Power connectors

J2 VDC PWR — GND

J3 +5V Cock — GND

Connectors to power other boards

DCDC

U3 Tex_DCDC_v2

VDC → VIN; 5V → +5V → TP2 TestPoint; 3V3 → +3V3 → TP3 TestPoint; TP1 TestPoint

GND GND GND

VDC → R43 10k → D13 LED → GND

+5V → R44 1k8 → D14 LED → GND

+3V3 → R45 1k8 → D15 LED → GND

Raspberry

CAN1_P, CAN1_N, CAN2_P, CAN2_N

File: raspberry.kicad_sch

UART_TX, UART_RX, UART_RTS, UART_CTS, SPI0_CLK, SPI0_MISO, SPI0_MOSI, MCU-RPI_SPI_CS

UART_RX, UART_TX, UART_CTSD, UART_RTSC, MCU_SPI_CLK, MCU_SPI_MISO, MCU_SPI_MOSI, MCU-RPI_SPI_CS

U2A Sensors

1	1	WR_B−
2	2	WR_B+
3	3	WL_B−
4	4	WL_B+
5	5	+5V
6	6	GND
7	7	+5VA
8	8	APPS_S1
9	9	APPS_S2
10	10	GNDA
11	11	Spare4
12	12	Spare8

U2B Sensors

13	13	WR_A−
14	14	WR_A+
15	15	WL_A−
16	16	WL_A+
17	17	+5V
18	18	GND
19	19	+5VA
20	20	BPPS_S1
21	21	BPPS_S2
22	22	GNDA
23	23	Spare9

U2C Sensors

24	24	SW_CLK+
25	25	SW_CLK−
26	26	SW_DATA−
27	27	SW_DATA+
28	28	+5V
29	29	GND
30	30	+5VA
31	31	BRAKE_SR
32	32	BRAKE_SF
33	33	GNDA
34	34	Spare10
35	35	Spare5

U1A Main

1	1	SD_FB2
2	2	SD_FB3
3	3	BRAKELIGHT_CH2
4	4	BRAKELIGHT_CH0
5	5	CAN2_N
6	6	CAN2_P
7	7	CAN1_N
8	8	CAN1_P

U1B Main

9	9	SD_FB4
10	10	SD_FB1
11	11	BRAKELIGHT_CH1
12	12	Spare1
13	13	Spare6
14	14	Spare2
15	15	VDC → D1 824500281 → GND

U1C Main

16	16	SD_IN
17	17	SD_OUT
18	18	SD_FB0
19	19	BRAKELIGHT_CH3
20	20	Aux_ADC
21	21	Spare7
22	22	Spare3
23	23	GND

Right of car --> / <-- Left of car

J1 Spare

Spare1	1	7	12	Spare6
Spare2	2	8	11	Spare7
Spare3	3	9	10	Spare8
Spare4	4	10	9	Spare9
Spare5	5	11	8	Spare10
+5V	6	12	7	GND

