



# TRINAMIC

MOTION CONTROL

[www.trinamic.com](http://www.trinamic.com)

TMC-Evaluation-Platform:

TMC4671-EVAL

Interfaces:

SPI, UART, S/D



open source  
hardware

v1.2

GND  
ADC\_I0\_INN  
ADC\_I1\_INN  
AENC\_WY\_INN  
AENC\_UX\_INN  
DBG\_SPI\_MISO  
DBG\_SPI\_TRG  
DBG\_SPI\_SCK  
GPI02  
GPI01  
GPI00  
+3V3  
+5V



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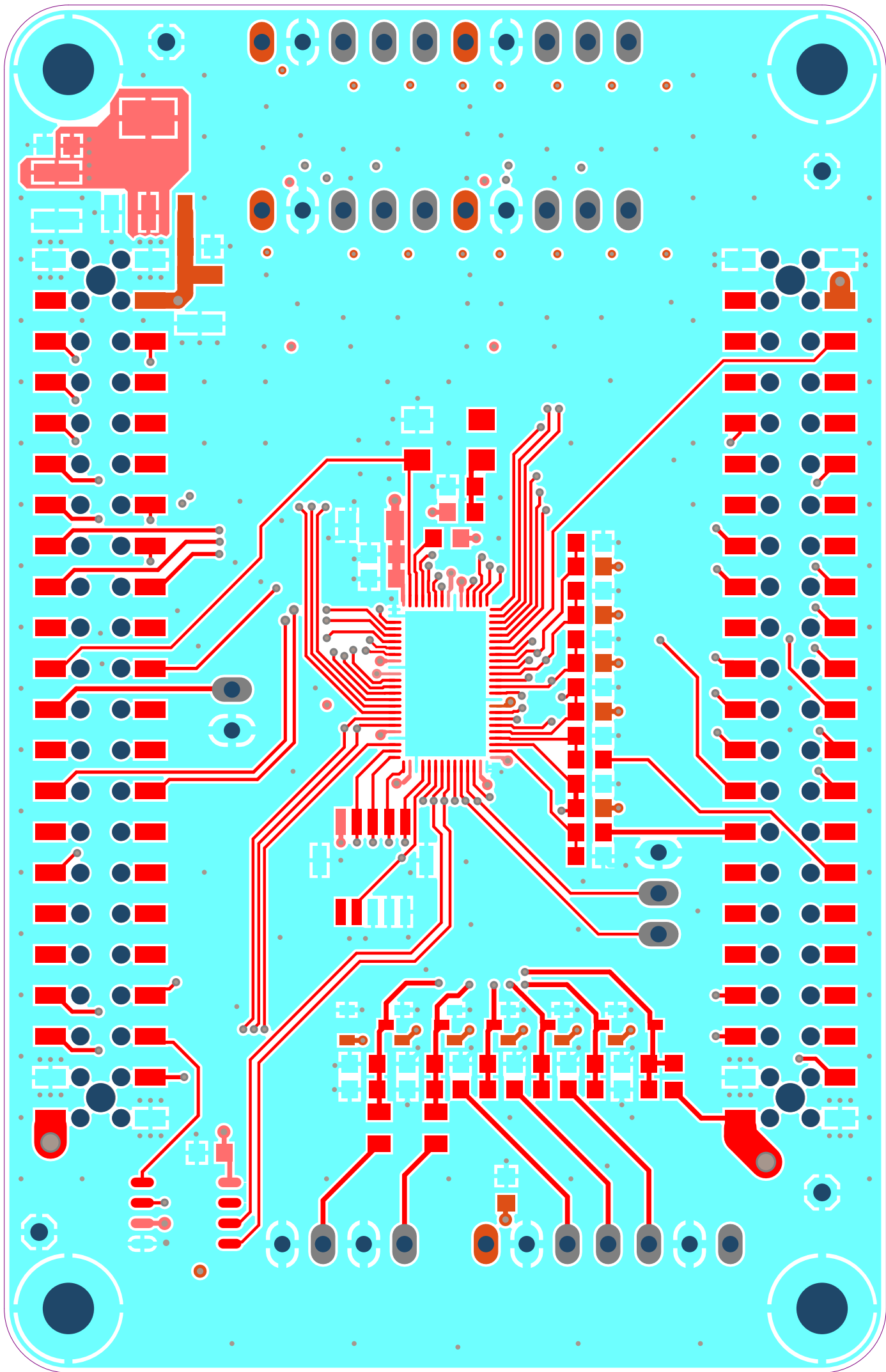
SPI, UART, S/D

