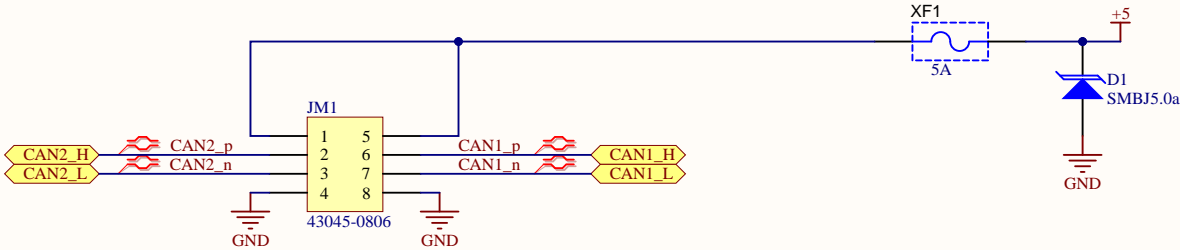


Supply & CAN Connecor

5V input supply whole PCB
CAN2 in this version is not used but
it was design for future application

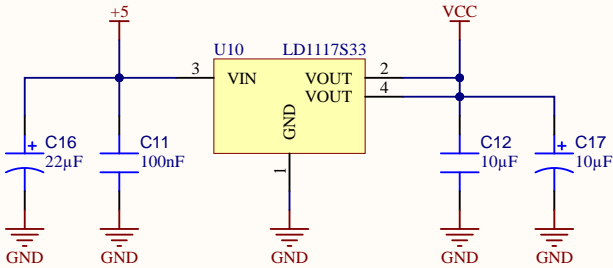
Protection

For Protection has been used a fuse and a TVS diode.
So The circuit are protected from:
-Short Circuit
-Reverse polarity supply
-Over voltage supply



3V3 Supply

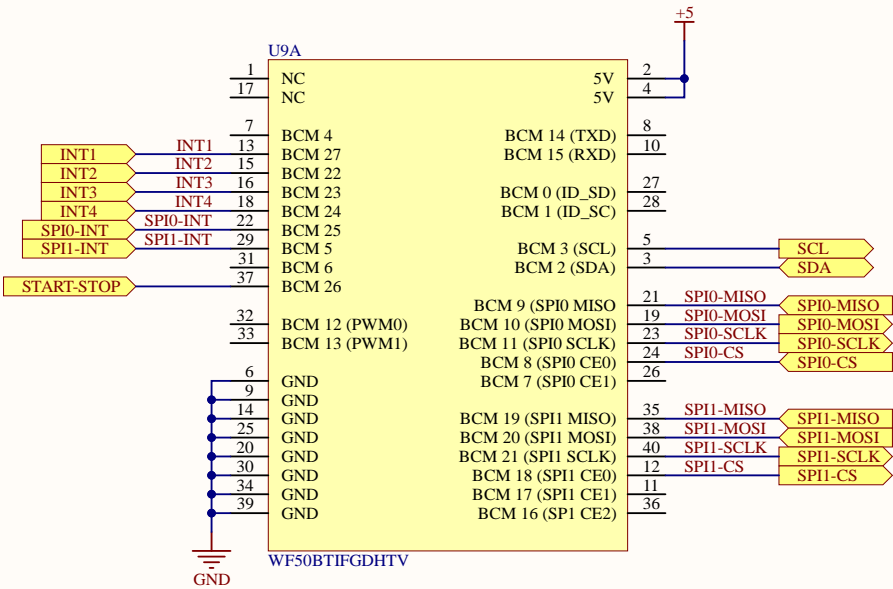
We use LD1117S33 to generate 3.3V for device.
Is NOT possible supply devices from 3V3 Raspberry PI pin
because it haven't enough current.



RaspBerry PI 4 + HDMI Display WF50BTIFGDHTV

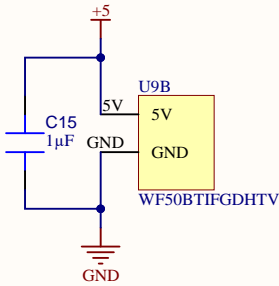
The Display WF50BTIFGDHTV have two connector, one for the Rasp and one for shields.
ATTENTION: The connectors are flipped!

- The Core of PCB is the Raspberry PI 4. It has been used:
- 2 SPI ports for CAN bus
 - 1 I2C port for multiplexers of button and rotative switch and LEDs drivers
 - 6 Interrupts pin for SPIs and multiplexers
 - 1 BCM for STAR-STOP button (it's better to use with interruts)