CAN connector

J4 CAN

CAN1_P	1
CAN1_N	2
CAN2_P	3
CAN2_N	4

Digital Sensors

SW_DATA+, SW_DATA−, SW_CLK+, SW_CLK− → SW_DATA, SW_CLK

WL_A+, WL_A−, WL_B+, WL_B− → WL_A, WL_B

WR_A+, WR_A−, WR_B+, WR_B− → WR_A, WR_B

CS → IMU_CS

IMU_INT → IMU_INT

SCK → SPI2_SCK_1

MOSI → SPI2_MOSI_1

MISO → SPI2_MISO_1

File: digital−sensors.kicad_sch

Analog Sensors

APPS_S1, APPS_S2 → PITOT, APPS_1, APPS_2

BPPS_S1, BPPS_S2 → BPPS_1, BPPS_2

BRAKE_SF, BRAKE_SR → BRAKE_F, BRAKE_R

File: analog−sensors.kicad_sch

Analog Mux

Aux_ADC → R40 R → I7 → R41 R → GND

SD_FB0, SD_FB1, SD_FB2, SD_FB3, SD_IN, SD_OUT, VDC, SD_FB4 → RN3 3.3k, RN4 3.3k → I10, I11, I13, I12, I15, I14, I8, I9

+5V → C1 100n → GND

U4 CD74HC4067SM

PITOT, APPS_2, APPS_1, BPPS_2, BPPS_1, BRAKE_F, BRAKE_R, I7, I8, I9, I10, I11, I12, I13, I14, I15

COM → MUX_OUT

S0 → MUX_0, S1 → MUX_1, S2 → MUX_2, S3 → MUX_3

E → GND; VCC → +5V; GND → GND

MCU

CAN1_P, CAN1_N, CAN2_P, CAN2_N

File: mcu.kicad_sch

BRAKE_LIGHT_CH1, BRAKE_LIGHT_CH2, BRAKE_LIGHT_CH3, SD_CLOSED

Brakelight

BRAKELIGHT_CH0 → Q10 SSM3K361TU; BL_CH1_G → R42 33R 0.5W → GND

BRAKELIGHT_CH1 → Q3 SSM3K361TU; BL_CH1_G → GND

BRAKELIGHT_CH2 → Q4 SSM3K361TU; BL_CH2_G → GND

BRAKELIGHT_CH3 → Q5 SSM3K361TU; BL_CH3_G → GND

RN5 33: BL_CH1, BL_CH2, BL_CH3, SD_CLOSE → BL_CH1_G, BL_CH2_G, BL_CH3_G, SD_CLOSE_G

RN6 100k → GND

Shutdown Relay

SD_IN → D2 1N4148W → K1 EX1−2U1S → SD_OUT; SD_IN

SD_CLOSE_G → Q2 2N7002NXAKR → GND

PTT

PTT → R1 33 → PTT_G → Q1 2N7002NXAKR; R3 100k → +5V; R2 100k → GND

J5 PTT: PTT, +5V, GND, GND

Mounting Holes

H1 MountingHole, H2 MountingHole, H3 MountingHole

Thomas Nonis
Thomas Nonis
Filippo Volpe

E-Agle TRT

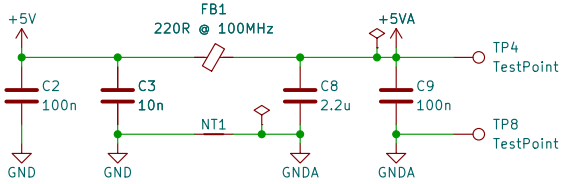
Sheet: /
File: hw−fenice−evo−ecu.kicad_sch

Title: ECU

Size: A3	Date: 2022−12−22	**Rev: v1.1**
KiCad E.D.A. kicad (6.0.11)		Id: 1/5

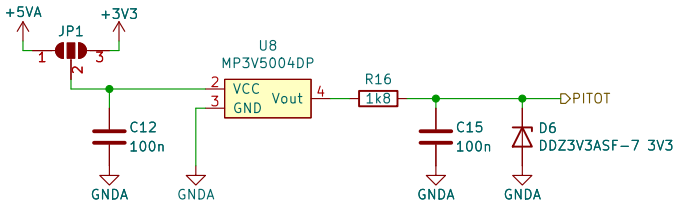
Clean power

Output current:
- Brake transducers: 2x5.5mA=11mA
- Accelerator potentiometers: 2x3mA=6mA
- Brake potentiometers: 2x3mA=6mA
- Strain gauges: 4x40mA = 160mA



