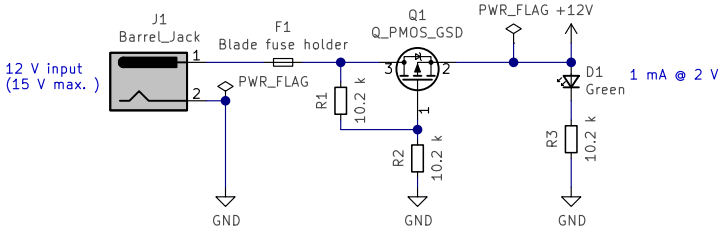
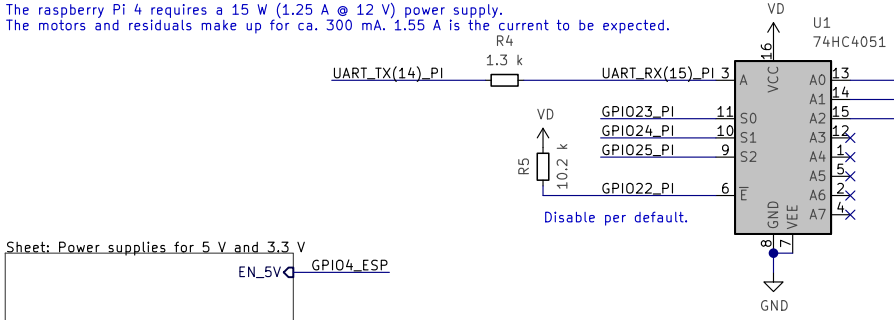
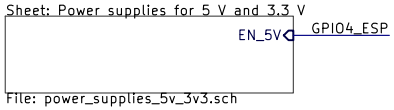
Pd = 129.735 mW @ 1.55 A being equal to approx. 0.7 % of the total power consumption.

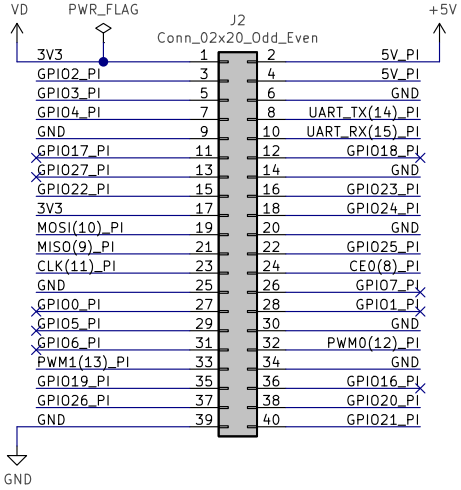
Conceptualized for the 28BYJ-48 stepper motor (12 V).

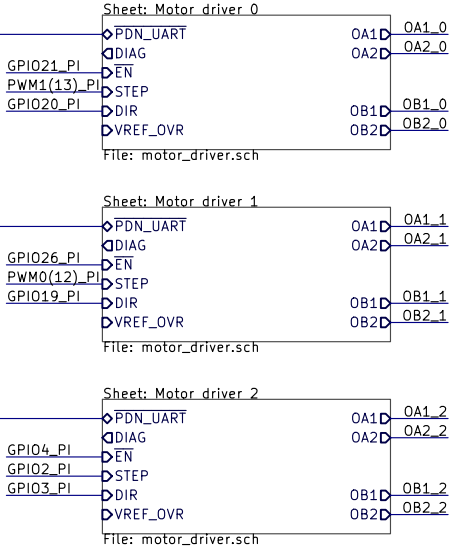


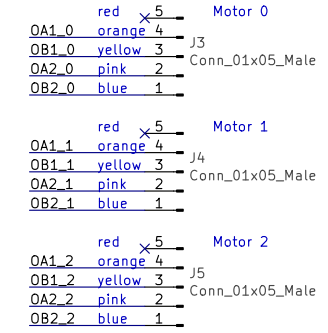
The raspberry Pi 4 requires a 15 W (1.25 A @ 12 V) power supply.
The motors and residuals make up for ca. 300 mA. 1.55 A is the current to be expected.