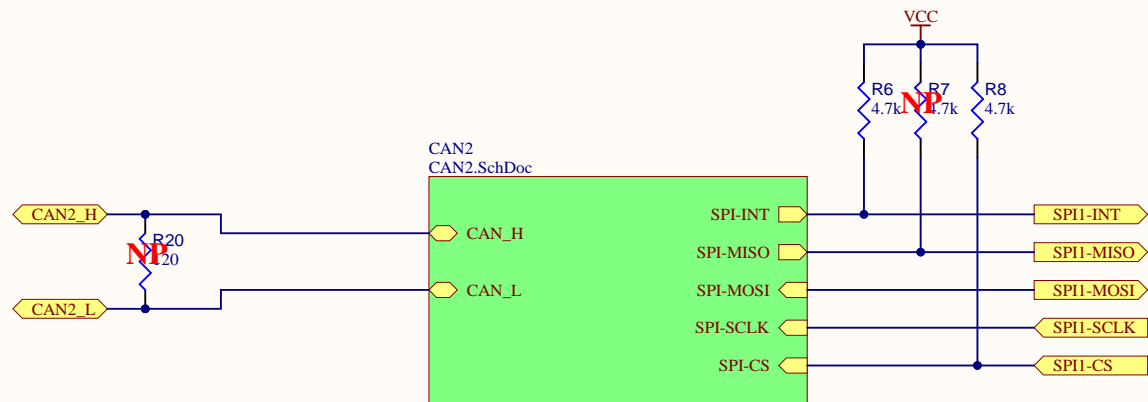
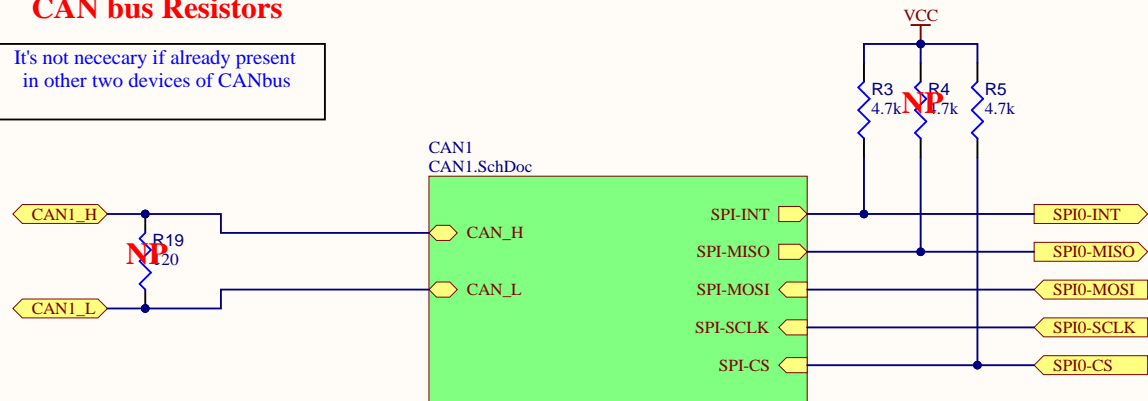
Display power supply

It's a connector to power the display:
WF50BTIFGDHTV
Max current: 380mA



CAN bus Resistors

It's not necessary if already present
in other two devices of CANbus



Title: **Steering Wheel.PrjPcb**

Sheet Name: CAN Interface.SchDoc

Version:

Sheet 4 of 12

Date: 08-Jul-20

Author: *

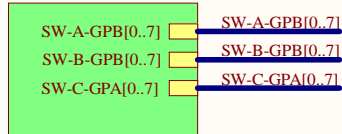


Multiplexers

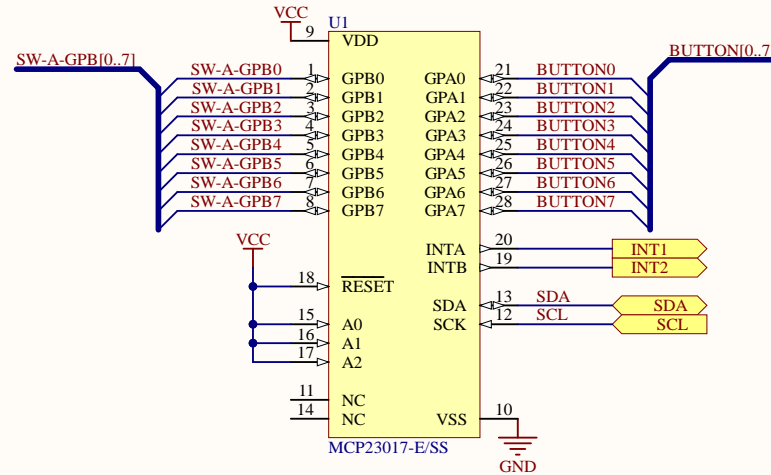
Is not possible control all nutton and rotative switch directly with Rasp PI.
It has been used MCP23017 because they have:

- Interface I2C
- 2 byte of inputs
- Internal pull-up
- Interrupt trigger when some bit change

SWITCHES
Switches.SchDoc

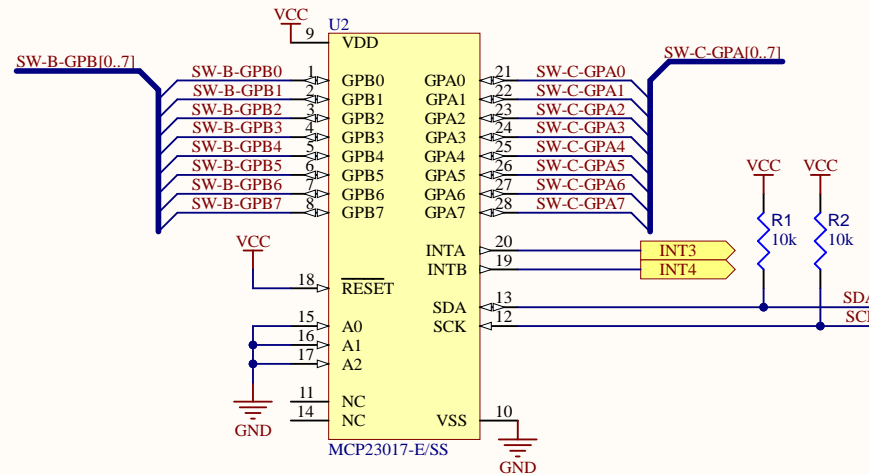


BUTTONS
Buttons.SchDoc



Address U1

Address of U1 is:
0100 111



Address U2

Address of U1 is:
0100 000

Title: **Steering Wheel.PrjPcb**

Sheet Name: HMI.SchDoc

Version:

Sheet 5 of 12

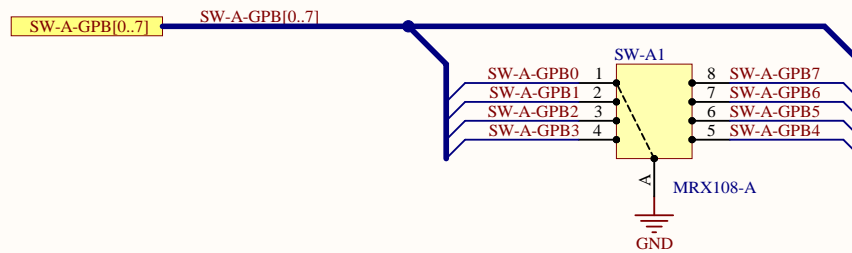
Date: 08-Jul-20

Author: *

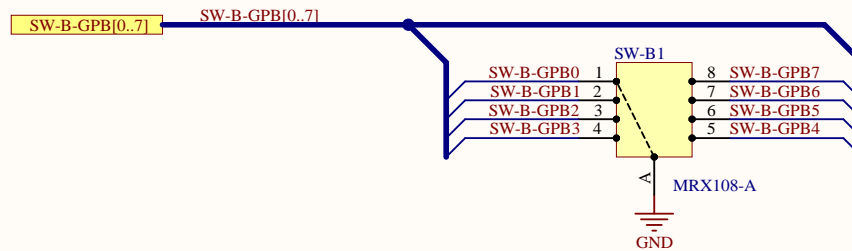


Rotative Switches

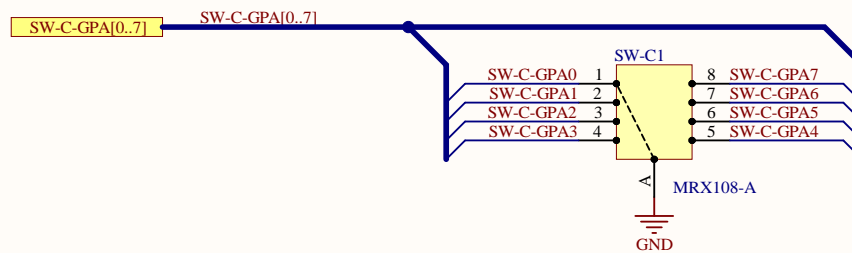
All switches have 8+1 pins
It's possible to use infinite rotation in everyone



Central Switche



Left Switche



Right Switche

Title: **Steering Wheel.PrjPcb**

Sheet Name: Switches.SchDoc

Version:

Sheet 6 of 12

Date: 08-Jul-20

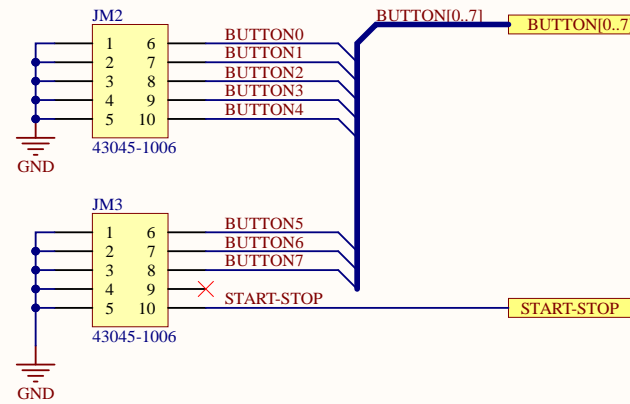
Author: *



External Buttons

There are two connectors that connect buttons in the steering wheel to ease the disassembly.

START-STOP button is not connected to multiplexer, but it's connected directly to Rasp PI 4.



Title: **Steering Wheel.PrjPcb**

Sheet Name: Buttons.SchDoc

Sheet 7 of 12

Author: *

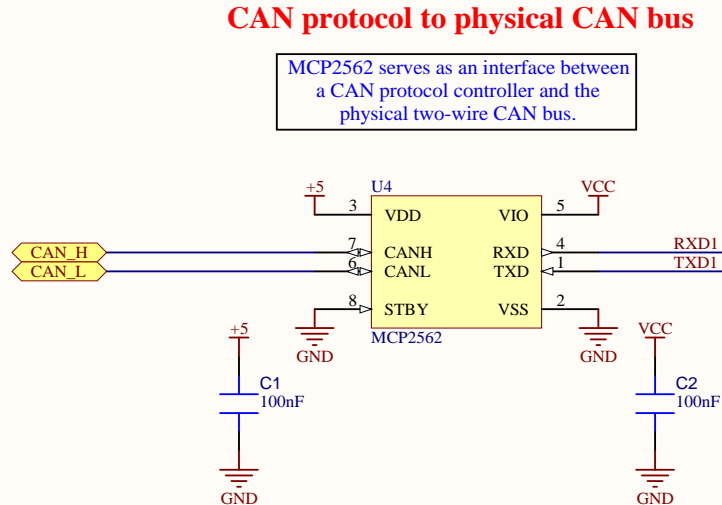
Version:

Date: 08-Jul-20



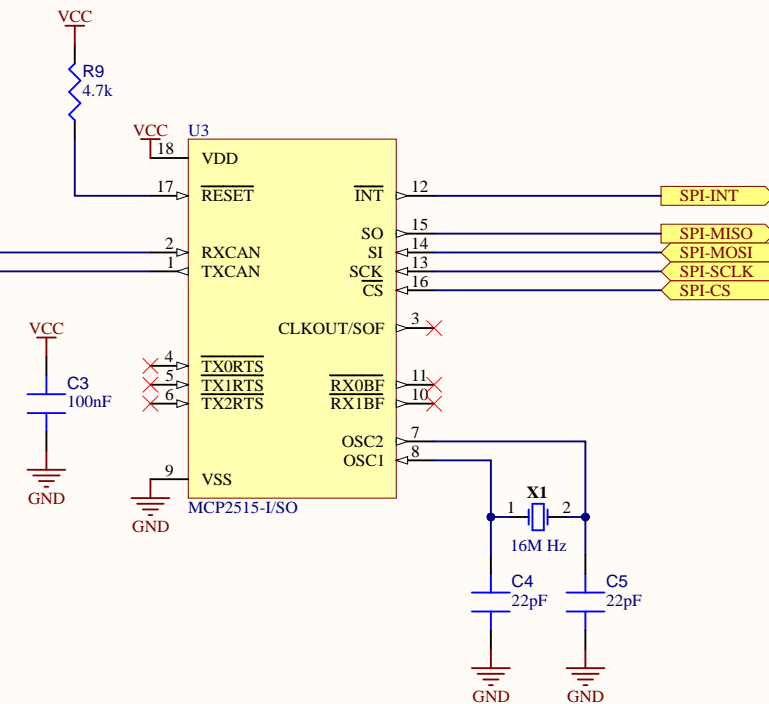
CAN protocol to physical CAN bus

MCP2562 serves as an interface between a CAN protocol controller and the physical two-wire CAN bus.



UART to SPI

The MCP2515 interfaces with microcontroller (Rasp PI 4) via an Serial Peripheral Interface (SPI)



Title: **Steering Wheel.PrjPcb**

Sheet Name: CAN1.SchDoc

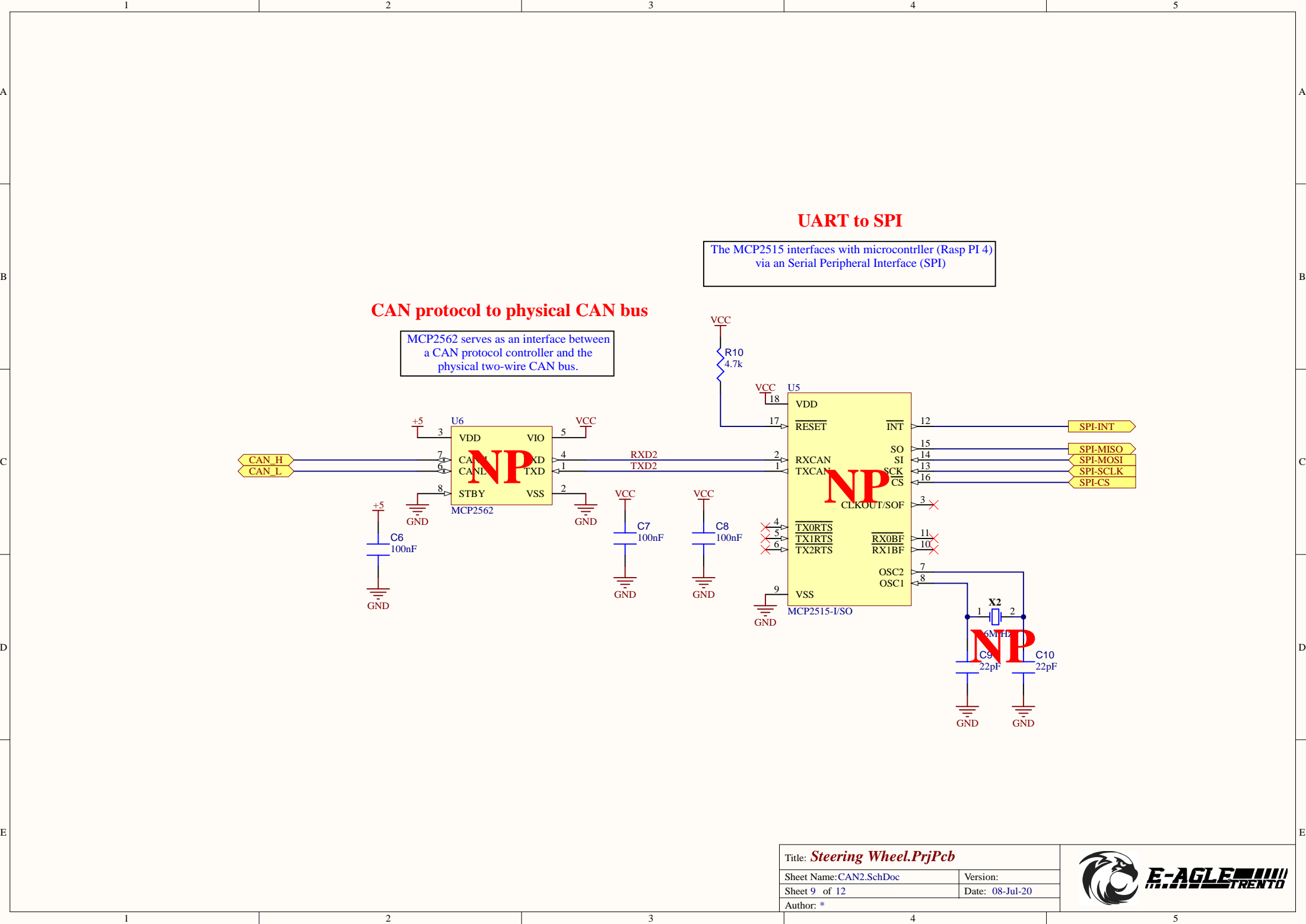
Sheet 8 of 12

Author: *

Version:

Date: 08-Jul-20





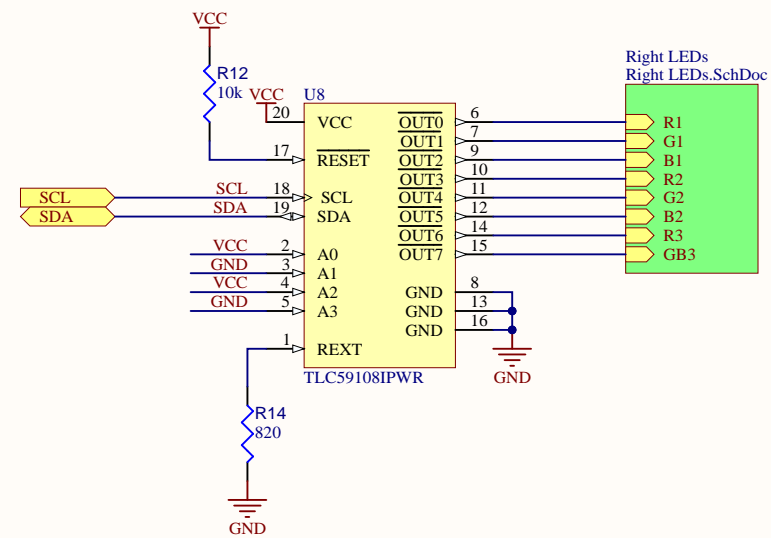
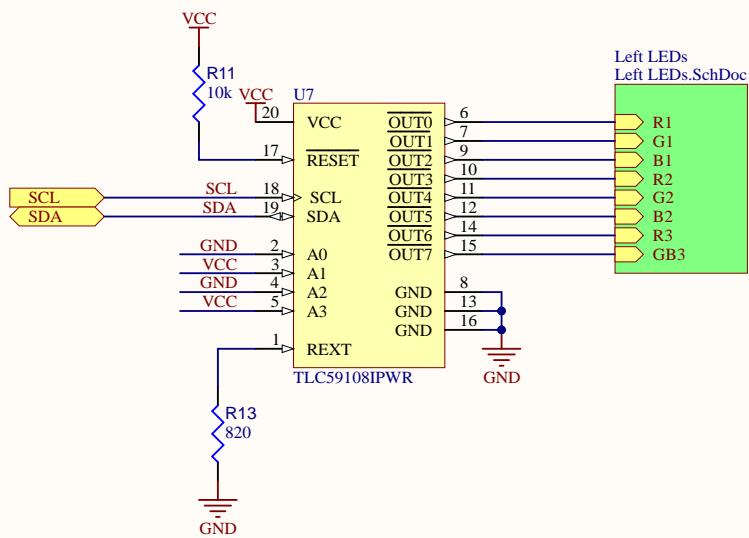
UART to SPI

The MCP2515 interfaces with microcontrller (Rasp PI 4) via an Serial Peripheral Interface (SPI)

CAN protocol to physical CAN bus

MCP2562 serves as an interface between a CAN protocol controller and the physical two-wire CAN bus.





Title: **Steering Wheel.PrjPcb**

Sheet Name: LEDs Drivers.SchDoc

Sheet 10 of 12

Author: *

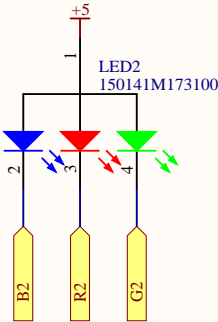
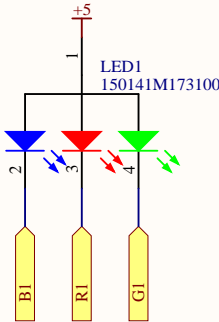
Version:

Date: 08-Jul-20



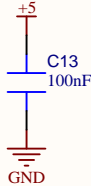
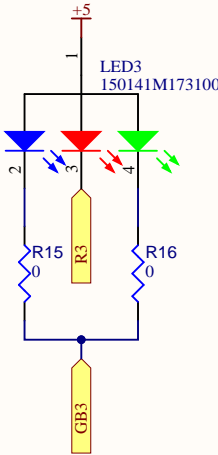
Left RGB LEDs

It's controlled by
TLC5910IPWR (U7)



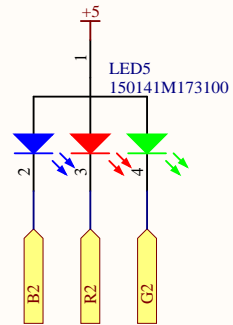
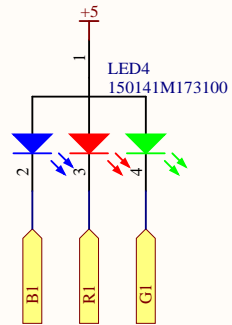
Green/Blue selector

TLC5910 can control only 8 pins,
so G&B is connected together
through 0 Ohm Resistor.
Is not Recommended solder both resistor.



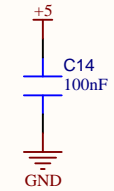
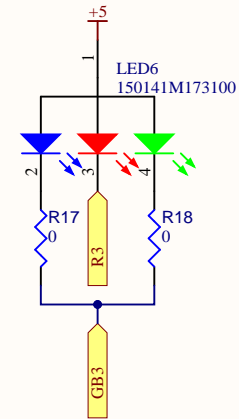
Left RGB LEDs

It's controlled by
TLC5910IPWR (U7)



Green/Blue selector

TLC5910 can control only 8 pins,
so G&B is connected together
through 0 Ohm Resistor.
Is not Recommended solder both resistor.