Pitot tube sensor

Pin compatible with MPXV4006 which uses 5V

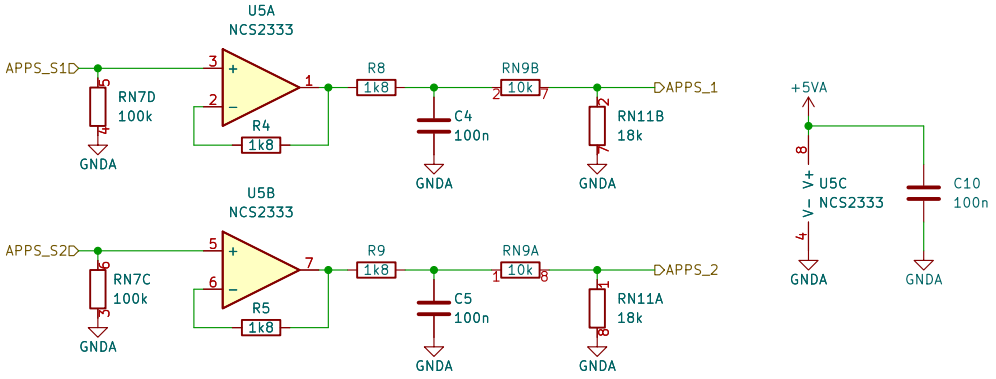


Accelerator pedal position sensors

Accelerator potentiometer:
Aviorace DIA95-25
- resistance: 1.7kOhm
- linear

Datasheet

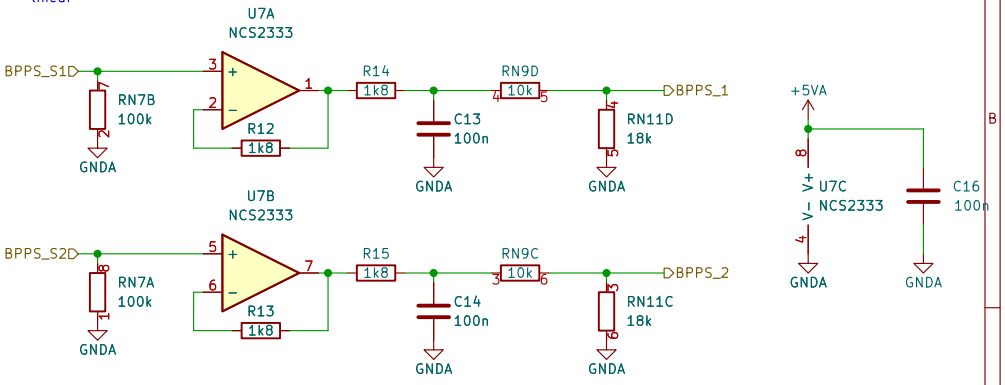
APPS are SCS, therefore the following failures must be detected:
- Open circuit
- Short to ground
- Short to vcc



Brake pedal position sensors

Brake sensor potentiometer:
Aviorace DIA95-25
- resistance: 1.7kOhm
- linear

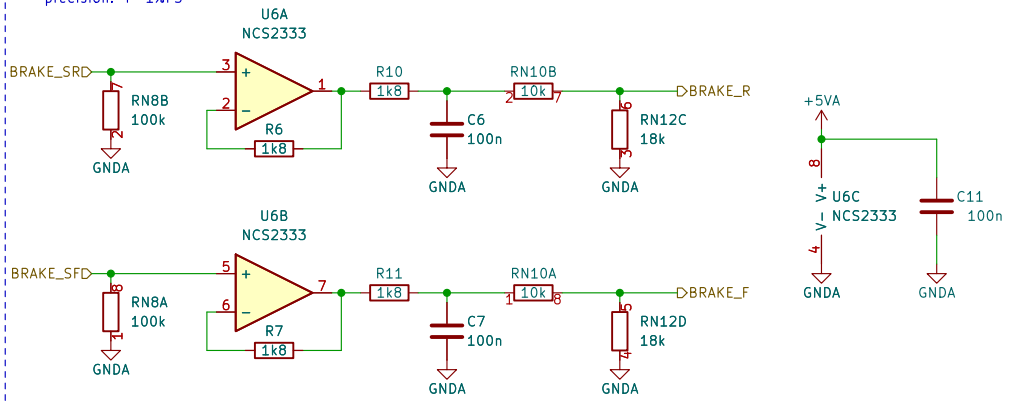
Datasheet



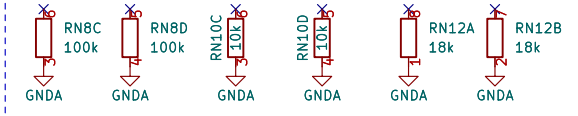
Brake system pressure sensors

Brake pressure transducers:
Aviorace SP100
- ratiometric
- input: 0-100 bar
- output: 0.5-4.5 V
- precision: +-1%FS

