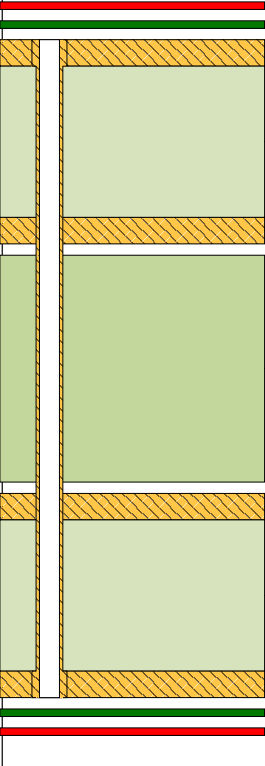
6

A

B

C

D

	A	B	C	D			
1	<div>Layer Stack Legend</div> 	Material	Layer	Thickness	Dielectric Material	Type	Gerber
		Surface Material	Top Solder	0mm	Solder Resist	Solder Mask	GTS
		Copper	Top	0mm		Signal	GTL
		Core		0mm	FR-4	Dielectric	
		Copper	GND	0mm		Signal	G1
		Prepreg		1mm	FR-4	Dielectric	
		Copper	VM	0mm		Signal	G2
		Core		0mm	FR-4	Dielectric	
		Copper	Bottom	0mm		Signal	GBL
		Surface Material	Bottom Solder	0mm	Solder Resist	Solder Mask	GBS
			Bottom Overlay			Legend	GBO
		Total thickness: 2mm					
4	Bill Of Materials						
	Line #	Designator	Comment	Quantity			
	1	C1, C5, C7, C8	100nF	4			
	2	C2, C3	2u2	2			
	3	C4	470nF	1			
	4	C6	22nF	1			
	5	C9, C10, C15, C16, C17, C18, C19, C20	GRM21BC72A105KE01L	8			
	6	C11, C12, C13, C14	220nF	4			
	7	C48V1, C48V2, C48V3, C48V4	C3225X7R1N106K250AC	4			
	8	IC1	TMC5160-TA	1			
	9	J1, J2	PRPC011SFAN-RC	2			
	10	JCLK	TSW-102-07-F-S	1			
	11	Q1, Q2, Q3, Q4	CSD88537ND	4			
	12	R3, R4, R5, R6, R13, R14, R15, R16	22R / 100mW / 1%	8			
	13	R7, R8, R9, R10	47R / / 1%	4			
14	R11, R12	75mR	2				
15	R17	2R2/1%/	1				
6							
	A	B	C	D			