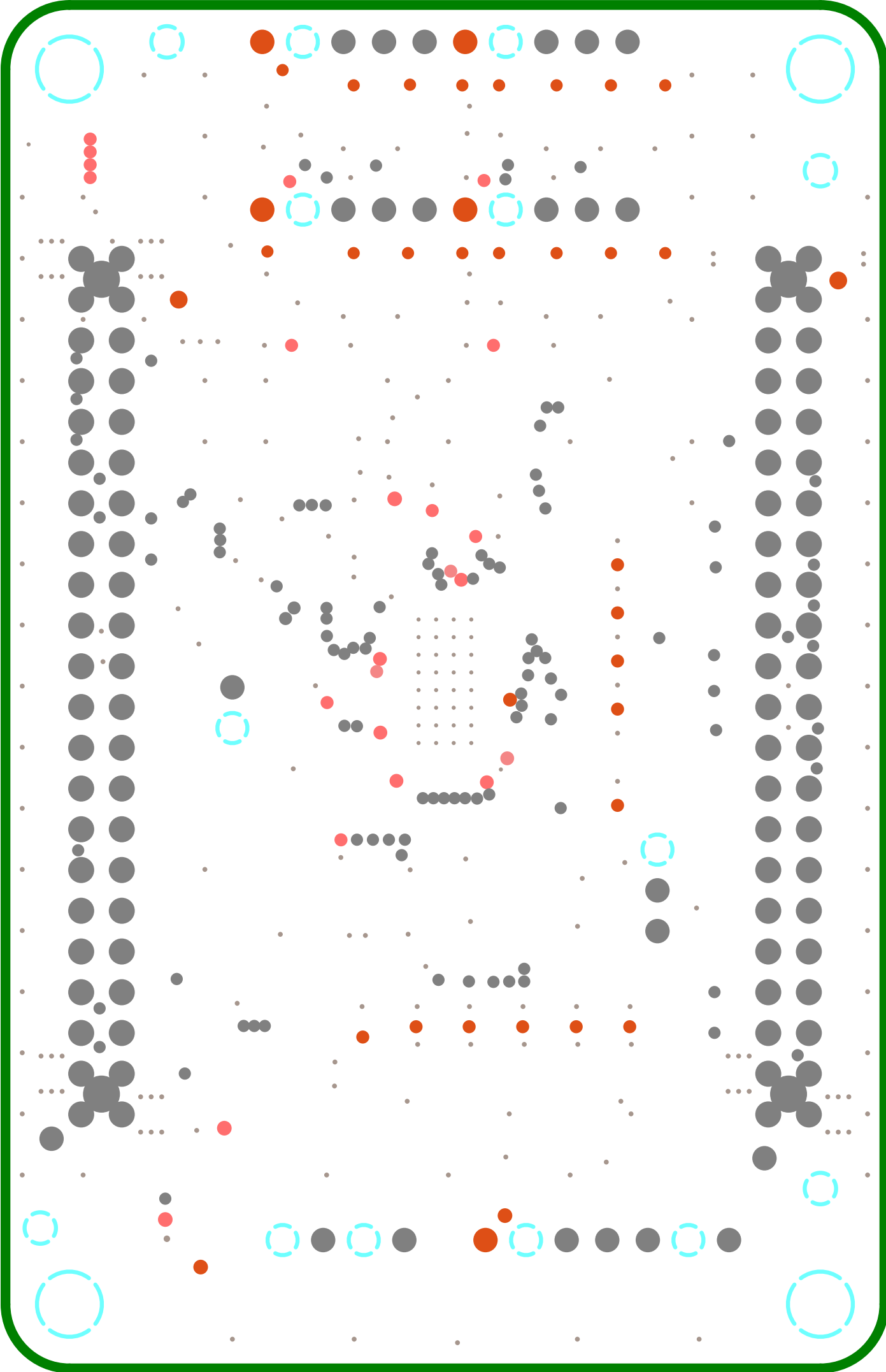
v1.2

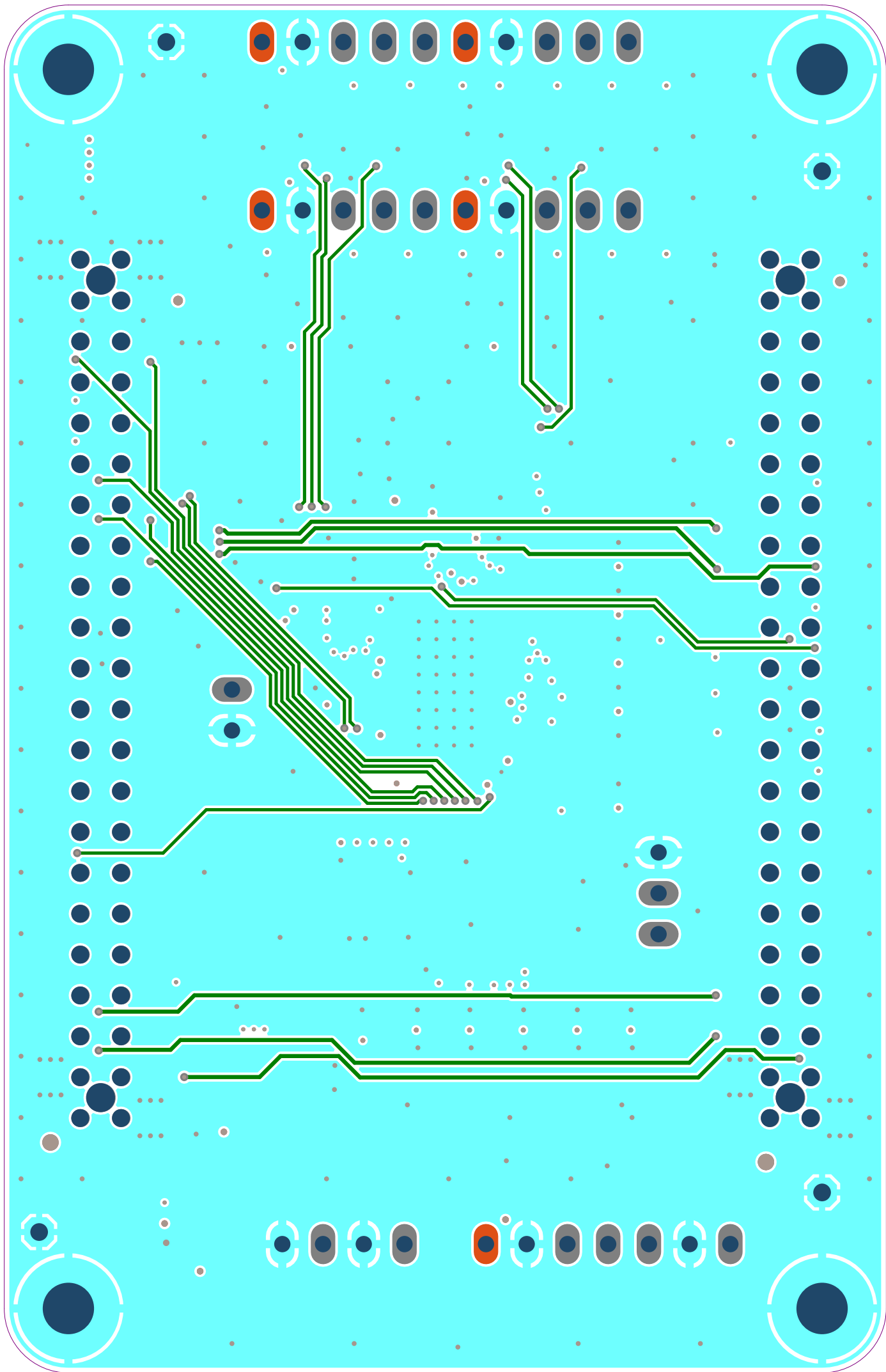


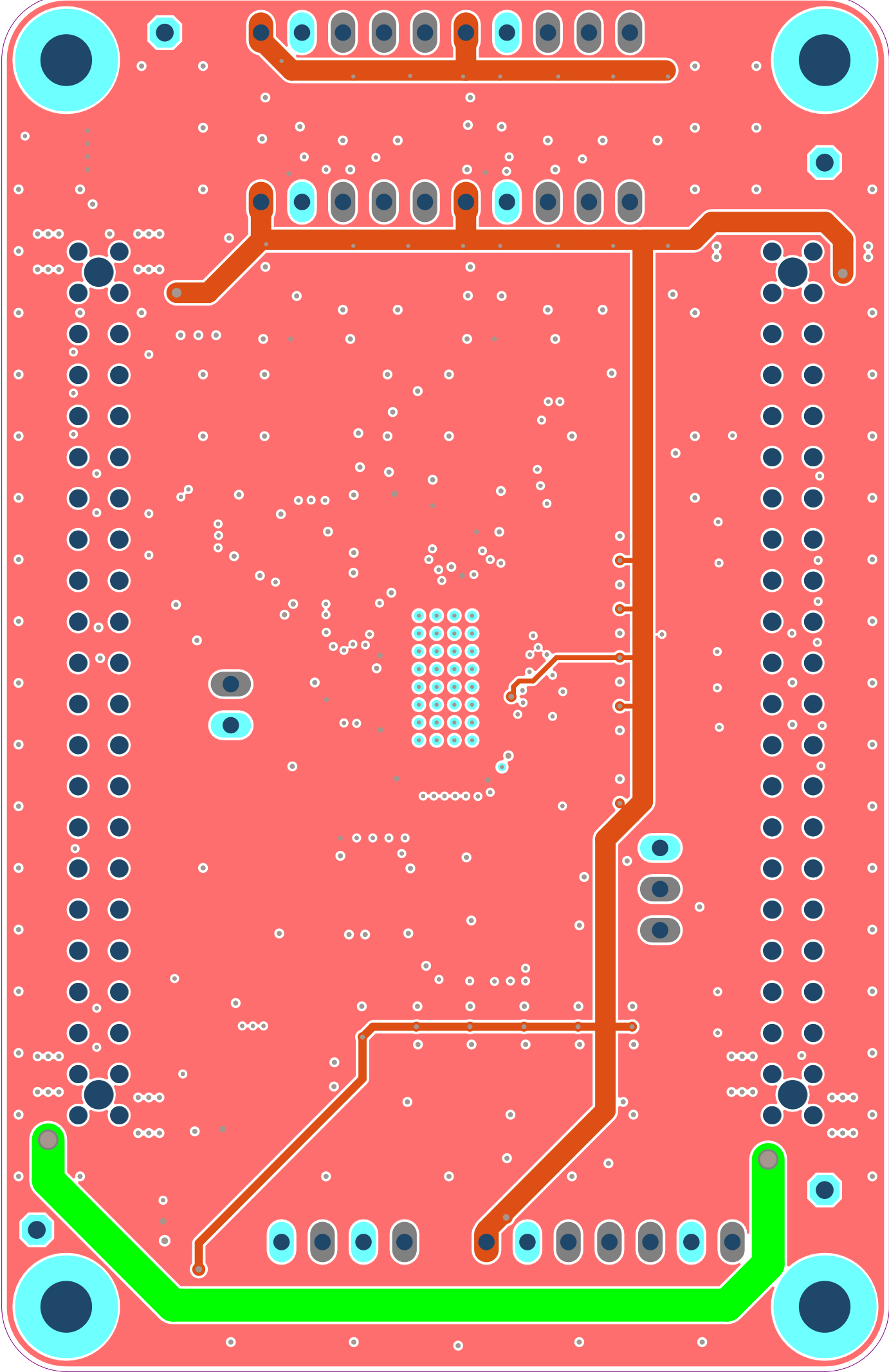
open source  
hardware

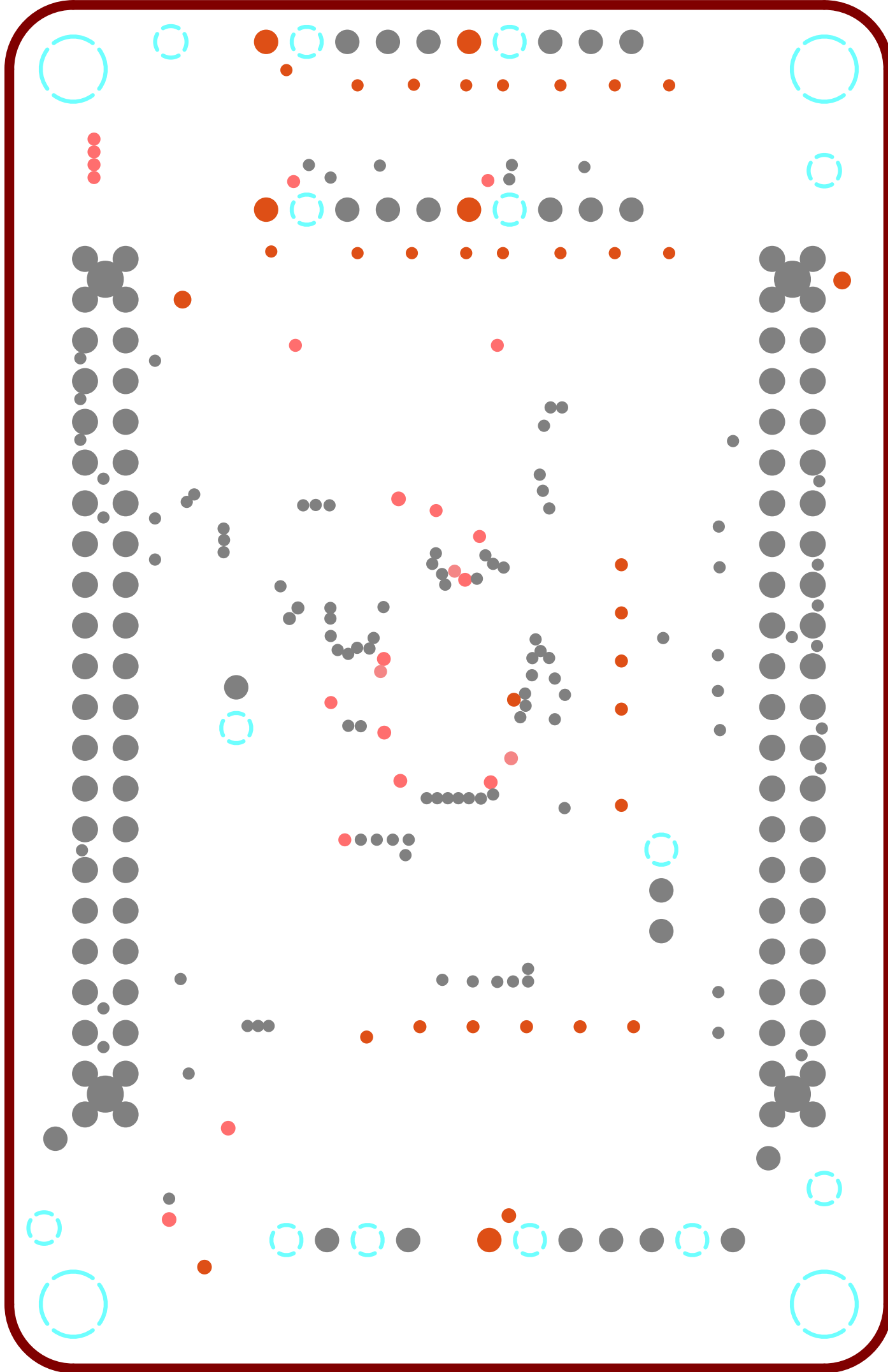
GND ADC\_IO\_INN AENC\_I1\_INN AENC\_IY\_INN AENC\_UN\_INN DBG\_UX\_INN DBG\_SPI\_TRG DBG\_SPI\_MISO DBG\_SPI\_SCK GP102 GP101 GP100 +3V3 +5V