Datasheet



Unused



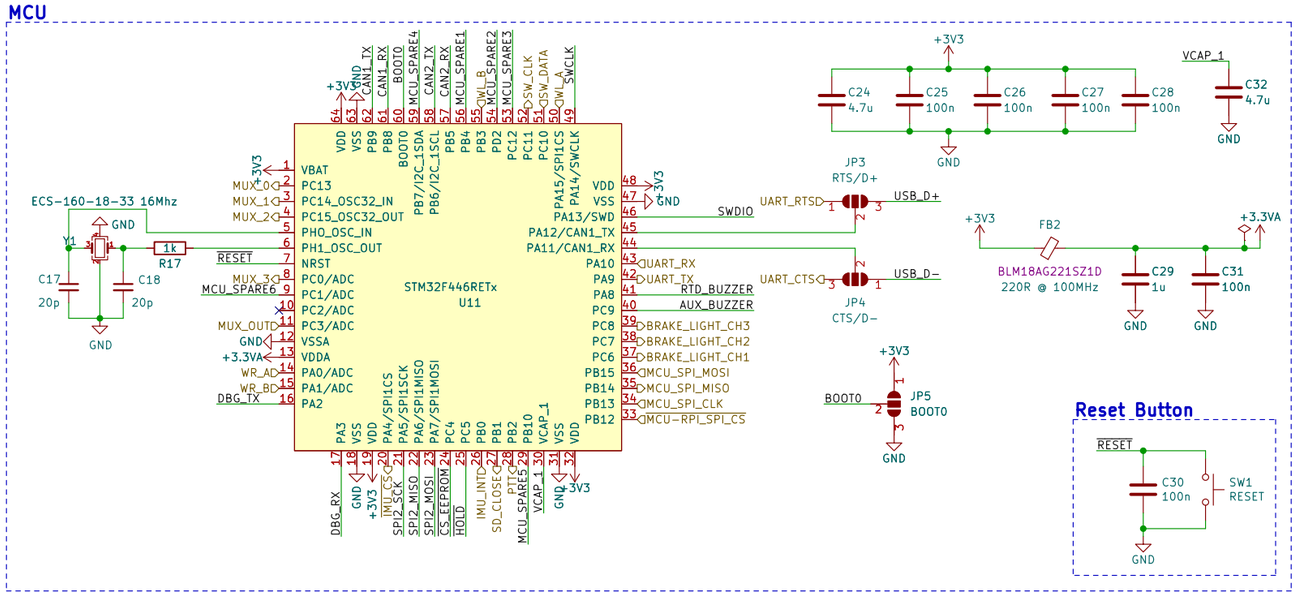
Thomas Nonis
Thomas Nonis
Filippo Volpe
E-Agle TRT

Sheet: /Analog Sensors/
File: analog-sensors.kicad_sch

Title: ECU

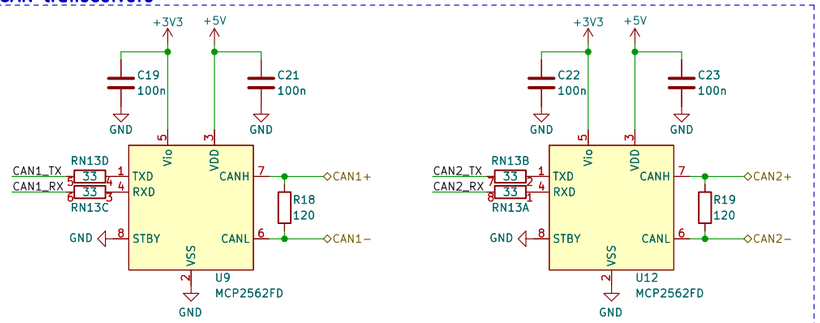
Size: A4	Date: 2022-12-22	**Rev: v1.1**
KiCad E.D.A. kicad (6.0.11)		Id: 4/5