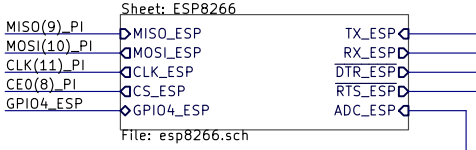


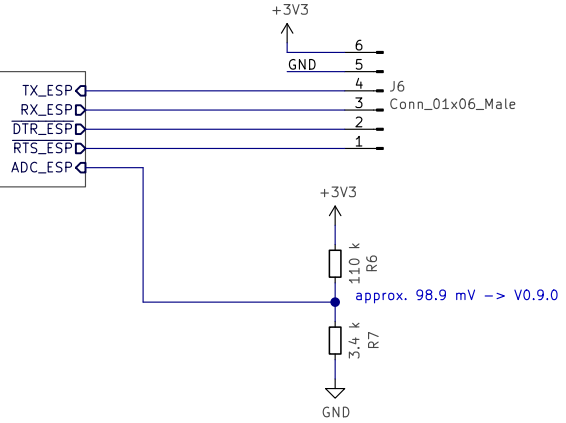


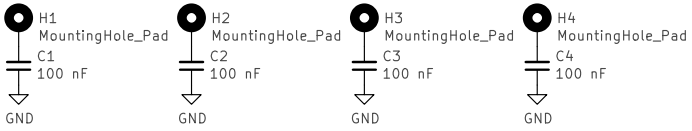












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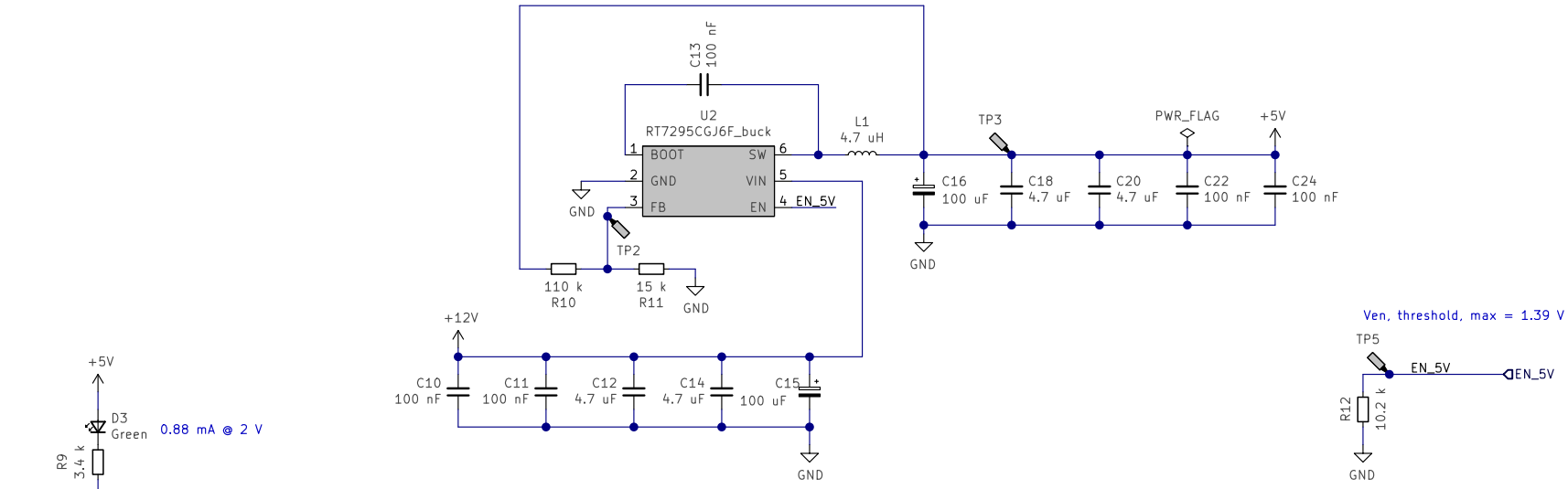
Sheet: /
File: SaMcam_shield.sch