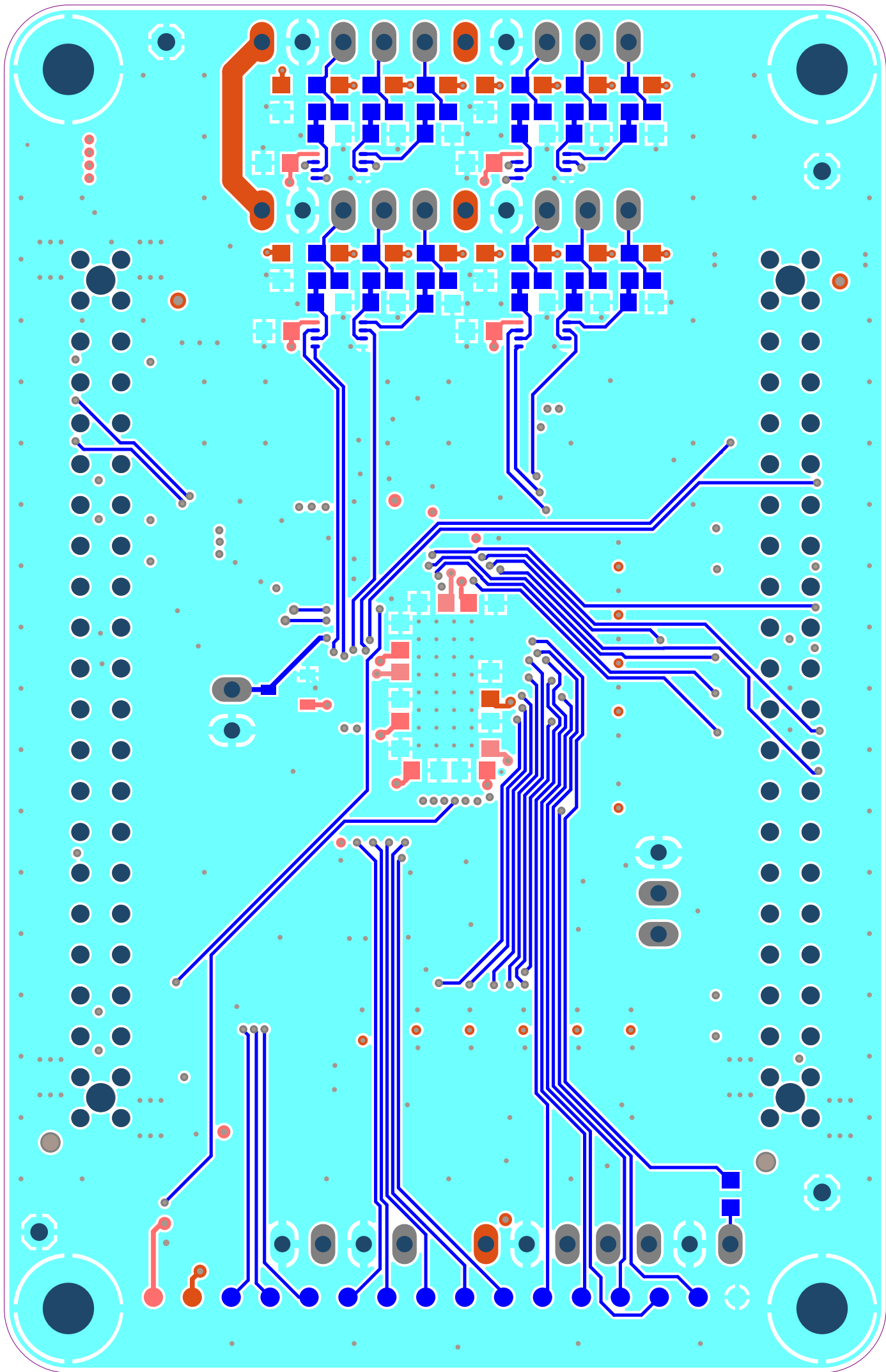






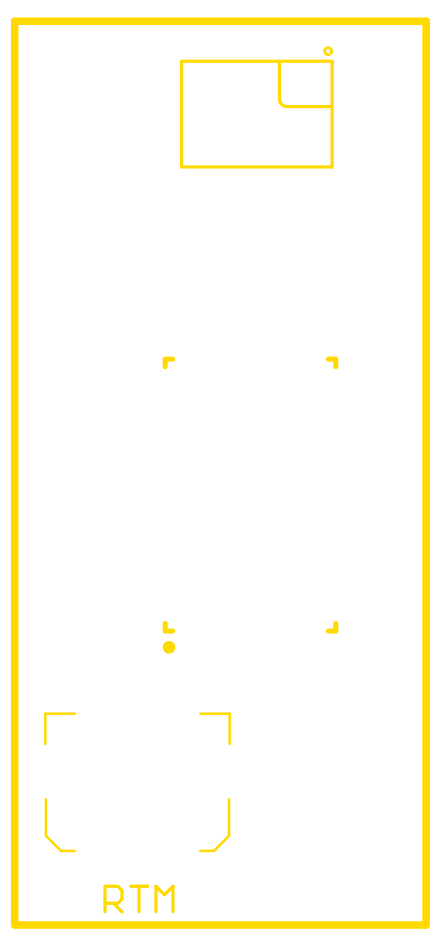






HALL\_WY  
HALL\_UX  
HALL\_UY  
GND  
+5V  
REF\_R  
REF\_H  
REF\_L  
GND  
+5V

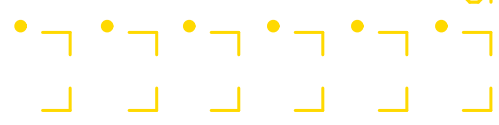
ENC1\_N  
ENC1\_B  
ENC1\_A  
GND  
+5V  
ENC2\_N  
ENC2\_B  
ENC2\_A  
GND  
+5V



PWM  
GND

GND  
TXD  
RXD

UART



GND  
AGPI\_A  
GND  
AGPI\_B  
+5V  
GND  
AENC\_UX  
AENC\_UN  
AENC\_WY  
GND  
BRAKE



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TMC4671-EVAL

v1.2



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TMC-Evaluation-Platform:

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Interfaces:

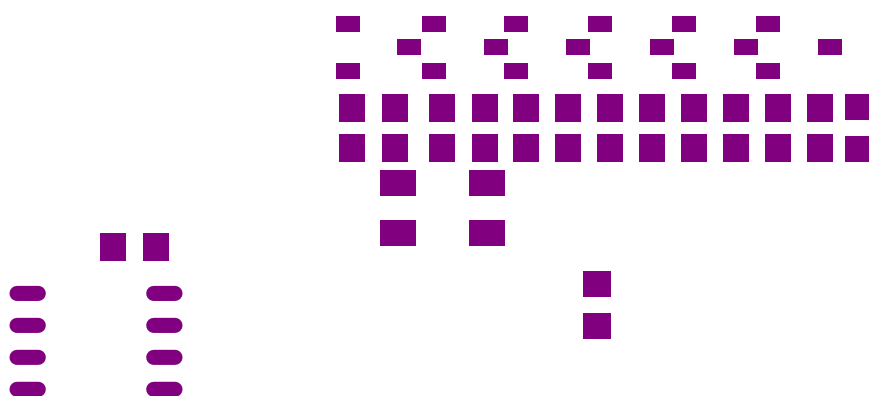
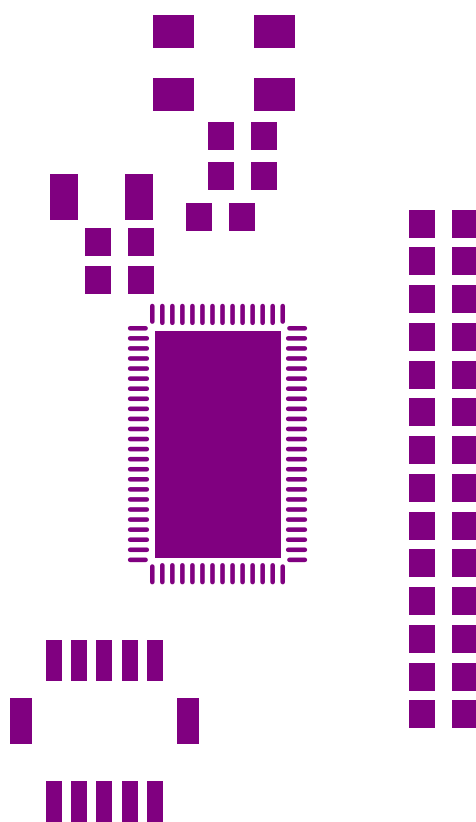
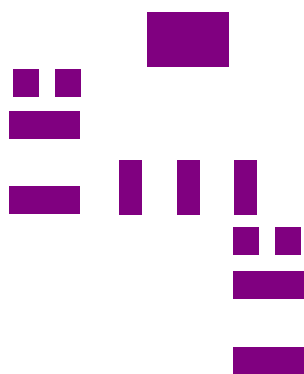
SPI, UART, S/D