MCU

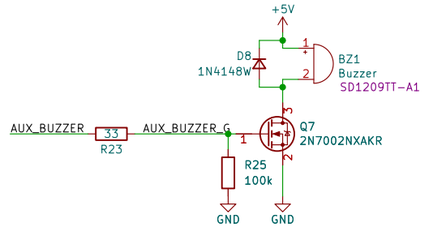


Reset Button

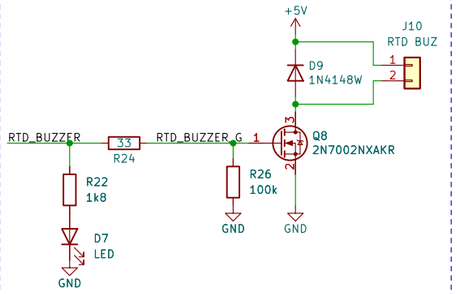
CAN transceivers



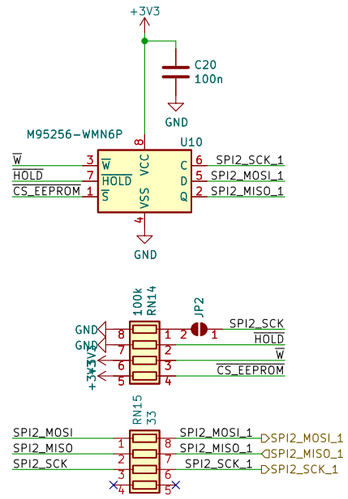
Secondary buzzer



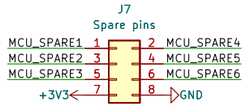
Buzzer



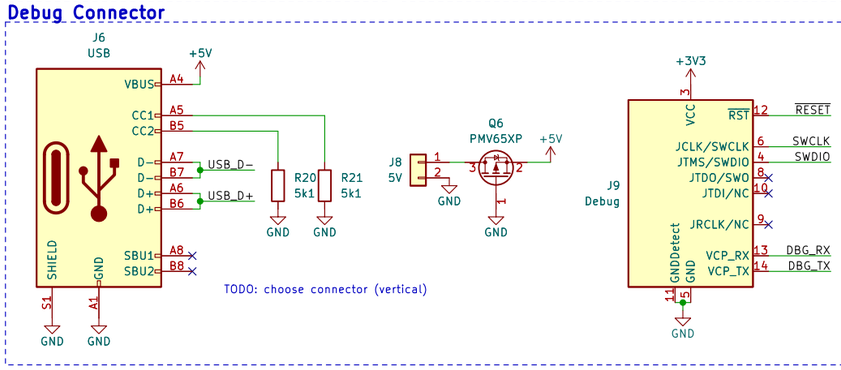
EEPROM



Spare pins



Debug Connector



Thomas Nonis Thomas Nonis Filippo Volpe **E-Agle TRT**	
Sheet: /MCU/ File: mcu.kicad_sch	
Title: ECU	
Size: A3 | Date: 2022-12-22	**Rev: v1.1**
KiCad E.D.A. kicad (6.0.11)	Id: 4/5