Title: Main

Size: A4	Date: 2022-01-17	**Rev: V0.9.0**
KiCad E.D.A.	kicad 5.1.12-84ad8e8a8692ubuntu20.04.1	Id: 1/6



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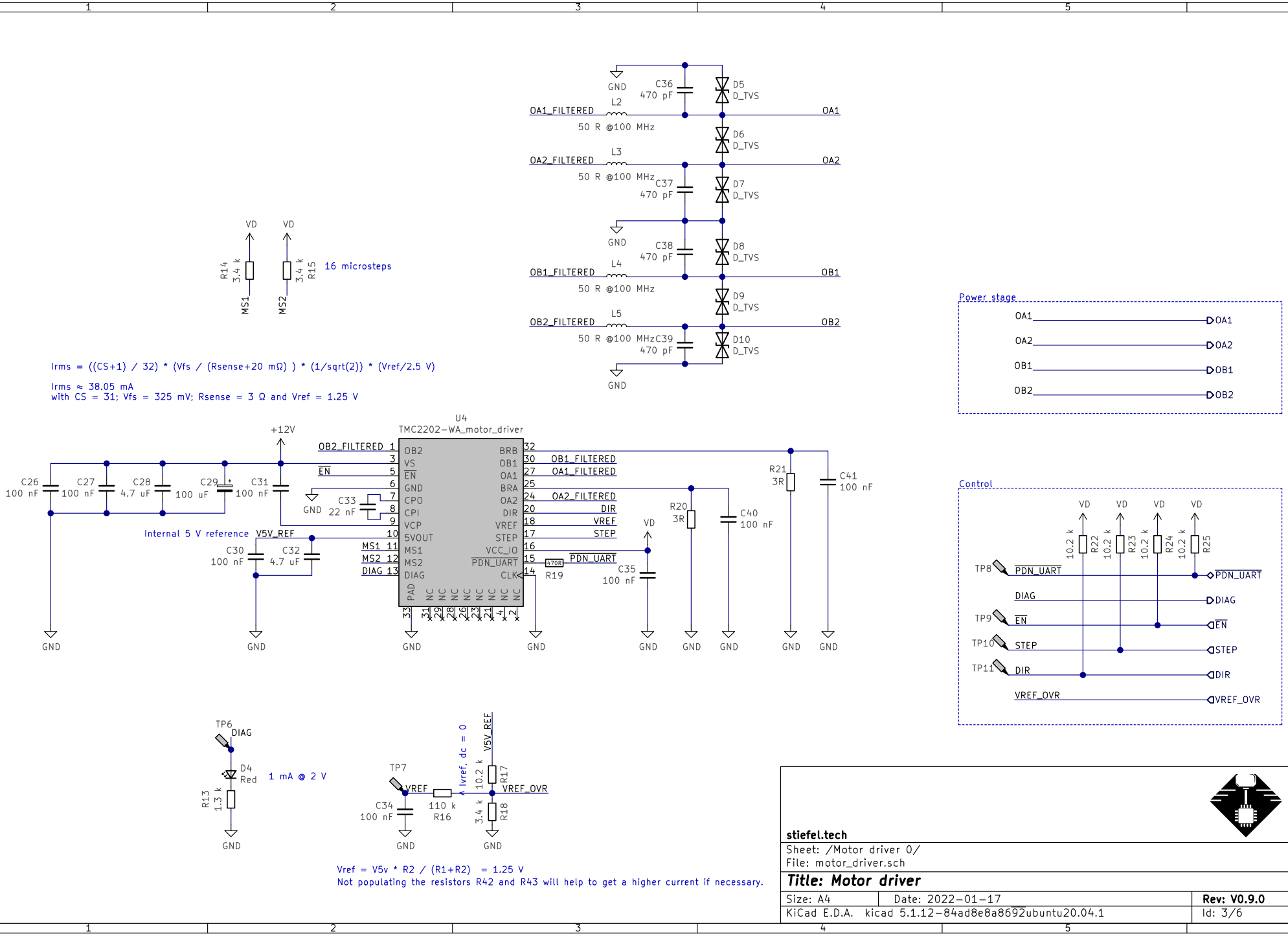
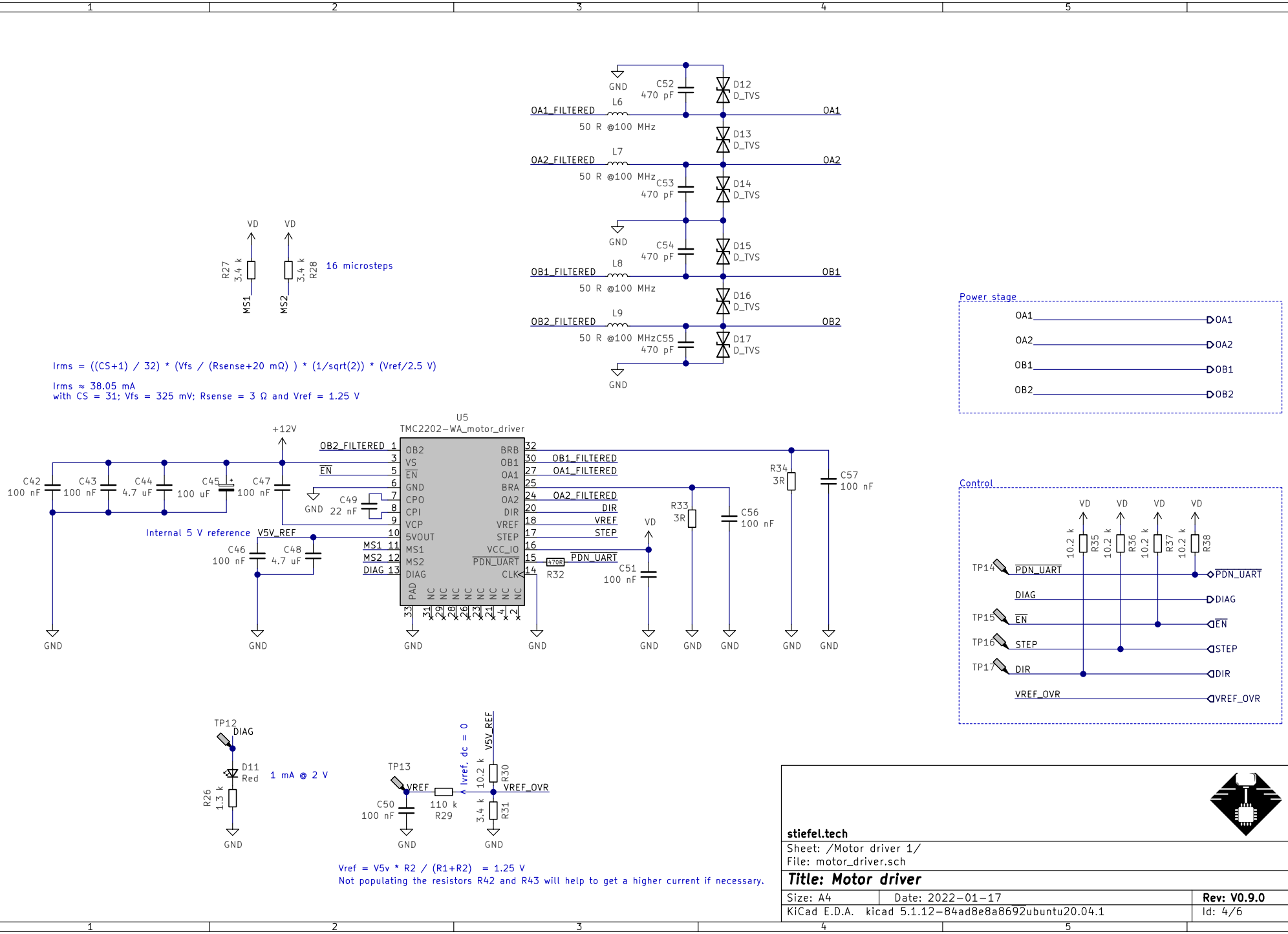