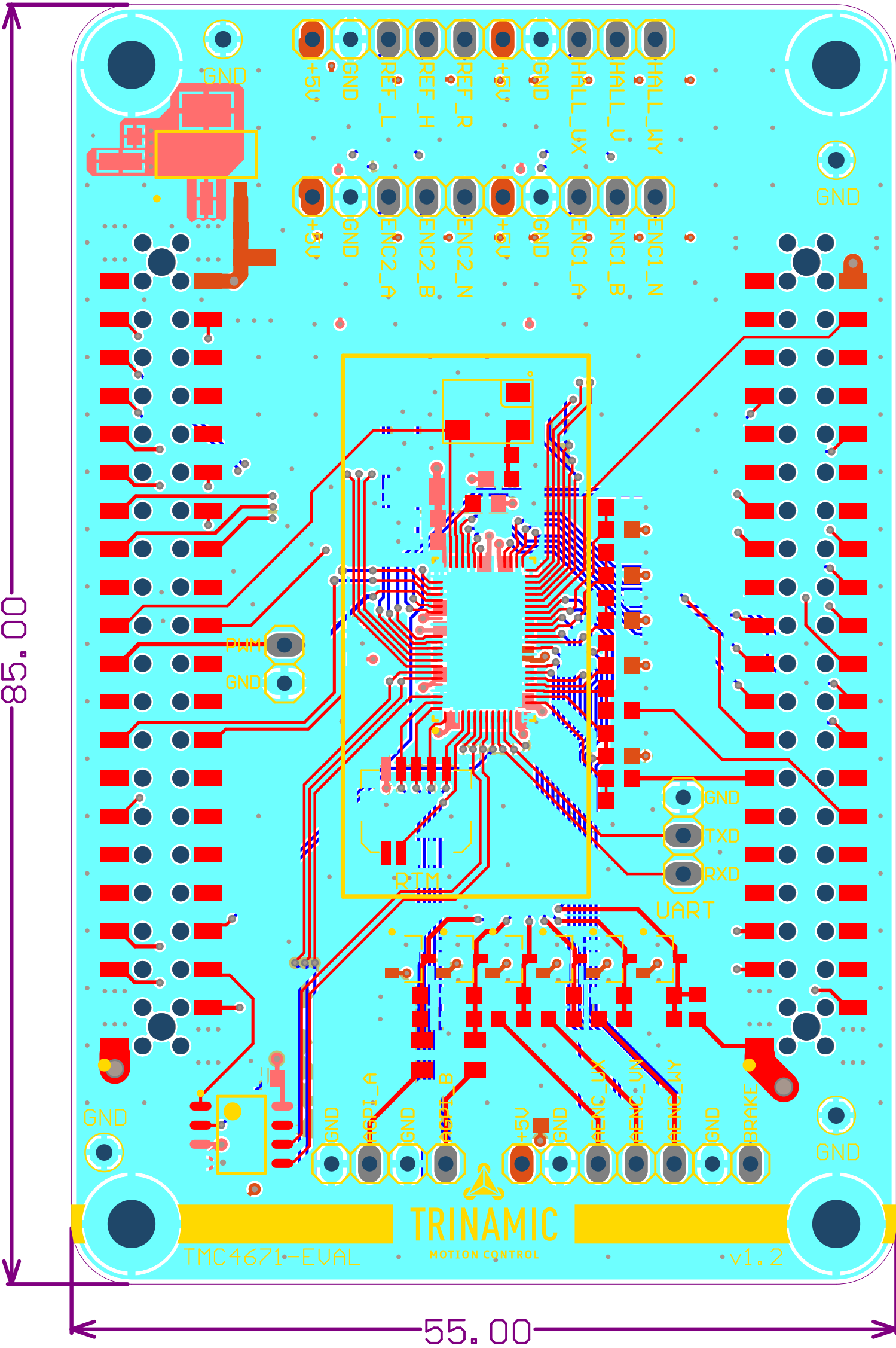


open source  
hardware

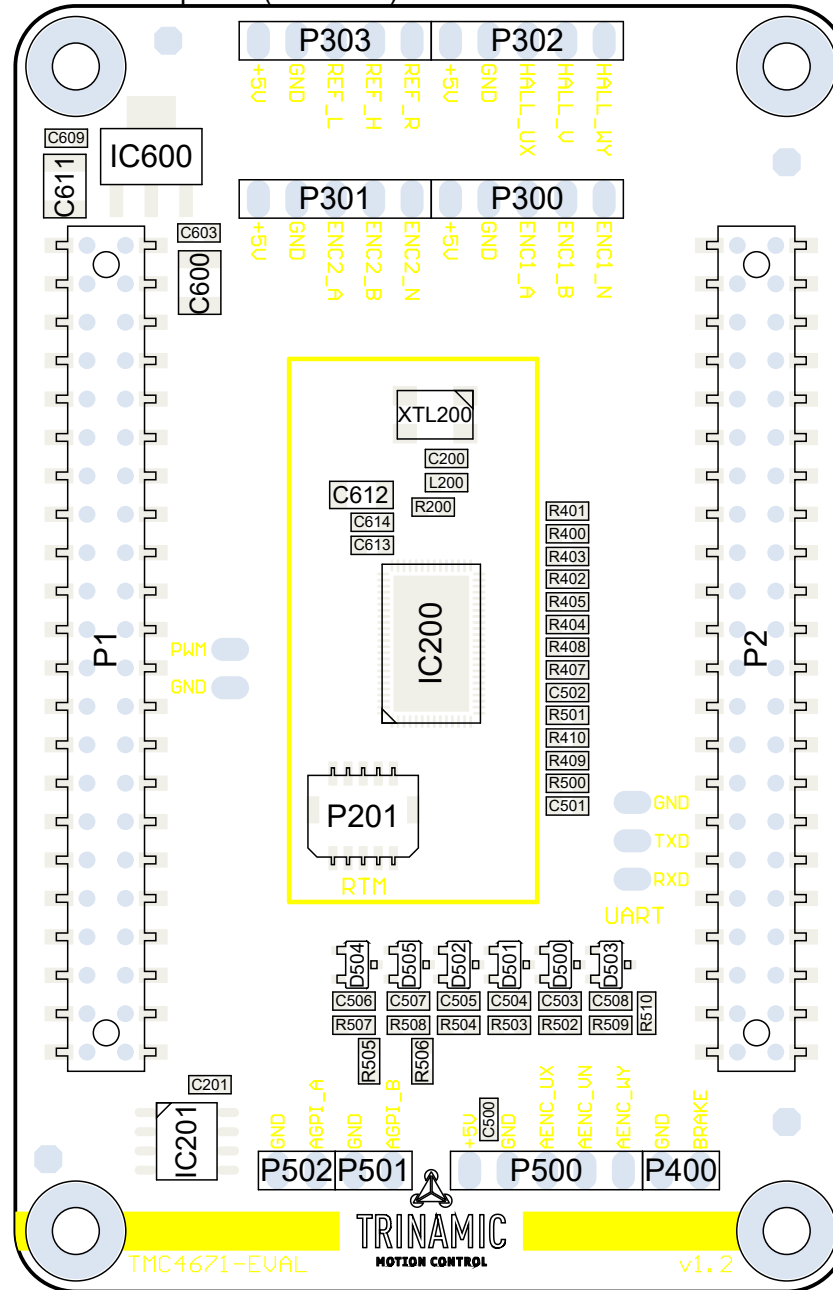
v1.2

+3V3  
+5V  
GPIO0  
GPIO1  
GPIO2  
DBG\_SPI\_nSCS  
DBG\_SPI\_SCK  
DBG\_SPI\_TRG  
DBG\_SPI\_MISO  
DBG\_SPI\_TRG  
AENC\_UX\_INN  
AENC\_UX\_INN  
AENC\_WY\_INN  
AENC\_WY\_INN  
ADC\_I1\_INN  
ADC\_I1\_INN  
GND

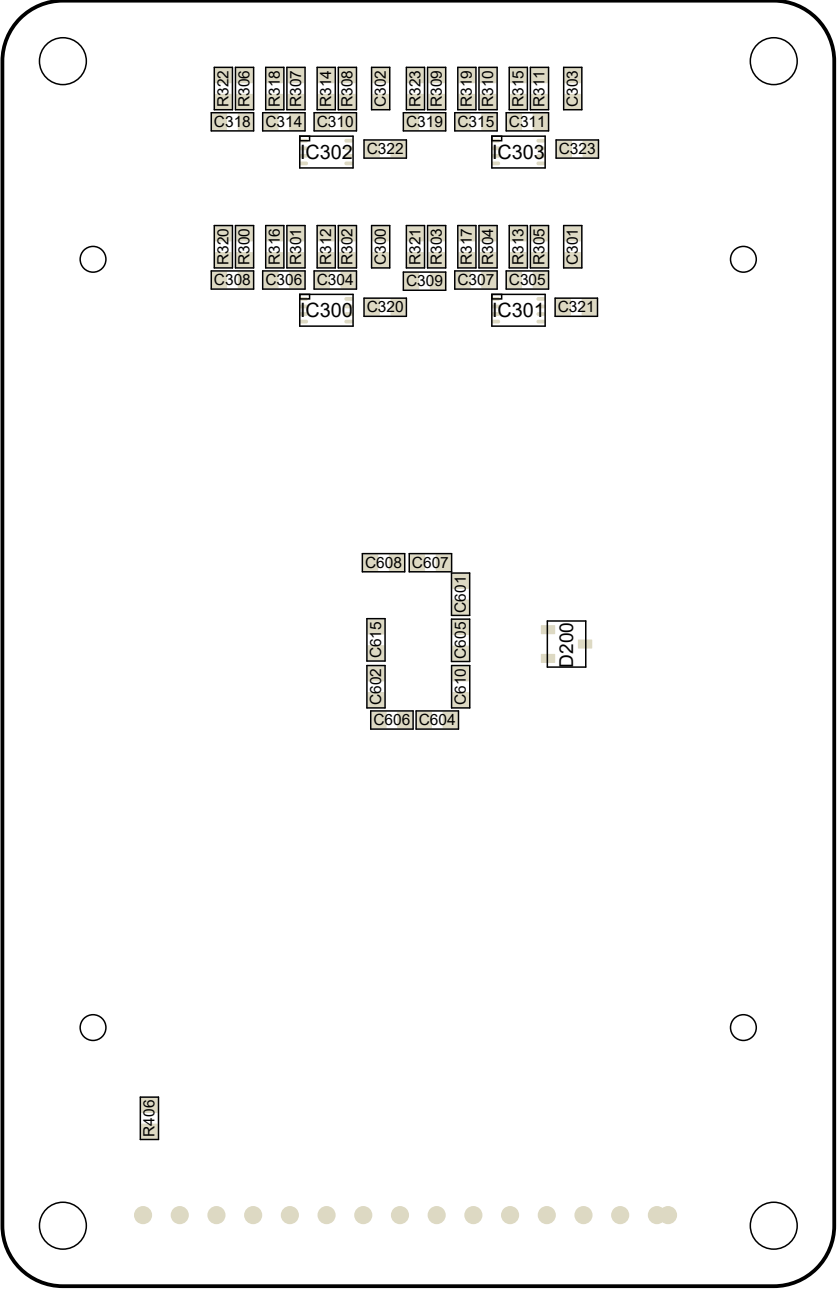




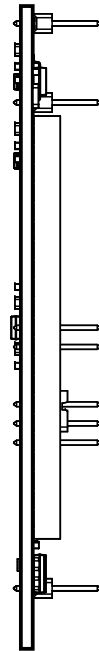
View from Top side (Scale 2:1)



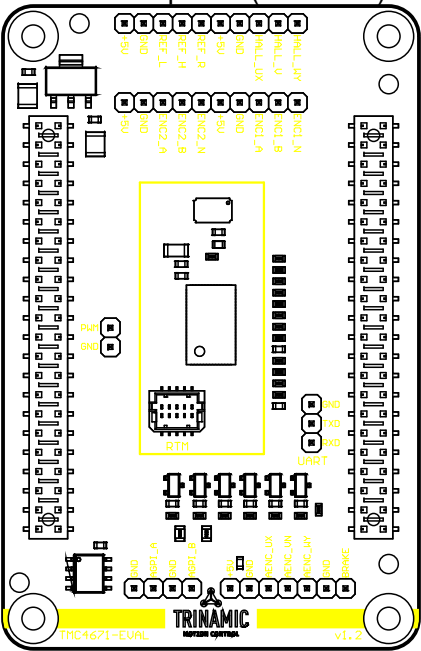
View from Bottom side (Scale 2:1)



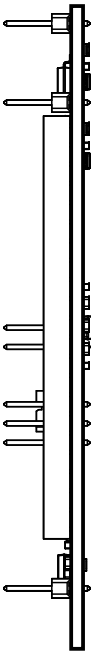
View from Left side (Scale 1:1)



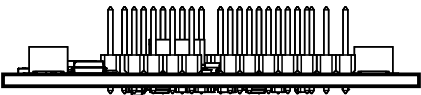
View from Top side (Scale 1:1)



View from Right side (Scale 1:1)



View from Front side (Scale 1:1)