Title: **Steering Wheel.PrjPcb**

Sheet Name: Right LEDs.SchDoc

Sheet 12 of 12

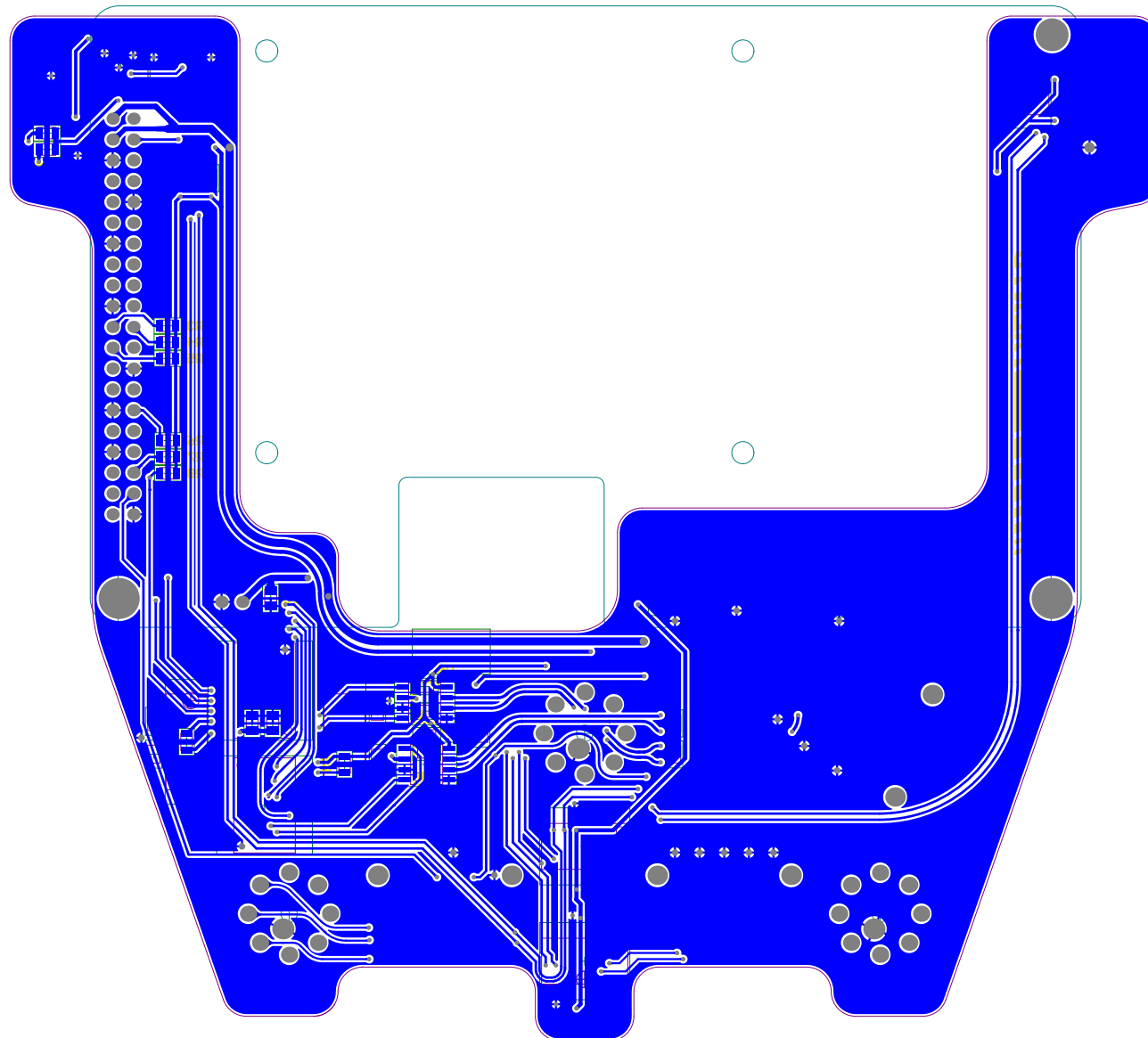
Author: *

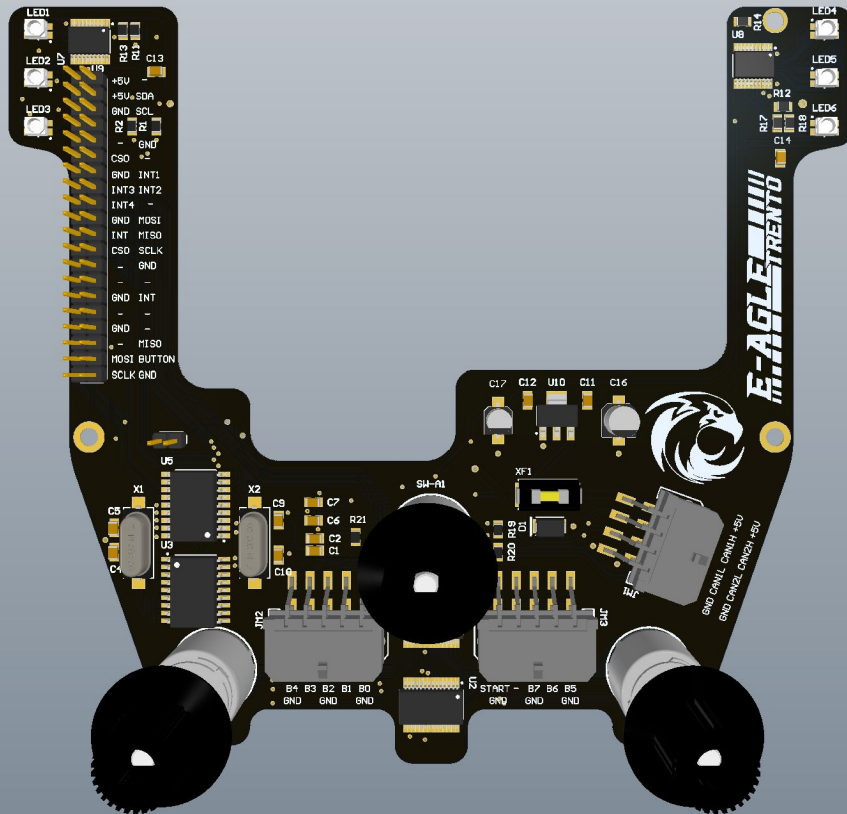
Version:

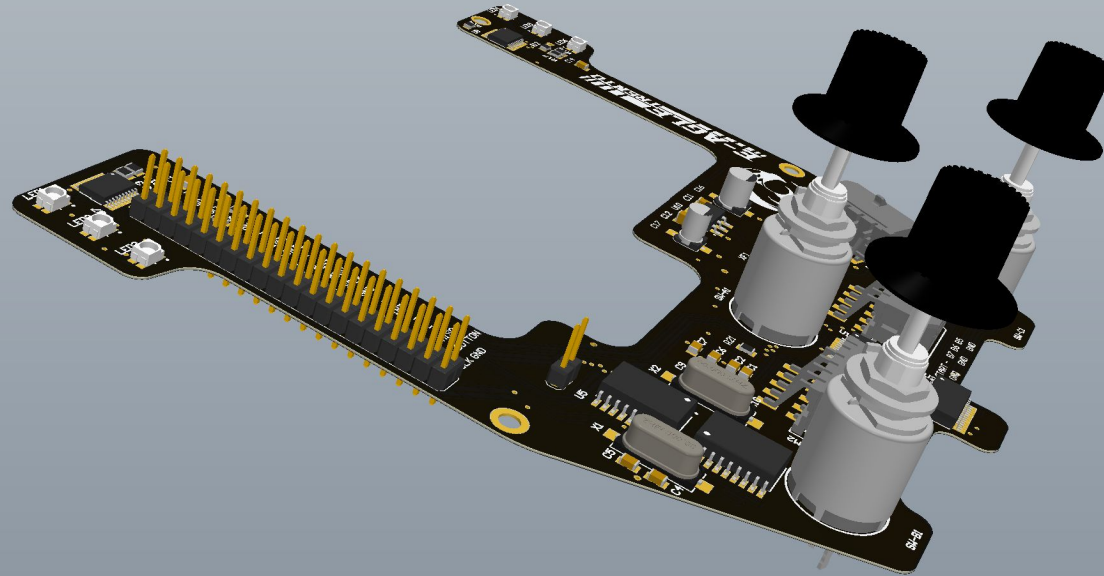
Date: 08-Jul-20

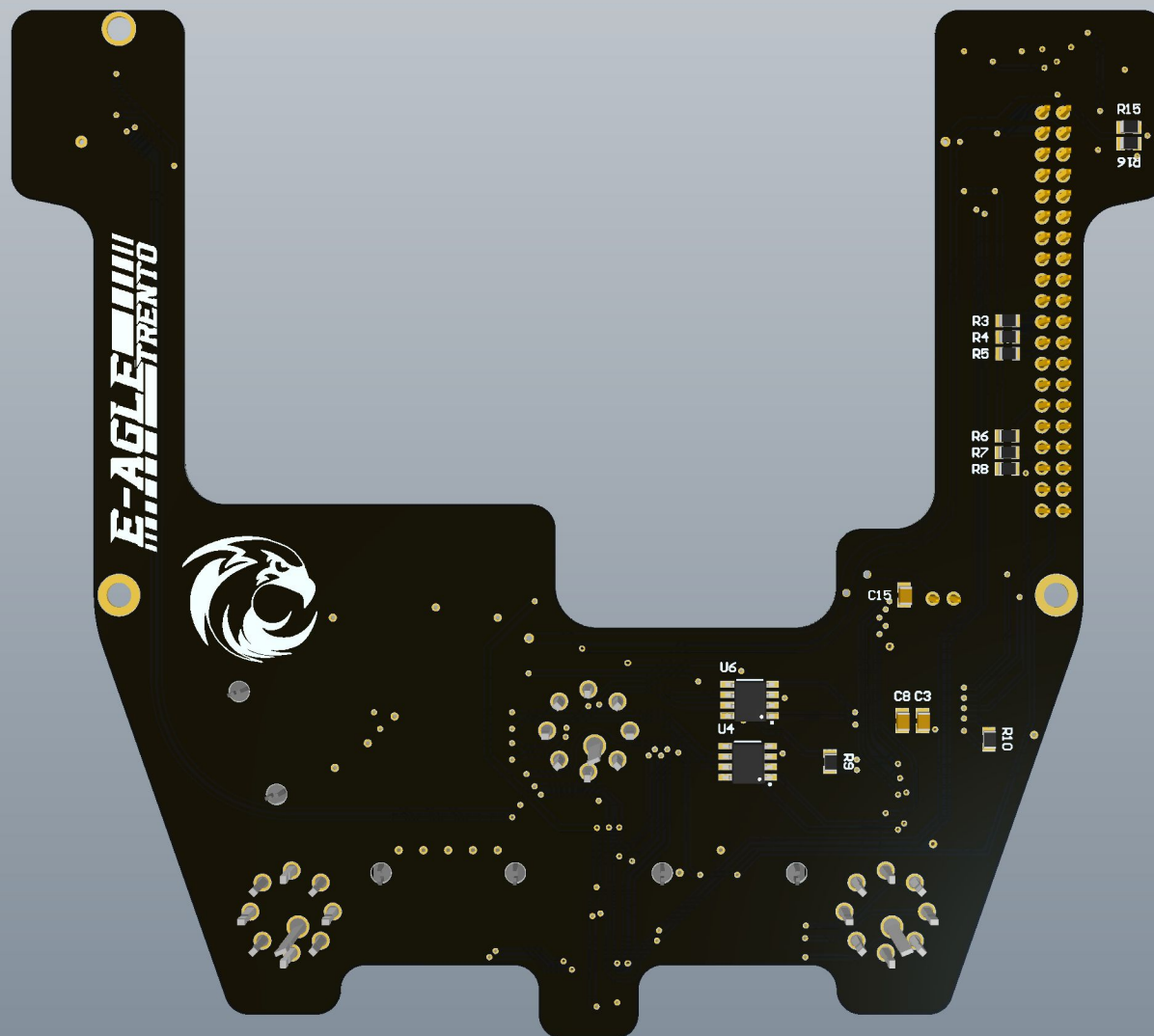












Line #	ComponentType	Name	Description	Designator	Quantity	Manufacturer 1	Manufacturer Part Number 1	Manufacturer Lifecycle 1	Supplier 1	Supplier Unit Price 1	Supplier Subtotal 1
	Capacitors	C0805C104J4RACTU	Capacitor SMD 0805	C1, C2, C3, C4, C7, C8, C11, C13, C14	9	KEMET	C0805C104J4RACTU	Volume Production	Mouser	0.41344	4.13
	Capacitors	C0805C105J4RACTU	Capacitor SMD 0805	C15	1	KEMET	C0805C105J4RACTU	Volume Production	Mouser	0.31871	0.31871
	Capacitors	C0805C220J4GACTU	Capacitor SMD 0805	C4, C5, C9, C10	4	KEMET	C0805C220J4GACTU	Volume Production	Mouser	0.24788	0.99154
	Capacitors	C1206C106J4RACTU	Capacitor SMD 1206	C12	1	KEMET	C1206C106J4RACTU	Volume Production	Mouser	2.37	2.37
	Capacitors	EEEP1C100AR	Capacitor: Alum Electrolytic: Cap 10uF: Tol 20%: Vol-Rtg 16 VDC: SMT: 4x6.1: Cut Type	C17	1	Panasonic	EEEP1C100AR	Volume Production	Mouser	0.4338	0.4338
	Capacitors	EEEP1C220AR	PANASONIC ELECTRONIC COMPONENTS EEEP1C220AR SMD Aluminium Electrolytic Capacitor, Radial Can - SMD, 22 F, 16 V, 0.36 ohm, FP Series	C16	1	Panasonic	EEE-FP1C220AR	Volume Production	Mouser	0.41609	0.41609
	Connectors	43045-0806	Molex 2x4 SMD Right Angle	JM1	1	Molex	43045-0806	Volume Production	Mouser	3.07	3.07
	Connectors	43045-1006	Molex 2x5 SMD Right Angle	JM2, JM3	2	Molex	0430451006	Volume Production	Mouser	3	6
	Crystals & Oscillators	FOXSDLF/160-20	CRYSTAL 16.0MHz 20PPM SMD	X1, X2	2	Fox Electronics	FOXSDLF/160-20	Volume Production	Mouser	0.23903	0.47806
	DCDC	LD1117533	STMICROELECTRONICS LD1117533TR: LDO VOLTAGE REGULATOR, 3.3V, 0.8A, SOT-223-3	U10	1	STMicroelectronics	LD1117533TR	Volume Production	Mouser	0.369	0.369
	Diodes	SMBJ5.0a	BOURNS - SMAJ5.0A - TVS Diode, SMAJ Series, Unidirectional 5 V, 9.2 V, DO 214AC, 2 Pins	D1	1	Bourns	SMAJ5.0A	Volume Production			