Wheel Encoders

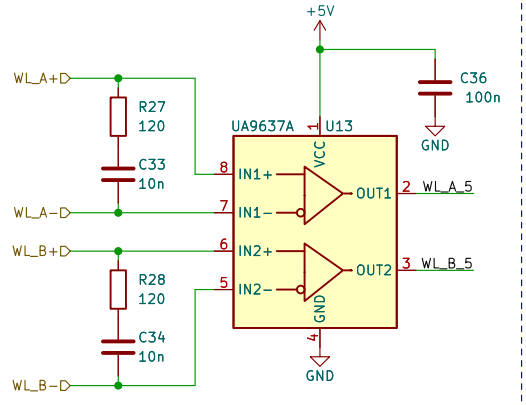
Wheel Encoder:
RLS LM13ICD40AB10F00
–RS422
–interpolation factor: 400

Datasheet

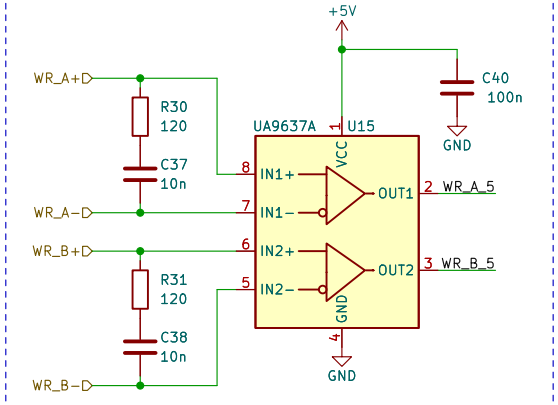
Cable:
–5V: Brown
–GND: White
–A+: Green
–A–: Yellow
–B+: Blue
–B–: Red

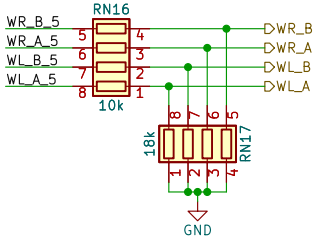
Radial incremental magnetic rings:
RLS MR075E060A120B00
–outer diameter: 57mm
–cross section height: 10mm
–radial magnetisation
–inner diameter: 85mm
–with reference mark
–number of poles: 120

Left Wheel Encoder

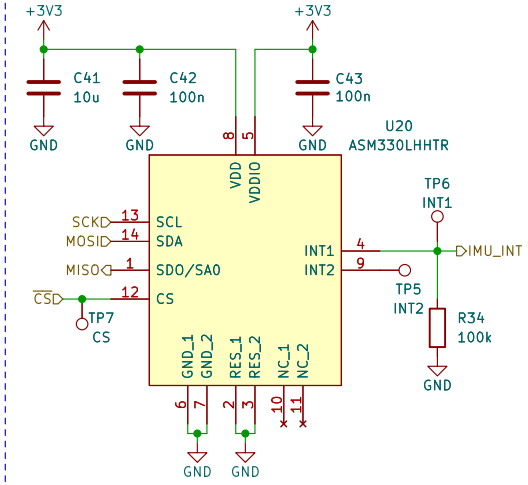


Right Wheel Encoder





IMU

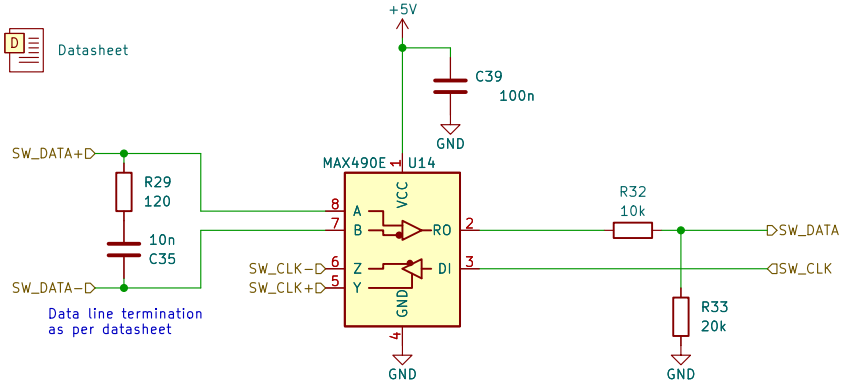


Steering Wheel Encoder

Steering Wheel Encoder:
RLS RM44SC0012B10F2F10

Datasheet

Cable:
–Vdd: Red
–GND: Blue
–Clock+: White
–Clock–: Brown
–Data+: Green
–Data–: Yellow