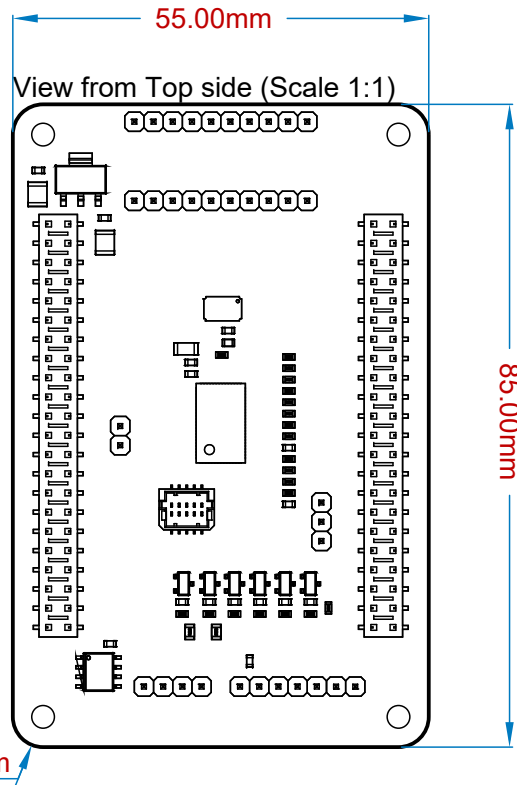
## Layer Stack Legend

Material	Layer	Thickness	Dielectric Material	Type	Gerber
	Top Overlay			Legend	GTO
Surface Material	Top Solder	0.010mm(0.400mil)	Solder Resist	Solder Mask	GTS
Copper	Top	0.035mm(1.378mil)		Signal	GTL
Core		0.127mm(5.000mil)	FR-4	Dielectric	
Copper	GND1	0.035mm(1.378mil)		Internal Plane	GP1
Prepreg		0.127mm(5.000mil)		Dielectric	
Copper	MID	0.035mm(1.378mil)		Signal	G1
Core		0.850mm(33.465mil)		Dielectric	
Copper	VM	0.035mm(1.378mil)		Signal	G2
Prepreg		0.127mm(5.000mil)		Dielectric	
Copper	GND2	0.035mm(1.378mil)		Internal Plane	GP2
Core		0.127mm(5.000mil)		Dielectric	
Copper	Bottom	0.035mm(1.378mil)		Signal	GBL
Surface Material	Bottom Solder	0.010mm(0.400mil)	Solder Resist	Solder Mask	GBS
	Bottom Overlay			Legend	GBO

Total thickness: 1.588mm(62.533mil)

### Notes:

1. MATERIAL : FR-4-2 NATURAL EPOXY/FIBERGLASS
2. APPLY SOLDERMASK ON BOTH SIDES  
COLOR: WHITE  
FABRICATOR SHALL MAKE NECESSARY MODIFICATIONS TO SOLDERMASK PHOTOPLOT FILES FOR OPTIMAL SOLDERMASK COVERAGE BETWEEN FINE PITCH COMPONENT LEADS.
3. FINISH ALL EXPOSED COPPER SURFACES WITH IMMERSION GOLD.
4. HOLE SIZES APPLY AFTER PLATING.
5. APPLY SILKSCREEN TO BOTH SIDES  
COLOR: BLACK  
FABRICATOR SHALL MAKE NECESSARY MODIFICATIONS TO LEGEND PHOTOPLOT FILES TO ENSURE NO LEGEND INK COVERS ANY COMPONENT PAD OR VIA PAD.
6. MODIFIED PHOTOPLOT FILES ARE TO BE RETURNED BEFORE ORDER DELIVERED.
7. ALL PRINTED CIRCUITBOARD NETS SHALL BE ELECTRICALLY TESTED FOR OPENS AND SHORTS.
8. FABRICATION OF PCB TO COMPLY WITH IPC-A-600 CLASS II . CURRENT REVISION.



Title: TMC4671-EVAL

Version: 1.2

Date: 9/4/2019 Time: 3:43 PM 3:43 PM

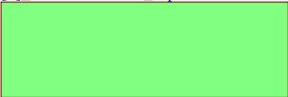


# TMC4671\_EVAL\_V1.0

[1]\_InterfaceConnectors  
[1]\_InterfaceConnectors.SchDoc



[2]\_Communication\_Inputs  
[2]\_Communication\_Inputs.SchDoc



[3]\_Output\_Feedback  
[3]\_Output\_Feedback.SchDoc



[4]\_Output\_Feedback\_2  
[4]\_Output\_Feedback\_2.SchDoc



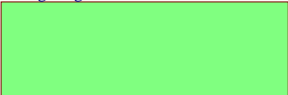
[5]\_Analog\_input\_filters  
[5]\_Analog\_input\_filters.SchDoc



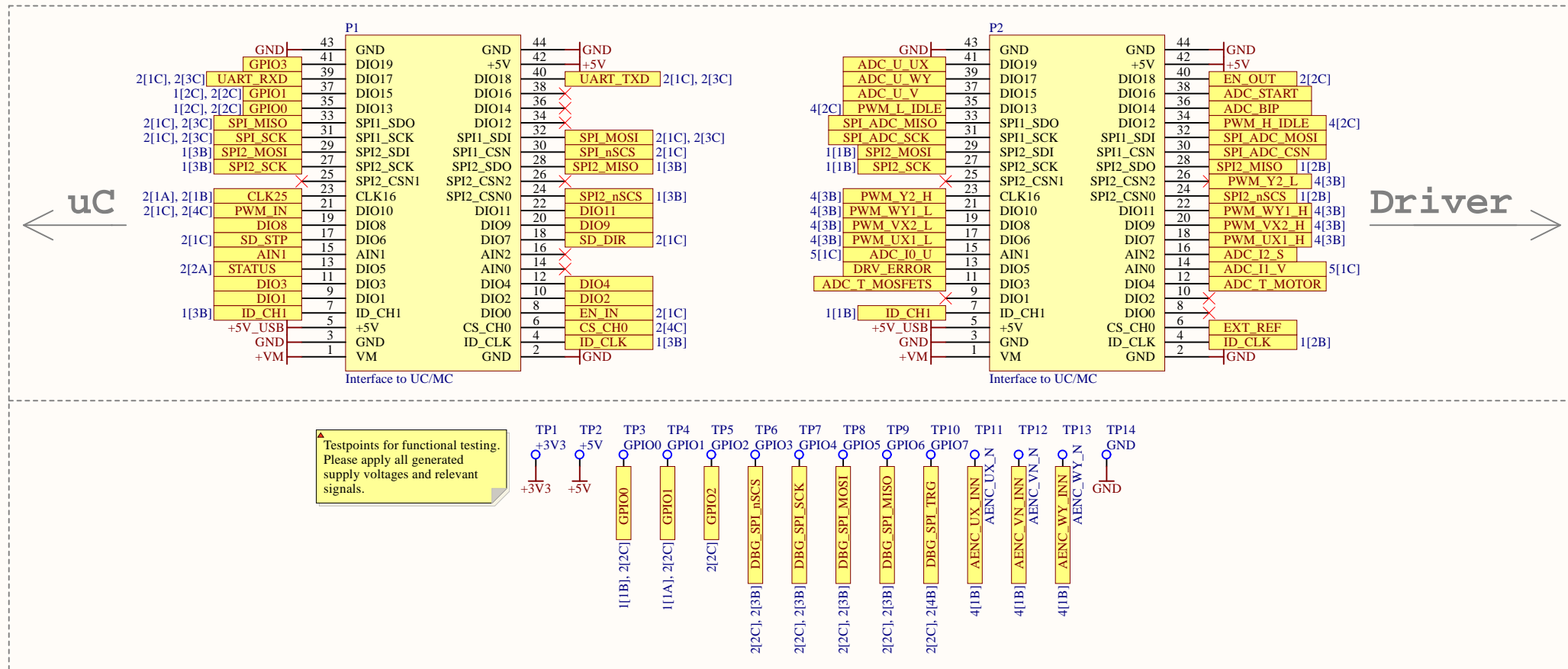
[6]\_PSU  
[6]\_PSU.SchDoc



ChangeLog  
ChangeLog.SchDoc



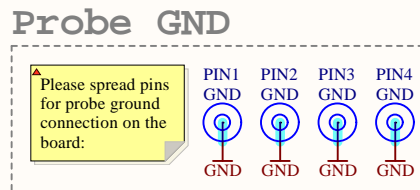
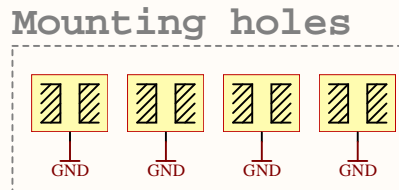
# Interface connectors, mounting holes & testpads