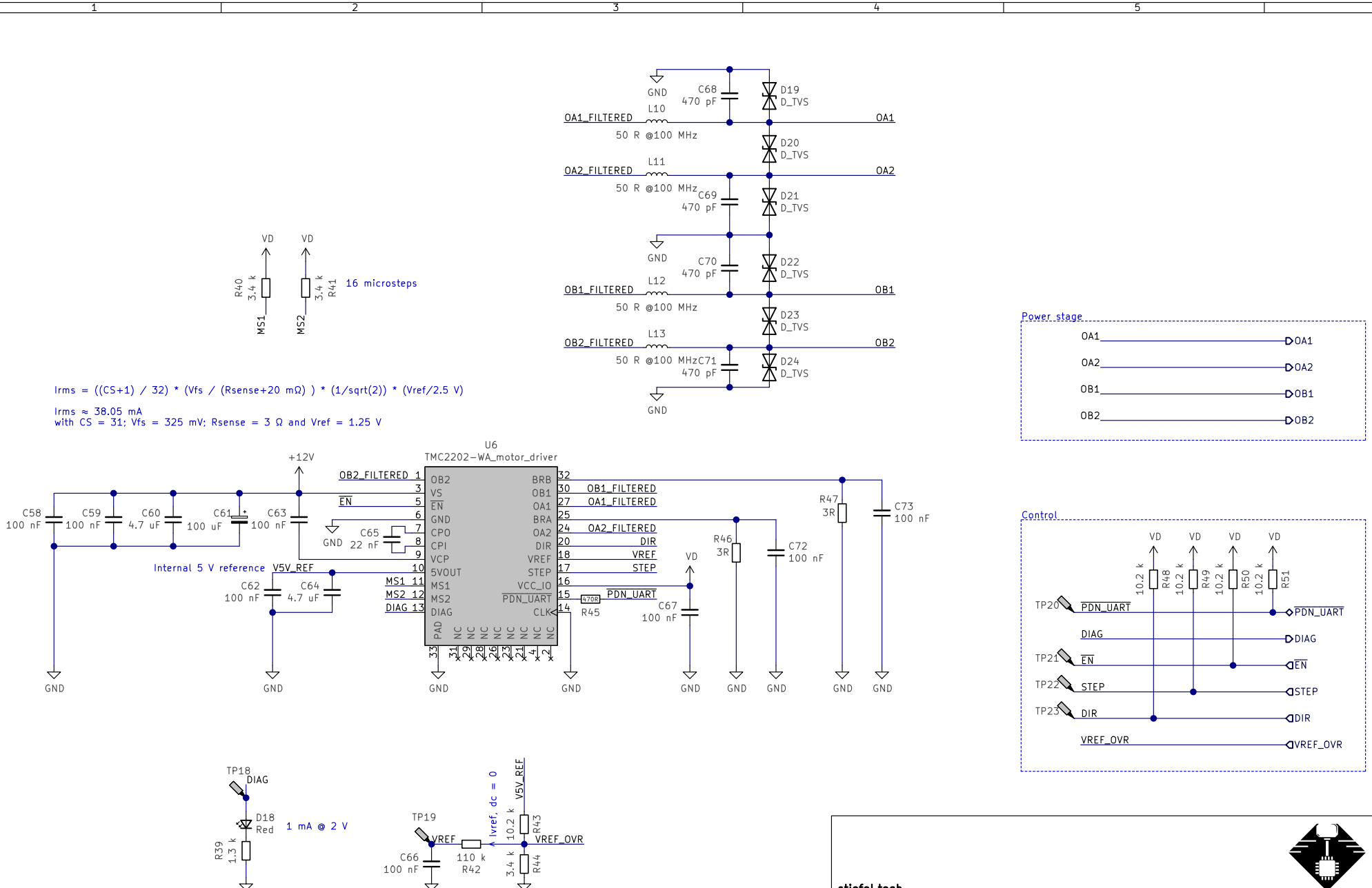
Sheet: /Power supplies for 5 V and 3.3 V/
File: power_supplies_5v_3v3.sch