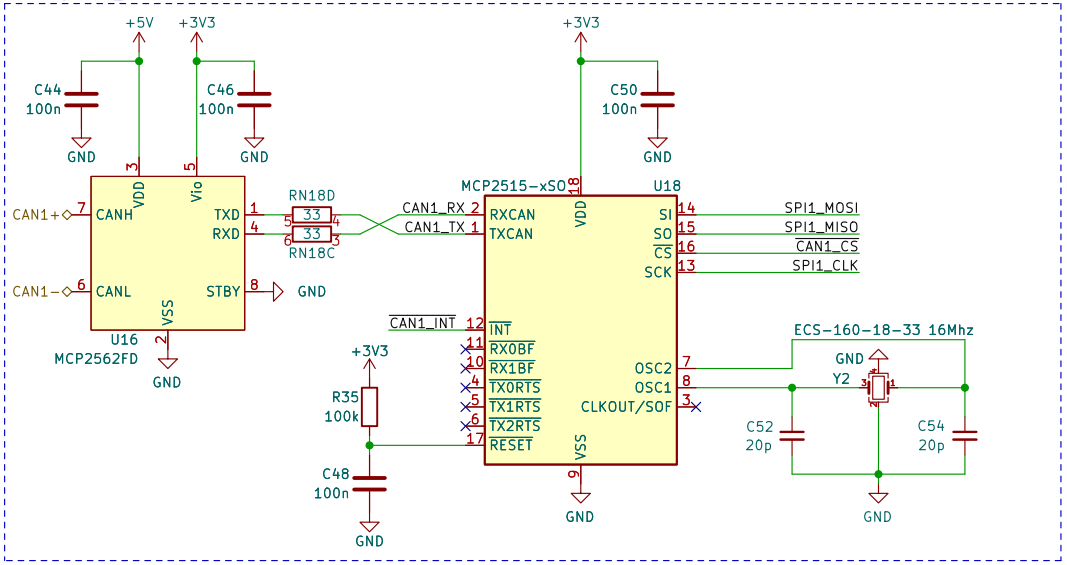
Thomas Nonis
Thomas Nonis
Filippo Volpe
E–Agle TRT