**SILK**

SILK1  
BACK SIDE GRAPHICS

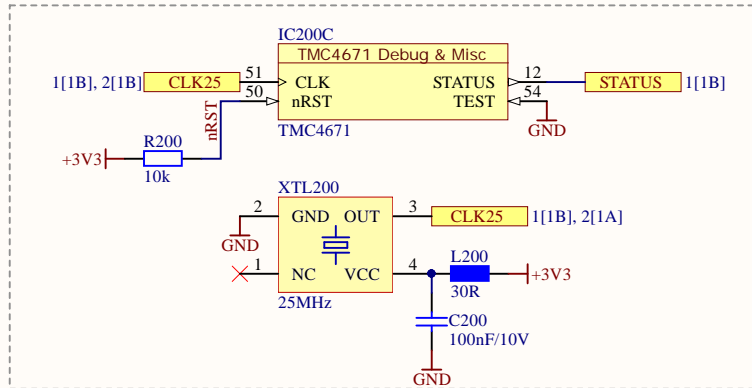
SILK2  
TMC LOGO SMALL



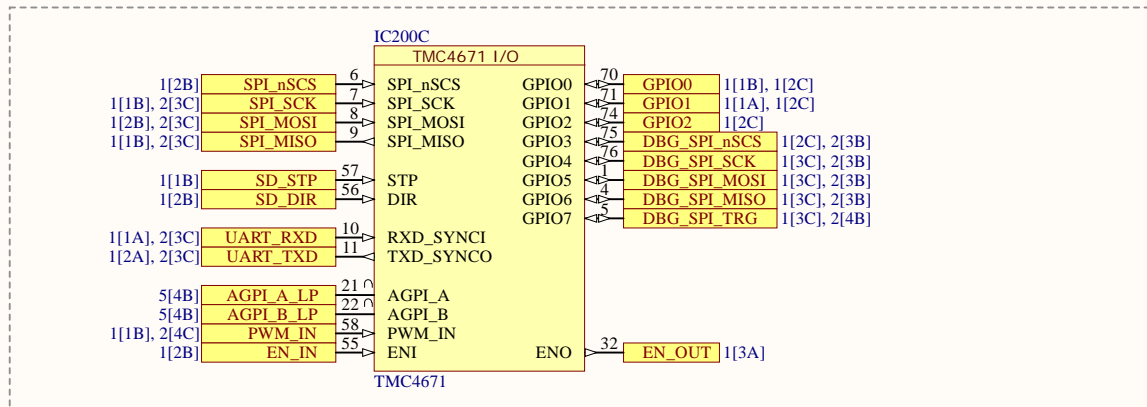
**TMC4671-EVAL**

# Communication & Inputs

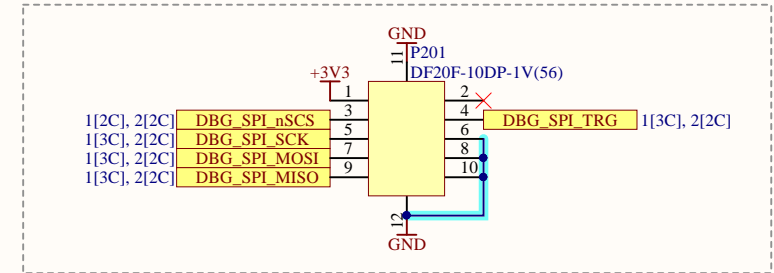
## Clock & Misc



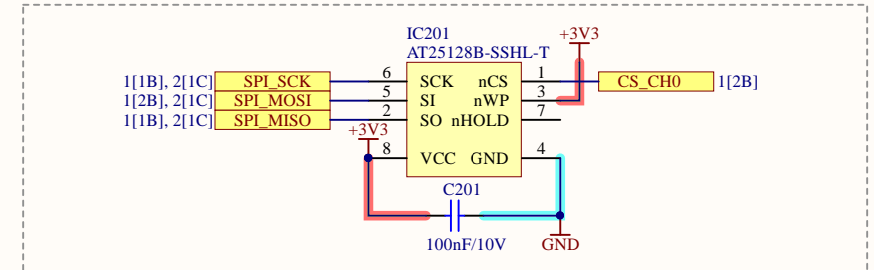
## TMC4671 I/O



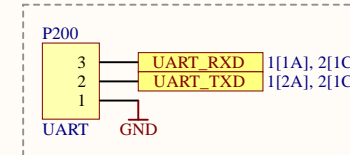
## TMC Realtime Monitoring Interface



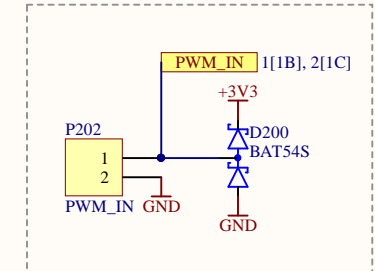
## Module identification EEPROM



## UART / Sync I/O



## PWM Input



Title: Communication & Inputs

Size: A4 Project: TMC4671-EVAL

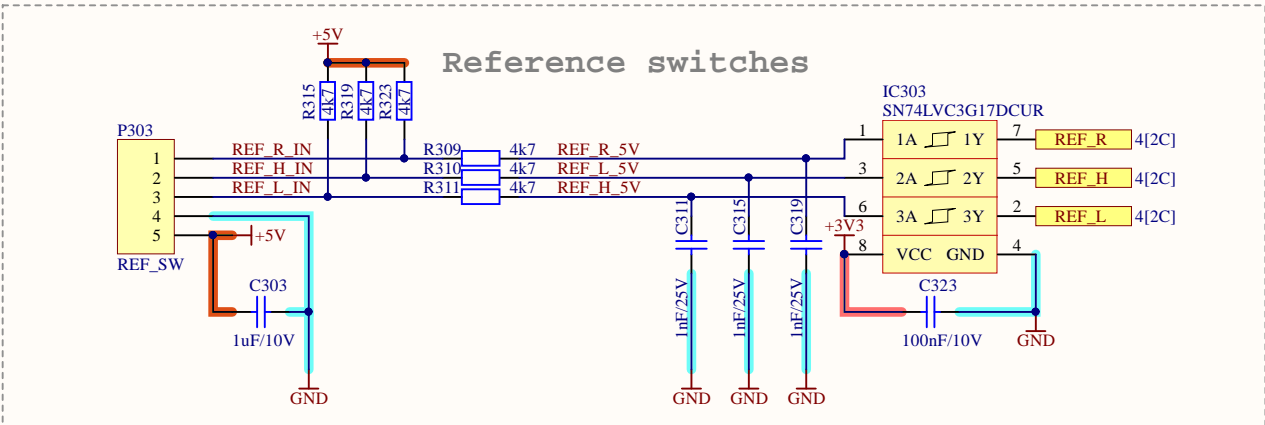
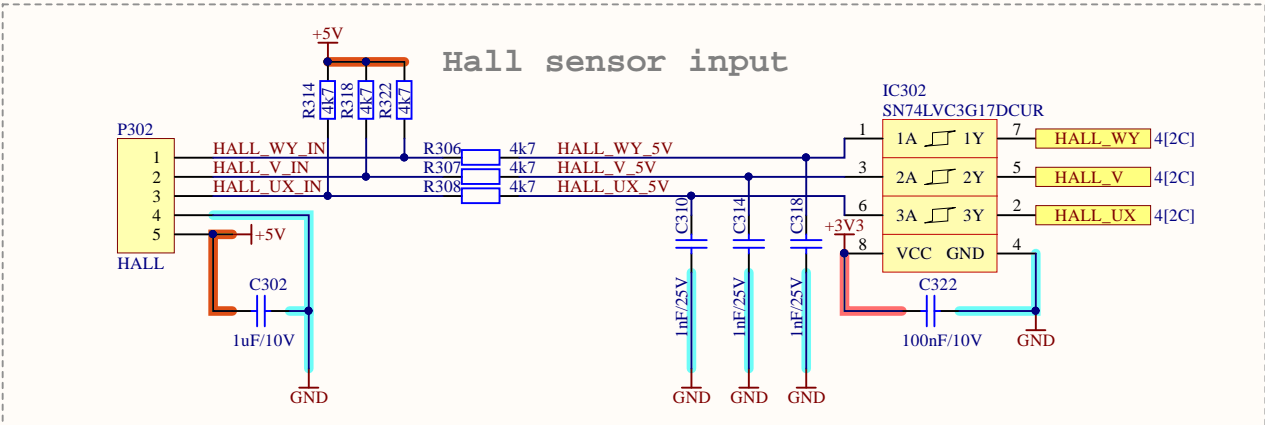
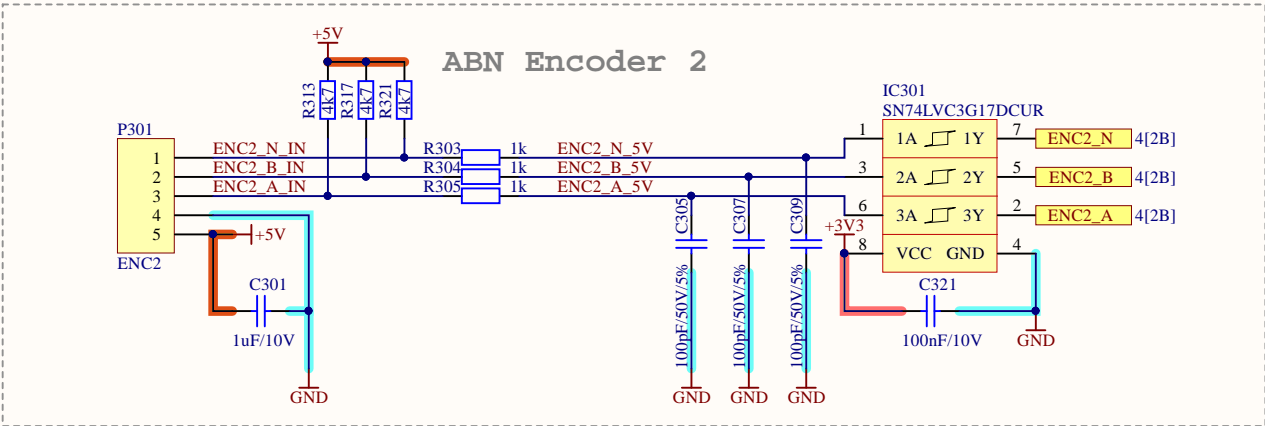
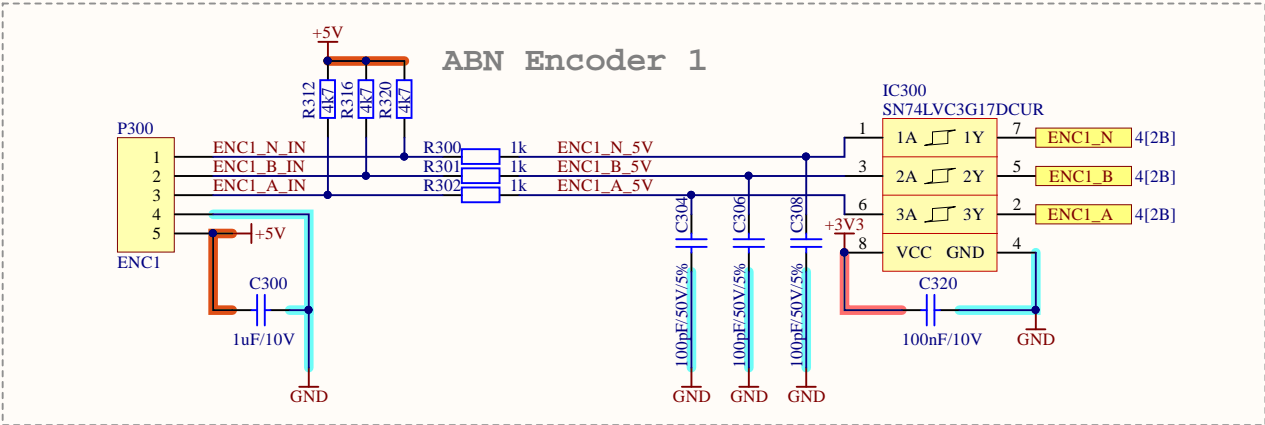
Version: 1.2