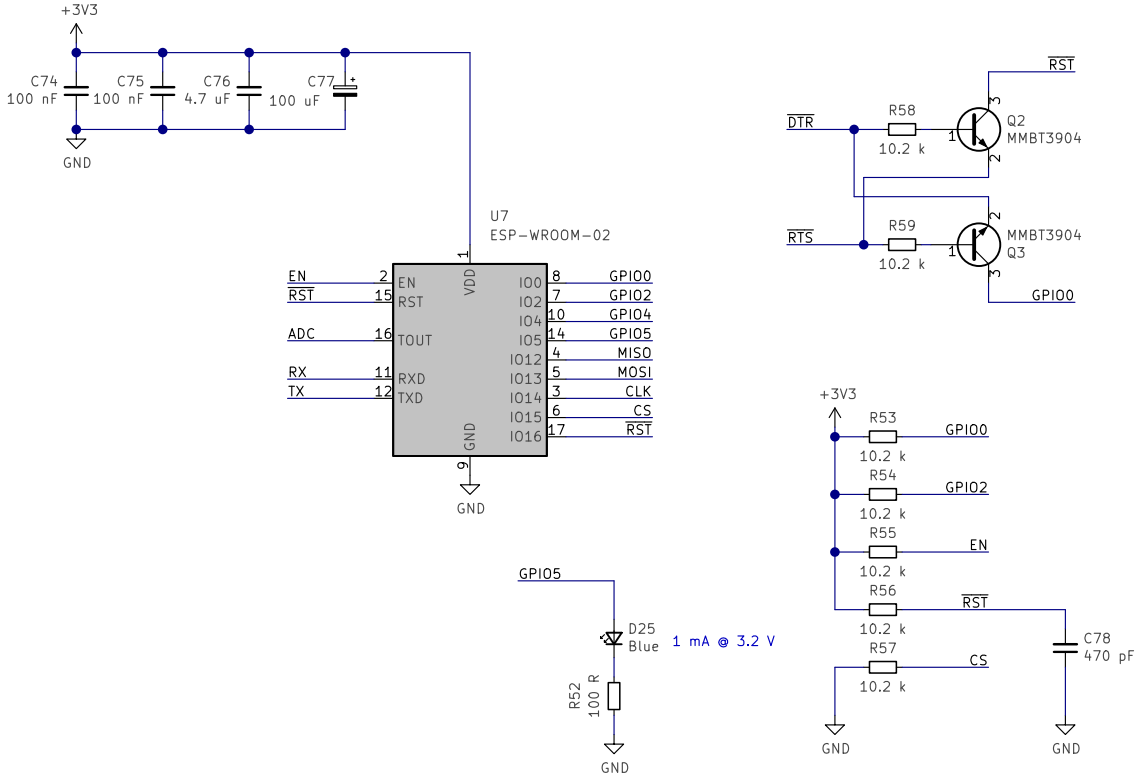
Title:

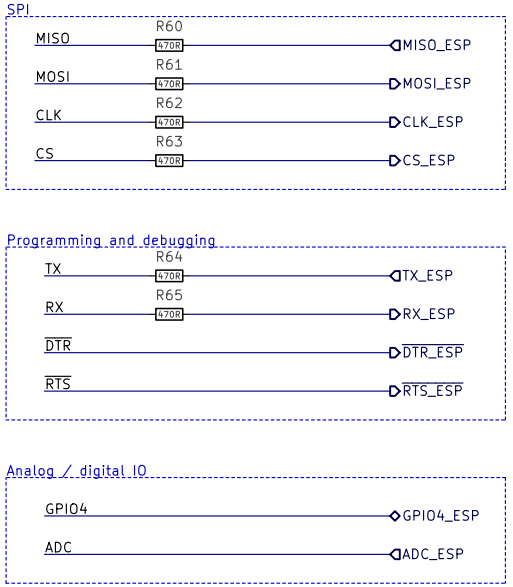
Size: A4	Date: 2022-01-17	**Rev: V0.9.0**
KiCad E.D.A. kicad 5.1.12-84ad8e8a8692ubuntu20.04.1		Id: 2/6


VD
R14
3.4 k
MS1
VD
3.4 k
R15
MS2
16 microsteps
GND
C36
470 pF
D5
D_TVS
OA1_FILTERED
L2
50 R @100 MHz
OA1
D6
D_TVS
OA2_FILTERED
L3
50 R @100 MHz
OA2
C37
470 pF
D7
D_TVS
GND
C38
470 pF
D8
D_TVS
OB1_FILTERED
L4
50 R @100 MHz
OB1
D9
D_TVS
OB2_FILTERED
L5
50 R @100 MHz
OB2
C39
470 pF
D10
D_TVS
GND
Power stage
OA1
OA2
OB1
OB2
Irms = ((CS+1) / 32) * (Vfs / (Rsense+20 mΩ)) * (1/sqrt(2)) * (Vref/2.5 V)
Irms ≈ 38.05 mA
with CS = 31; Vfs = 325 mV; Rsense = 3 Ω and Vref = 1.25 V
U4
TMC2202-WA_motor_driver
+12V
OB2_FILTERED
EN
C26
100 nF
C27
100 nF
C28
4.7 uF
C29
100 uF
C31
100 nF
C33
22 nF
Internal 5 V reference
V5V_REF
C30
100 nF
C32
4.7 uF
MS1
MS2
DIAG
OB2
VS
EN
GND
CPO
CPI
VCP
5VOUT
MS1
MS2
DIAG
PAD
BRB
OB1
OA1
BRA
OA2
DIR
VREF
STEP
VCC_IO
PDN_UART
CLK
NC
OB1_FILTERED
OA1_FILTERED
OA2_FILTERED
DIR
VREF
STEP
PDN_UART
R19
470R
C35
100 nF
R20
3R
C40
100 nF
R21
3R
C41
100 nF
Control
TP8
TP9
TP10
TP11
PDN_UART
DIAG
EN
STEP
DIR
VREF_OVR
R22
R23
R24
R25
10.2 k
TP6
DIAG
D4
Red
1 mA @ 2 V
R13
1.3 k
TP7
VREF
C34
100 nF
110 k
R16
Ivref, dc = 0
V5V_REF
10.2 k
R17
VREF_OVR
3.4 k
R18
Vref = V5v * R2 / (R1+R2) = 1.25 V
Not populating the resistors R42 and R43 will help to get a higher current if necessary.
stiefel.tech
Sheet: /Motor driver 0/
File: motor_driver.sch
Title: Motor driver
Size: A4
Date: 2022-01-17
Rev: V0.9.0
KiCad E.D.A. kicad 5.1.12-84ad8e8a8692ubuntu20.04.1
Id: 3/6


VD
R27
3.4 k
MS1
VD
R28
3.4 k
MS2
16 microsteps
GND
C52
470 pF
D12
D_TVS
OA1_FILTERED
L6
50 R @100 MHz
OA1
D13
D_TVS
OA2_FILTERED
L7
50 R @100 MHz
OA2
C53
470 pF
D14
D_TVS
GND
C54
470 pF
D15
D_TVS
OB1_FILTERED
L8
50 R @100 MHz
OB1
D16
D_TVS
OB2_FILTERED
L9
50 R @100 MHz
C55
470 pF
OB2
D17
D_TVS
GND
Power stage
OA1
OA2
OB1
OB2
OA1
OA2
OB1
OB2
Irms = ((CS+1) / 32) * (Vfs / (Rsense+20 mΩ)) * (1/sqrt(2)) * (Vref/2.5 V)
Irms ≈ 38.05 mA
with CS = 31; Vfs = 325 mV; Rsense = 3 Ω and Vref = 1.25 V
U5
TMC2202-WA_motor_driver
+12V
OB2_FILTERED
EN
C42
100 nF
C43
100 nF
C44
4.7 uF
C45
100 uF
C47
100 nF
C49
22 nF
Internal 5 V reference
V5V_REF
C46
100 nF
C48
4.7 uF
MS1
MS2
DIAG
OB2
VS
EN
GND
CPO
CPI
VCP
5VOUT
MS1
MS2
DIAG
PAD
BRB
OB1
OA1
BRA
OA2
DIR
VREF
STEP
VCC_IO
PDN_UART
CLK
NC
OB1_FILTERED
OA1_FILTERED
OA2_FILTERED
DIR
VREF
STEP
PDN_UART
470R
R32
C51
100 nF
VD
R33
3R
C56
100 nF
R34
3R
C57
100 nF
GND
Control
VD
10.2 k
R35
R36
R37
R38
TP14
PDN_UART
DIAG
TP15
EN
TP16
STEP
TP17
DIR
VREF_OVR
PDN_UART
DIAG
EN
STEP
DIR
VREF_OVR
TP12
DIAG
D11
Red
1 mA @ 2 V
R26
1.3 k
TP13
VREF
Ivref, dc = 0
V5V_REF
10.2 k
R30
VREF_OVR
C50
100 nF
110 k
R29
3.4 k
R31
Vref = V5v * R2 / (R1+R2) = 1.25 V
Not populating the resistors R42 and R43 will help to get a higher current if necessary.
stiefel.tech
Sheet: /Motor driver 1/
File: motor_driver.sch
Title: Motor driver
Size: A4
Date: 2022-01-17
Rev: V0.9.0
KiCad E.D.A. kicad 5.1.12-84ad8e8a8692ubuntu20.04.1
Id: 4/6