Sheet: /Digital Sensors/
File: digital–sensors.kicad_sch

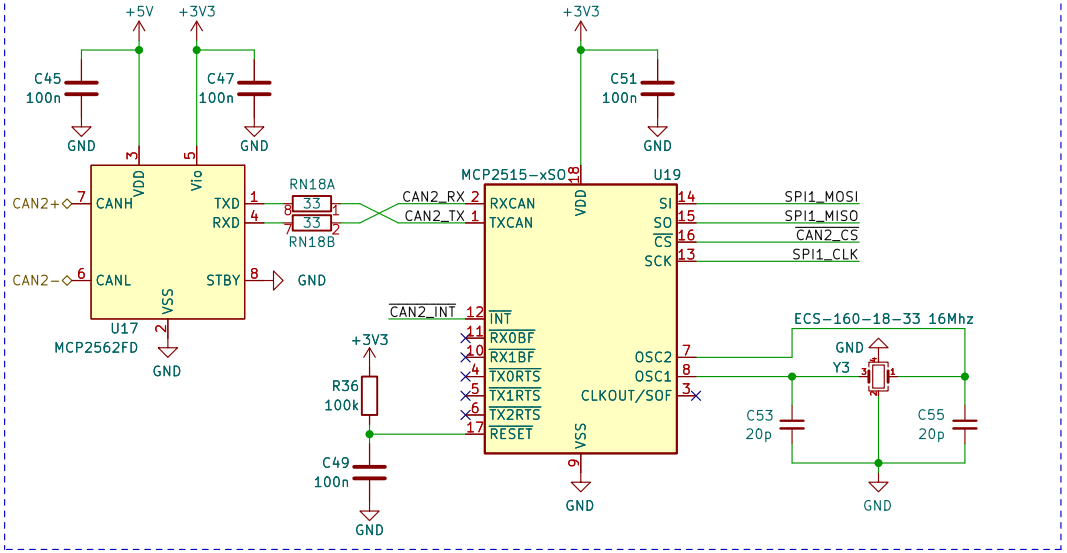
Title: ECU

Size: A4	Date: 2022–12–22	**Rev: v1.1**
KiCad E.D.A. kicad (6.0.11)		Id: 5/5

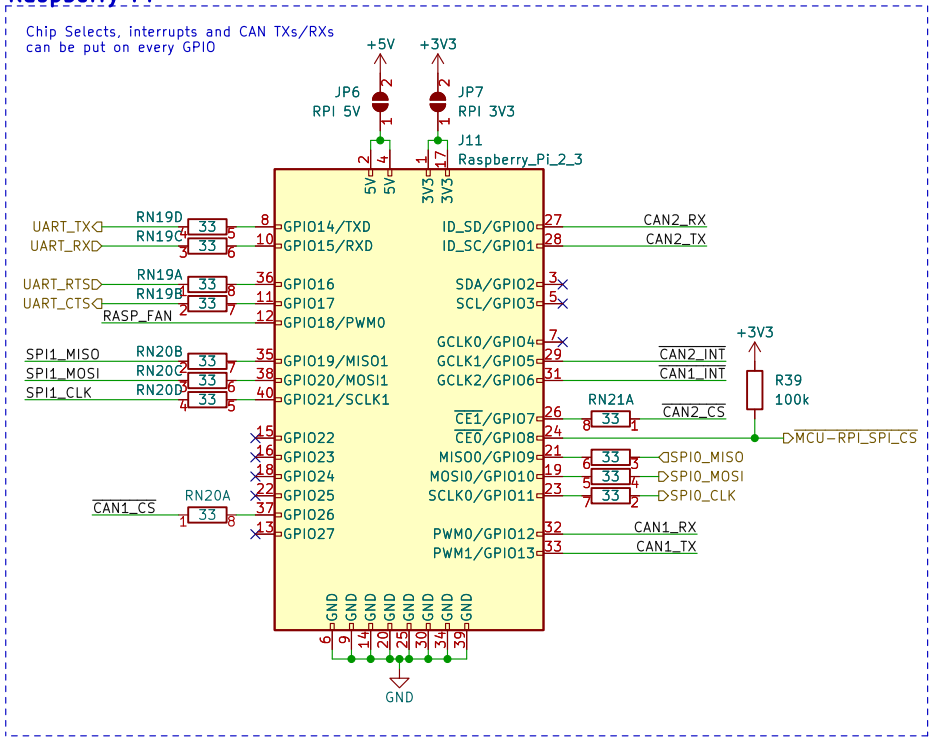
RPI CAN 1



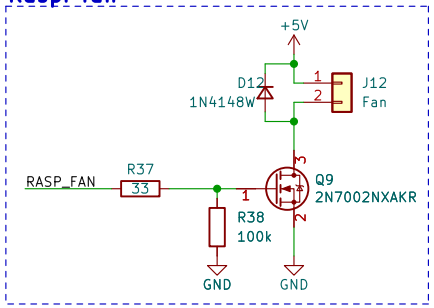
RPI CAN 2



Raspberry PI



Raspi fan



Could use 100k RN for CAN reset pull-ups and fan pull-down

Thomas Nonis
Thomas Nonis
Filippo Volpe
E-Agle TRT

Sheet: /Raspberry/
File: raspberry.kicad_sch

Title: ECU

Size: A4	Date: 2022-12-22	**Rev: v1.1**
KiCad E.D.A. kicad (6.0.11)		Id: 5/5