Date: 9/4/2019 Time: 3:43:39 PM Sheet 2 of 8

File: [2]\_Communication\_Inputs.SchDoc



# Output & Feedback



Title: Output & Feedback

Size: A4

Project: TMC4671-EVAL

Version: 1.2

Date: 9/4/2019

Time: 3:43:39 PM

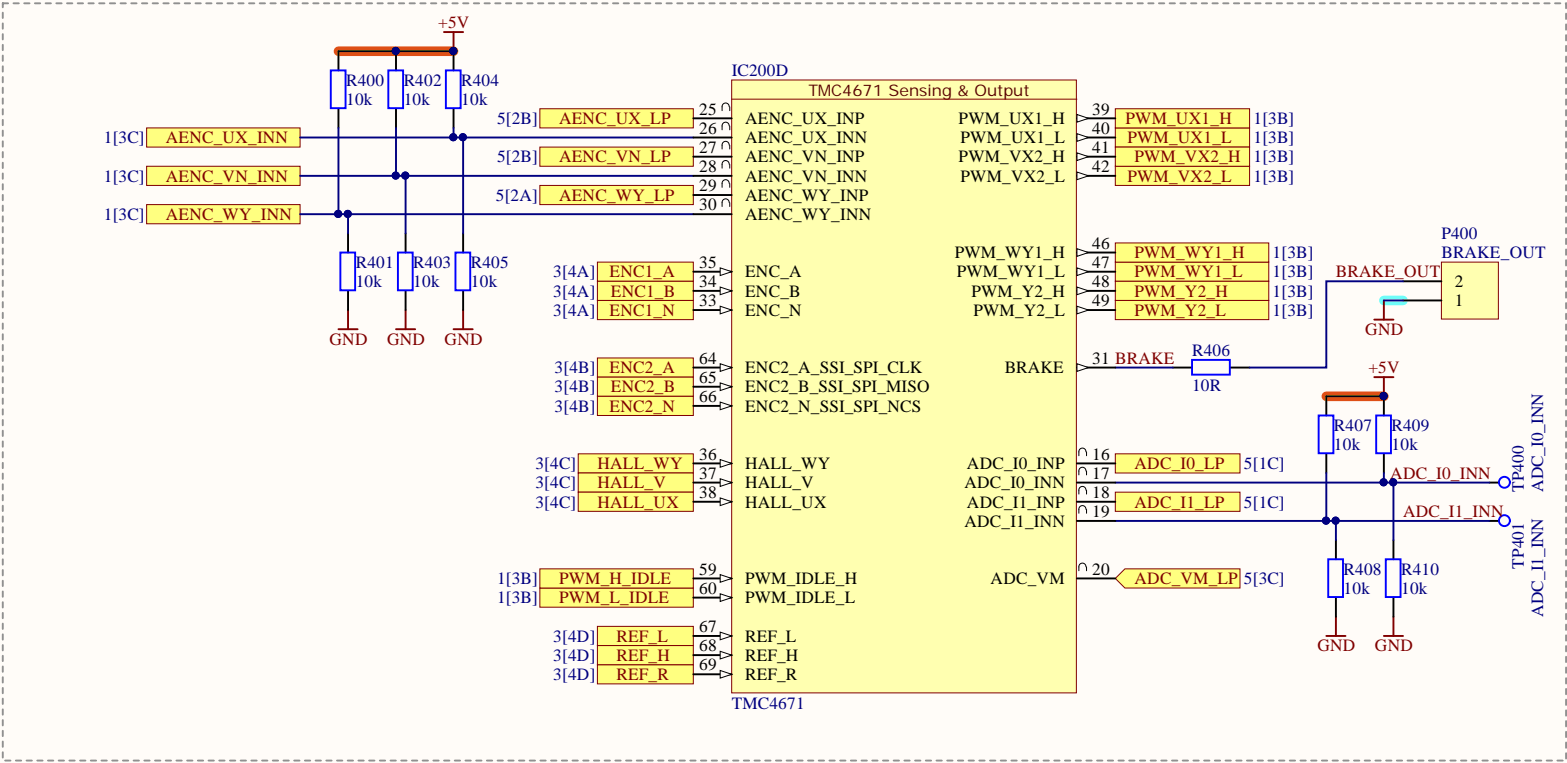
Sheet 3 of 8

File: [3]\_Output\_Feedback.SchDoc



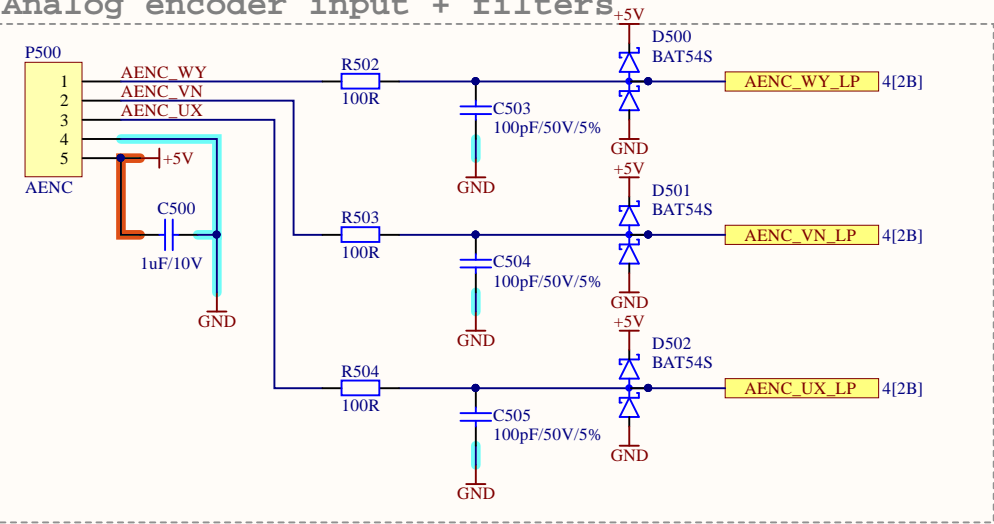
# Output & Feedback 2

TMC4671 Sensing & Output

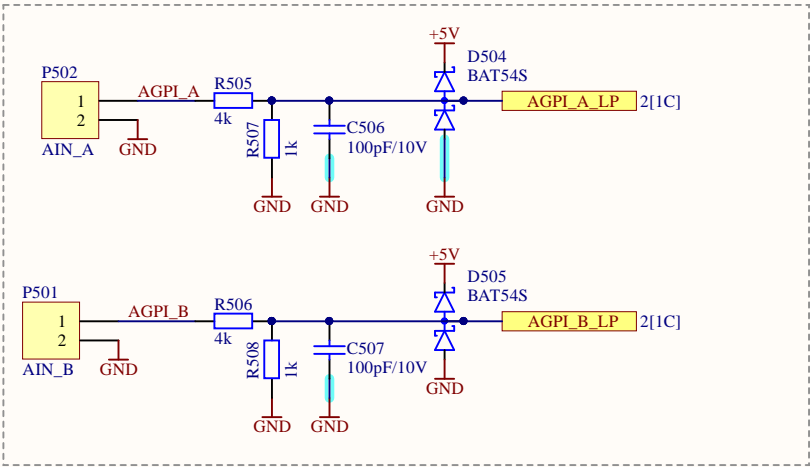


# Analog inputs & filters

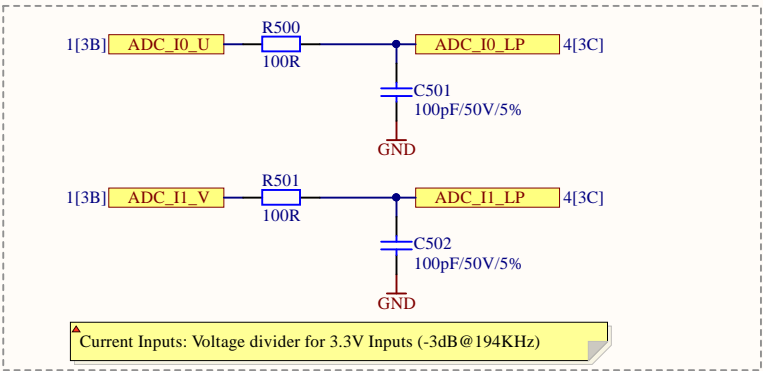
Analog encoder input + filters



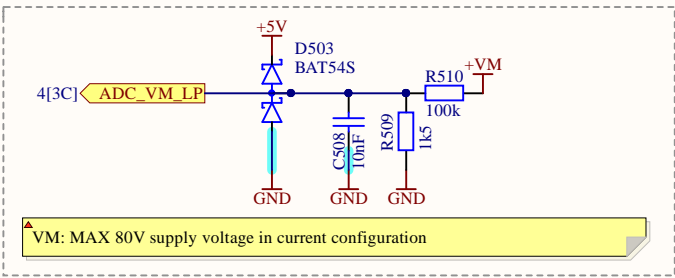
Analog inputs A & B with filters



ADC Filter

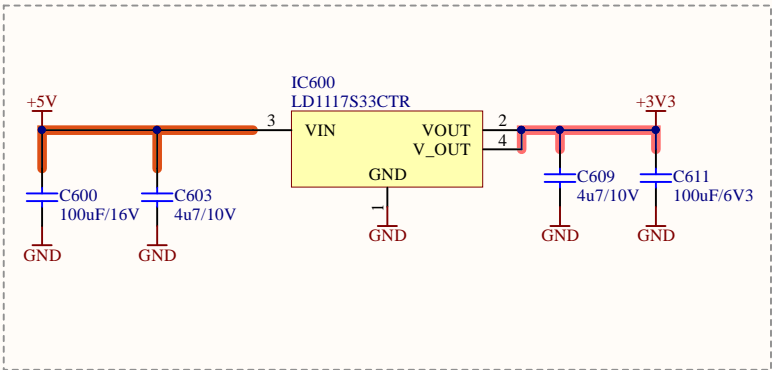


VM ADC Filter

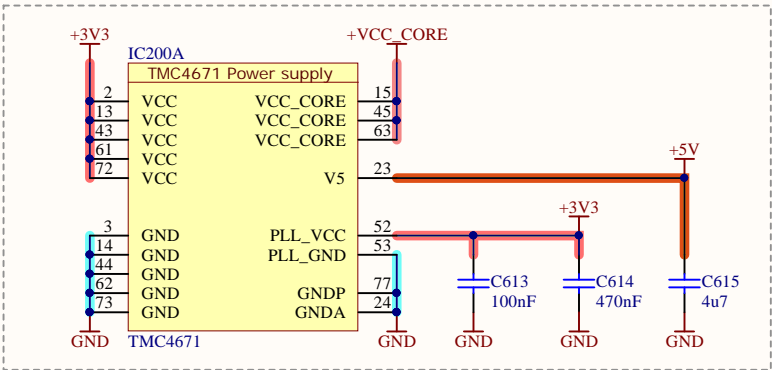


PSU

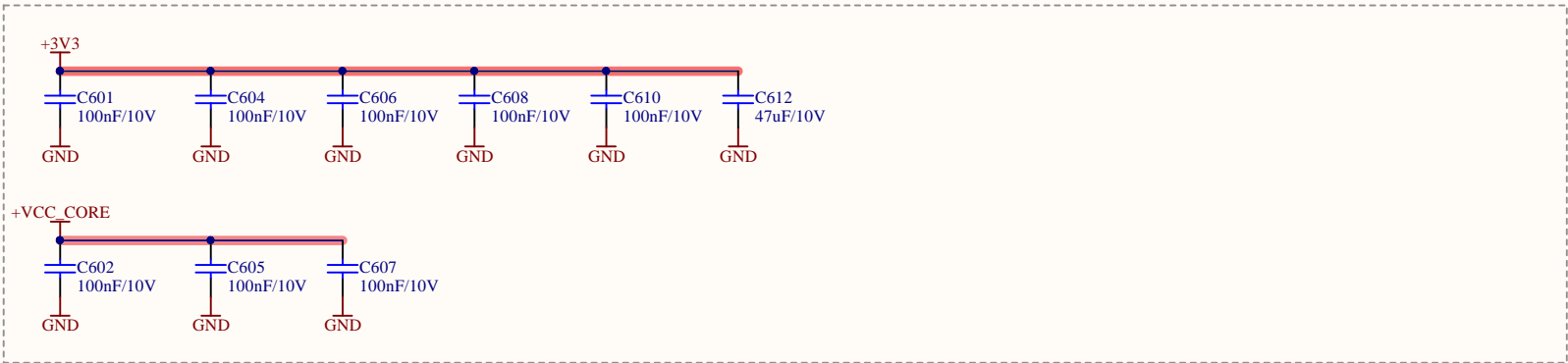
+3V3 LDO



TMC power



Bypass capacitors



ChangeLog

- V1.0 - Initial design
- # 25.09.2017
  - Fixed XTL200 FOX924B pinout bug (swapped pins 3 & 4).
- V1.1 - Bug fixes
- # 04.12.2017
  - Fixed twisted AENC\_UX and AENC\_WY nets.
  - Changed P200 pin order on PCB to [+5V, GND, AENC\_UX, AENC\_VN, AENC\_WY].
  - Minor clean-ups.
  - # 22.12.2017
  - Reduced TMC4671 footprint pad widths by 0.7mil.
  - Increased TMC4671 pad clearances from 6mil to match pad spacing 8.5mil.
- V1.2 - Bug fixes
- # 03.09.2019
  - Removed SRV05-4 protection ICs.
  - Moved all 4k7 pull-ups next to pinheaders on page 4.
  - Changed encoder filter values to 1k/100pF.
  - Changed hall sensor and reference input filter values to 4k7/1nF.

# BOM

Project: TMC4671-EVAL

Version: 1.2

Date: 9/4/2019

#	Quantity	MPN	Comment	Designator	FootPrint	Description	Note	MF
1	14	MC0603B104K100CT	100nF/10V	C200, C201, C320, C321, C322, C300, C301, C302, C303, C500	C0603	SMD Multilayer Ceramic Capacitor, 0603 [1608 Metric] 0.047 uF ±10%, 100V, X7R, MC Series		Multicomp
2	5	MC0603X105K100CT	1uF/10V	C300, C301, C302, C303, C500	C0603	SMD Multilayer Ceramic Capacitor, 0603 [1608 Metric] 1 uF ±10%, 10V, X7R, MC Series		MULTICOMP
3	11	MC0603N101J500CT	100pF/50V/5%	C304, C305, C306, C307, C308, C309, C501, C502, C503, C504	C0603	SMD Multilayer Ceramic Capacitor, 0603 [1608 Metric] 100 nF ±5%, 50V, C0G / NPO, MC Series		MULTICOMP
4	6	MC0603B102K250CT	1nF/25V	C310, C311, C314, C315, C318, C319	C0603	SMD Multilayer Ceramic Capacitor, 0603 [1608 Metric] 1000 pF ±10%, 25V, X7R, MC Series		MULTICOMP
5	2	MCMT18N101F100CT	100pF/10V	C506, C507	C0603	SMD Multilayer Ceramic Capacitor, 0603 [1608 Metric] 100 nF ±10%, 10V, X7R, MC Series		MULTICOMP
6	1	MCSH18B103K100CT	10nF	C508	C0603	SMD Multilayer Ceramic Capacitor, 0603 [1608 Metric] 0.01 uF ±10%, 10V, X7R, MCSH Series		MULTICOMP
7	1	EMK325ABJ107MM-T	100uF/16V	C600	C1210	SMD Multilayer Ceramic Capacitor, 1210 [3225 Metric] 100 uF ±16V ±20%, X5R, MC Series		TAIYO YUDEN
8	2	MC0603X475K100CT	4u7/10V	C603, C609	C0603	SMD Multilayer Ceramic Capacitor, 0603 [1608 Metric] 4.7 uF ±10V ±10%, X5R, MC Series		MULTICOMP
9	1	GRM31CR60J107ME39L	100uF/6V3	C611	C1210	SMD Multilayer Ceramic Capacitor, 1210 [3225 Metric] 100 uF 6.3V ±20%, X5R, GRM Series		MURATA
10	1	GRM31CR61A476ME15L	47uF/10V	C612	C1206	SMD Multilayer Ceramic Capacitor, 1206 [3216 Metric] 47 uF ±10V ±20%, X5R, GRM Series		MURATA
11	1	MC0603B104K100CT	100nF	C613	C0603	SMD Multilayer Ceramic Capacitor, 0603 [1608 Metric] 0.1 uF ±10V ±10%, X7R, MC Series		Multicomp
