ToDo:
- remplacer double mesures de courant de phase par mesure simple high side ?

Major Tom is a power board driving 3 BLDC motors. It also add 3 temperature measurements and a fan control.
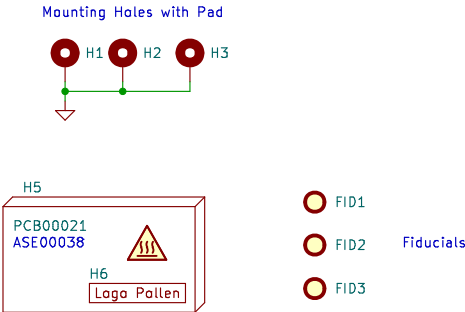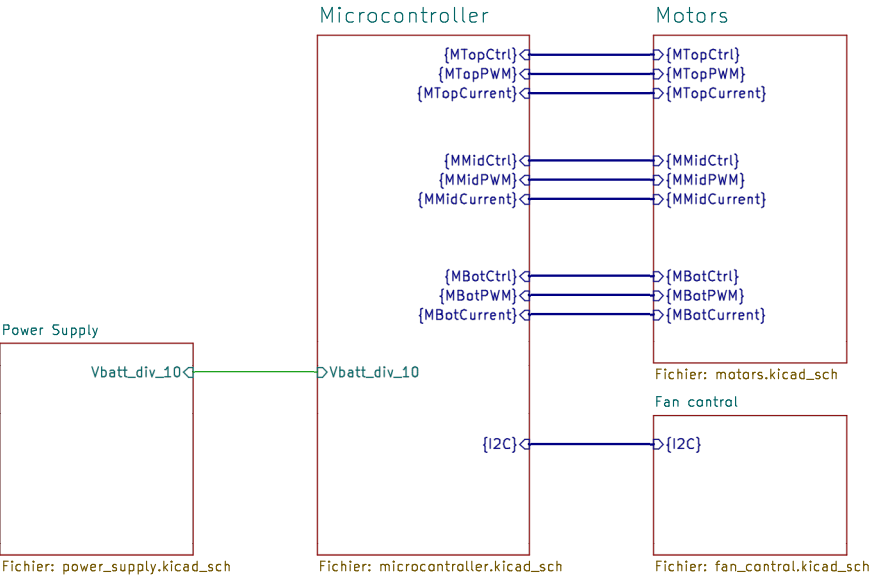
Mounting Holes with Pad

H1 H2 H3

H5

PCB00021
ASE00038

H6
Logo Pollen

FID1

FID2   Fiducials

FID3

Microcontroller

{MTopCtrl}
{MTopPWM}
{MTopCurrent}

{MMidCtrl}
{MMidPWM}
{MMidCurrent}

{MBotCtrl}
{MBotPWM}
{MBotCurrent}

Motors

{MTopCtrl}
{MTopPWM}
{MTopCurrent}

{MMidCtrl}
{MMidPWM}
{MMidCurrent}

{MBotCtrl}
{MBotPWM}
{MBotCurrent}

Fichier: motors.kicad_sch

Fan control

{I2C}   {I2C}

Fichier: fan_control.kicad_sch

Power Supply

Vbatt_div_10   Vbatt_div_10

Fichier: power_supply.kicad_sch
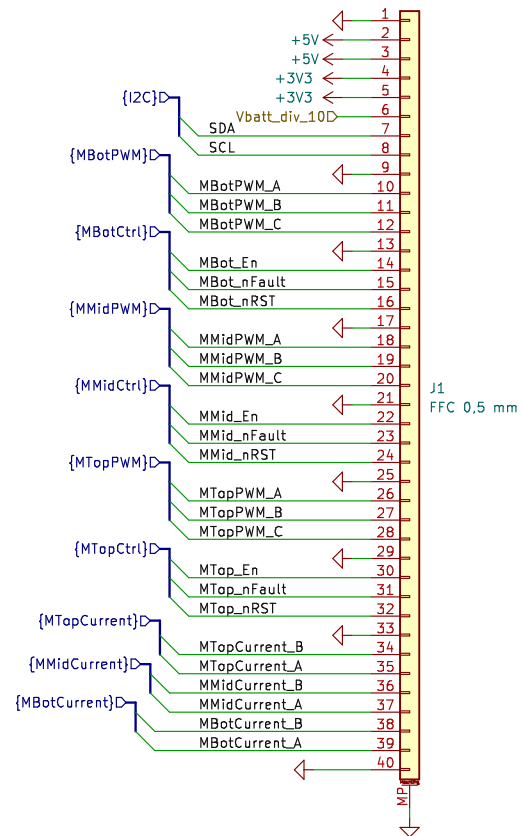
Fichier: microcontroller.kicad_sch