GND
C68
470 pF
D19
D_TVS
L10
OA1_FILTERED
OA1
50 R @100 MHz
D20
D_TVS
L11
OA2_FILTERED
OA2
50 R @100 MHz
C69
470 pF
D21
D_TVS
GND
C70
470 pF
D22
D_TVS
L12
OB1_FILTERED
OB1
50 R @100 MHz
D23
D_TVS
L13
OB2_FILTERED
OB2
50 R @100 MHz
C71
470 pF
D24
D_TVS
GND
VD
VD
R40
3.4 k
R41
3.4 k
MS1
MS2
16 microsteps
Irms = ((CS+1) / 32) * (Vfs / (Rsense+20 mΩ)) * (1/sqrt(2)) * (Vref/2.5 V)
Irms ≈ 38.05 mA
with CS = 31; Vfs = 325 mV; Rsense = 3 Ω and Vref = 1.25 V
U6
TMC2202-WA_motor_driver
+12V
OB2
VS
EN
GND
CPO
CPI
VCP
5VOUT
MS1
MS2
DIAG
PAD
BRB
OB1
OA1
BRA
OA2
DIR
VREF
STEP
VCC_IO
PDN_UART
CLK
NC
OB2_FILTERED
OB1_FILTERED
OA1_FILTERED
OA2_FILTERED
DIR
VREF
STEP
PDN_UART
MS1
MS2
DIAG
C58
100 nF
C59
100 nF
C60
4.7 uF
C61
100 uF
C63
100 nF
C65
22 nF
Internal 5 V reference
V5V_REF
C62
100 nF
C64
4.7 uF
R45
470R
C67
100 nF
R46
3R
C72
100 nF
R47
3R
C73
100 nF
Power stage
OA1
OA2
OB1
OB2
Control
VD
10.2 k
R48
R49
R50
R51
TP20
TP21
TP22
TP23
PDN_UART
DIAG
EN
STEP
DIR
VREF_OVR
TP18
DIAG
D18
Red
1 mA @ 2 V
R39
1.3 k
TP19
VREF
Ivref, dc = 0
V5V_REF
10.2 k
R43
VREF_OVR
C66
100 nF
110 k
R42
3.4 k
R44
Vref = V5v * R2 / (R1+R2) = 1.25 V
Not populating the resistors R42 and R43 will help to get a higher current if necessary.
stiefel.tech
Sheet: /Motor driver 2/
File: motor_driver.sch
Title: Motor driver
Size: A4
Date: 2022-01-17
Rev: V0.9.0
KiCad E.D.A. kicad 5.1.12-84ad8e8a8692ubuntu20.04.1
Id: 5/6





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Sheet: /ESP8266/
File: esp8266.sch

Title: ESP8266

Size: A4	Date: 2022-01-17	**Rev: V0.9.0**
KiCad E.D.A.	kicad 5.1.12-84ad8e8a8692ubuntu20.04.1	Id: 6/6