12	1	MC0603X474K160CT	470nF	C614	C0603	SMD Multilayer Ceramic Capacitor, 0603 [1608 Metric] 0.47 uF ±16V ±10%, X5R, MC Series		Multicomp
13	1	MC0603X475K100CT	4u7	C615	C0603	SMD Multilayer Ceramic Capacitor, 0603 [1608 Metric] 4.7 uF ±10V ±10%, X5R, MC Series		MULTICOMP
14	7	BAT54S	BAT54S	D200, D500, D501, D502, D503, D504, D505	SOT95P237X130-3N	Small Signal Schottky Diode, Dual Series, 30 V, 200 mA, 1 V, 600 mA, 125 °C		TAIWAN SEMICONDUCTOR
15	1	TMC4671	TMC4671	IC200	QFN40P1050X650X90_HS-77N			TRINAMIC
16	1	AT25128B-SSHL-T	AT25128B-SSHL-T	IC201	SOP127P600X175-8N	EEPROM, SPI, 128 Kbit, 16K x 8bit, 20 MHz, SOIC, 8 Pins		MICROCHIP
17	4	SN74LVC3G17DCUR	SN74LVC3G17DCUR	IC300, IC301, IC302, IC303	TSSOP50P310X90-8L	Triple Schmitt-Trigger Buffer, 74LVC3G17, 1.65 V to 5.5 V, VSSOP, 8		TEXAS INSTRUMENTS
18	1	LD1117S33CTR	LD1117S33CTR	IC600	SOT230P700X180-4N	Fixed LDO Voltage Regulator, 4.75V to 15V, 1.1V Dropout, 3.3Vout, 0.65mAout, SOT-223, 4		STMICROELECTRONICS
19	1	MFB-160808-0030PQ	30R	L200	L0603	Ferrite Bead, 30 ohm, 0603 [1608 Metric], MFB Series, 3 A, 0.04 ohm, ±25%		MEC MARCOM
20	2	HLE-122-02-L-DV	Interface to UC/MC	P1, P2	Interface_Connector	Board-To-Board Connector, 2.54 mm, 44 Contacts, Receptacle, HLE Series, Surface Mount, 2 Rows		SAMTEC
21	1		UART	P200	TH_HDR_1X3	Header, 3-Pin	Not fitted	
22	1	DF20F-10DP-1V(56)	DF20F-10DP-1V(56)	P201	CON, TMC Debug SPI	Wire-To-Board Connector, 1 mm, 10 Contacts, Header, DF20 Series, Surface Mount, 2 Rows		Hirose Electric Co Ltd
23	1		PWM_IN	P202	TH_HDR_1X2	Header, 2-Pin	Not fitted	
24	1		ENC1	P300	TH_HDR_1X5	Header, 5-Pin		
25	1		ENC2	P301	TH_HDR_1X5	Header, 5-Pin		
26	1		HALL	P302	TH_HDR_1X5	Header, 5-Pin		
27	1		REF_SW	P303	TH_HDR_1X5	Header, 5-Pin		
28	1		BRAKE_OUT	P400	TH_HDR_1X2	Header, 2-Pin		
29	1		AENC	P500	TH_HDR_1X5	Header, 5-Pin		
30	1		AIN_B	P501	TH_HDR_1X2	Header, 2-Pin		
31	1		AIN_A	P502	TH_HDR_1X2	Header, 2-Pin		
32	11	MC0063W0603110K	10k	R200, R400, R401, R402, R403, R404, R405, R407, R408, R409	R0603	SMD Chip Resistor, Thick Film, 10 kohm, 50 V, 0603 [1608 Metric] 63 mW ±1%, MC Series		MULTICOMP
33	8	MCWR06X1001FTL	1k	R300, R301, R302, R303, R304, R305, R507, R508	R0603	SMD Chip Resistor, Thick Film, 1 kohm, 50 V, 0603 [1608 Metric] 100 mW ±1%, MCWR Series, SMD		MULTICOMP
34	18	WR06X4701FTL	4k7	R306, R307, R308, R309, R310, R311, R312, R313, R314, R315	R0603	SMD Chip Resistor, Thick Film, 4.7 kohm, 75 V, 0603 [1608 Metric] 100 mW ±1%, WB06 Series		WALSIN
35	1	MC0063W0603110K	10R	R406	R0603	SMD Chip Resistor, Thick Film, 10 ohm, 50 V, 0603 [1608 Metric] 100 mW ±1%, MCWR Series		MULTICOMP
36	5	MCWR06X1000FTL	100R	R500, R501, R502, R503, R504	R0603	SMD Chip Resistor, Thick Film, 100 ohm, 50 V, 0603 [1608 Metric] 100 mW ±1%, MCWR Series		MULTICOMP
37	2	CRCV08054K00FKTA	4k	R505, R506	R0805	SMD Chip Resistor, Thick Film, 4 kohm, 150 V, 0805 [2012 Metric] 125 mW ±1%, CRCV Series		VISHAY
38	1	MCWR06X1501FTL	1k5	R509	R0603	SMD Chip Resistor, Thick Film, 1.5 kohm, 50 V, 0603 [1608 Metric] 100 mW ±1%, MCWR Series		MULTICOMP
39	1	MCWR06X1003FTL	100k	R510	R0603	SMD Chip Resistor, Thick Film, 100 kohm, 50 V, 0603 [1608 Metric] 100 mW ±1%, MCWR Series		MULTICOMP
40	1	FOX924B-25.000	25MHz	XTL200	FOX924B-25.000	TCXO, 25 MHz, 2.5 ppm, SMD, 5mm x 3.2mm,		FOX ELECTRONICS
Approved			Notes					123