POLLEN ROBOTICS

J1
FFC 0,5 mm

Pin	Signal
1	
2	+5V
3	+5V
4	+3V3
5	+3V3
6	Vbatt_div_10D
7	SDA
8	SCL
9	
10	MBotPWM_A
11	MBotPWM_B
12	MBotPWM_C
13	
14	MBot_En
15	MBot_nFault
16	MBot_nRST
17	
18	MMidPWM_A
19	MMidPWM_B
20	MMidPWM_C
21	
22	MMid_En
23	MMid_nFault
24	MMid_nRST
25	
26	MTopPWM_A
27	MTopPWM_B
28	MTopPWM_C
29	
30	MTop_En
31	MTop_nFault
32	MTop_nRST
33	
34	MTopCurrent_B
35	MTopCurrent_A
36	MMidCurrent_B
37	MMidCurrent_A
38	MBotCurrent_B
39	MBotCurrent_A
40	

{I2C}
{MBotPWM}
{MBotCtrl}
{MMidPWM}
{MMidCtrl}
{MTopPWM}
{MTopCtrl}
{MTopCurrent}
{MMidCurrent}
{MBotCurrent}

MP

Motor Top

U10 DRV8313

Nota :
– Only 2 current measurements are required
– Motor cabling (Maxon ECX TORQUE 22 M 24V):
  – phases in AWG18 (MicroFit AWG20–24)
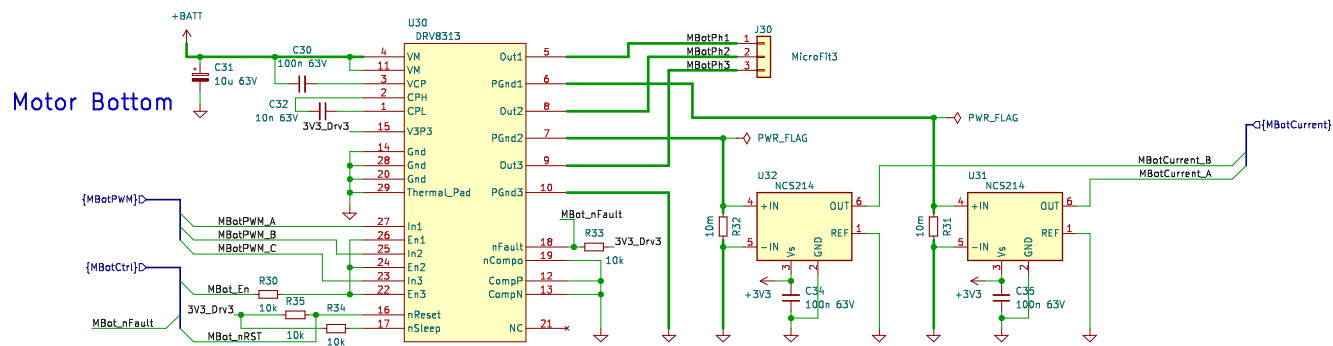 – encoders in AWG26 (PicoBlade AWG28–32).
  so more or less OK...
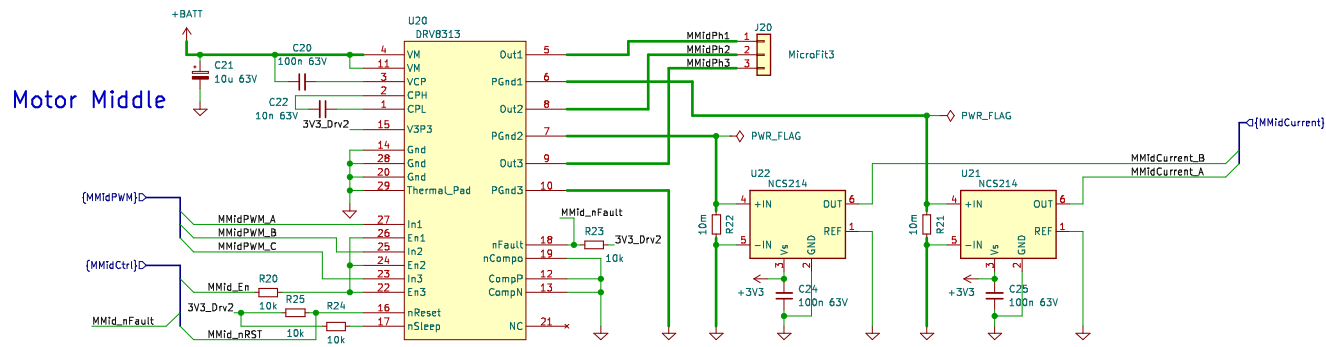
Low–side phase currentSense requires sync
between ADC and PWM (but cheap amplifiers).