	Drivers	TLC59108PWR	LED DRIVER, CONSTANT CURRENT, TSSOP-20: Device Topology: Constant Current: No. of Outputs: 8: Output Current: 120mA: Output Voltage: -: Driver Case Style: TSSOP: No. of Pins: 20: Input Voltage Min: 3V: Input Voltage Max: 5.5V: Switching: RoHS Compliant: Yes	U7, U8	2	Texas Instruments	TLC59108PWR	Volume Production	Mouser	1.73	3.45
	Fuses	0154005DRT	Fuse 5A SMD	XF1	1	Littelfuse	0154005 DRTL	Volume Production	Mouser	2.49	2.49
	Interface	MCP2515-I/SO	IC CAN CONTROLLER W/SPI 185QIC	U3, U5	2	Microchip	MCP2515-I/SO	Volume Production	Mouser	1.61	3.22
	Interface	MCP2562	Interface IC CAN SO-8 Microchip MCP2562ESN (Interface IC CAN SO-8 Interfaces)	U4, U6	2	Microchip	MCP2562-E/SN	Volume Production	Mouser	0.81	1.62
	Interface	MCP23017-E/SS	16-Bit I/O Expander with Serial Interface	U1, U2	2	Microchip	MCP23017-E/SS	Volume Production	Mouser	1.12	2.23
	LED	150141M173100	Standard LEDs RGB	LED1, LED2, LED3, LED4, LED5, LED6	6	Würth Electronics	150141M173100	Volume Production	Mouser	0.41609	2.5
	Miscellaneous	WF508TFFGQHTV	Display HDMI for Rasp Pi	U9	1						
	Resistors	CRCW08054K70FKEA	Resistor 0805 SMD	R3, R4, R5, R6, R7, R8, R9, R10	8	Vishay	CRCW08054K70FKEA	Volume Production	Mouser	0.05489	0.54889
	Resistors	CRCW080510K0FKEA	Resistor 0805 SMD	R1, R2, R11, R12, R21	5	Vishay	CRCW080510K0FKEA	Volume Production	Mouser	0.09	0.45
	Resistors	CRCW0805120RFKEA	Resistor 0805 SMD	R19, R20	2	Vishay	CRCW0805120RFKEA	Volume Production	Mouser	0.09	0.18
	Resistors	CRCW0805820RFKEA	Resistor 0805 SMD	R13, R14	2	Vishay	CRCW0805820RFKEA	Volume Production	Mouser	0.08853	0.17704
	Resistors	CRCW0805000Q02EA	Resistor 0805 SMD	R15, R16, R17, R18	4	Vishay	CRCW0805000Q02EA	Volume Production	Mouser	0.02125	0.21247
	Switches	MRX108-A	SWITCH ROTARY 2-POS 2A 125V	SW-A1, SW-B1, SW-C1	3	NKK Switches	MRX108-A	Volume Production	Mouser	12.44	37.32