https://docs.simplefoc.com/current_sense
(In–line Current Sense requires filtered
bi–dir amplifiers that are not easy to
source.)

Low–side Current Sense
– Vref 3,3V, gain 100V/V, R 10 mOhm
  –> 3,3 A max / 0,2 W –> [1206]
– Amplifier, gain 100V/V, package SC70–6 :
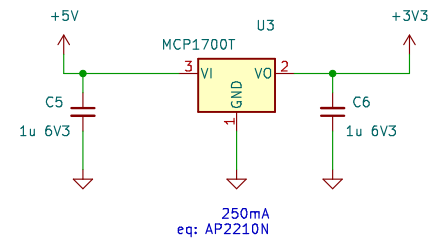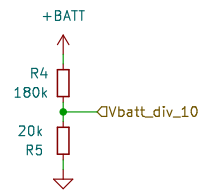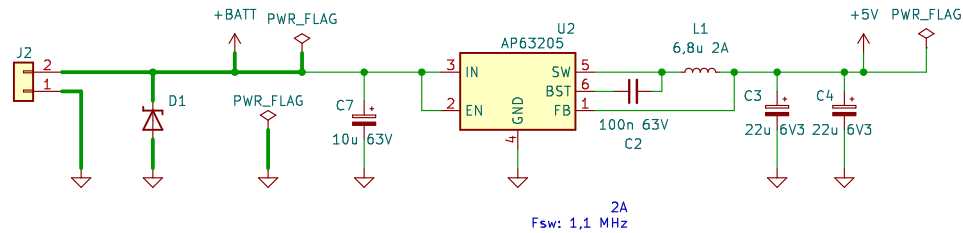 – TSC214IYCT (STMicro)
  – NCS214RSQT2G (On Semi)

Motor Middle

U20 DRV8313

Motor Bottom

U30 DRV8313

12V or 24V in regards to TVS diode D1.
(/!\ Fan voltage)

+BATT PWR_FLAG

J2

PWR_FLAG

D1

PWR_FLAG

C7
10u 63V

U2
AP63205

IN   SW
EN   BST
GND   FB

100n 63V
C2

L1
6,8u 2A

+5V PWR_FLAG

C3
22u 6V3

C4
22u 6V3

2A
Fsw: 1,1 MHz

+BATT

R4
180k

Vbatt_div_10

20k
R5

+5V

C5
1u 6V3

U3
MCP1700T

VI   VO
GND

+3V3

C6
1u 6V3

250mA
eq: AP2210N

Fan is 12V 1,2 W
(RS Pro 668-8808)

U70
MAX31730

+BATT

J73
Pico3

+3V3

+3V3

R71
100k

R70
100k

Q70B

Q70A

C70
100p

C71
100p

C72
100p

J70
Pico2

J71

J72

{I2C}

SDA

SCL

VDD 1
THERM 7
ADD 8
SDA 9
SCL 10
DXP1 2
DXP2 4
DXP3 5
DXN 3
GND 6