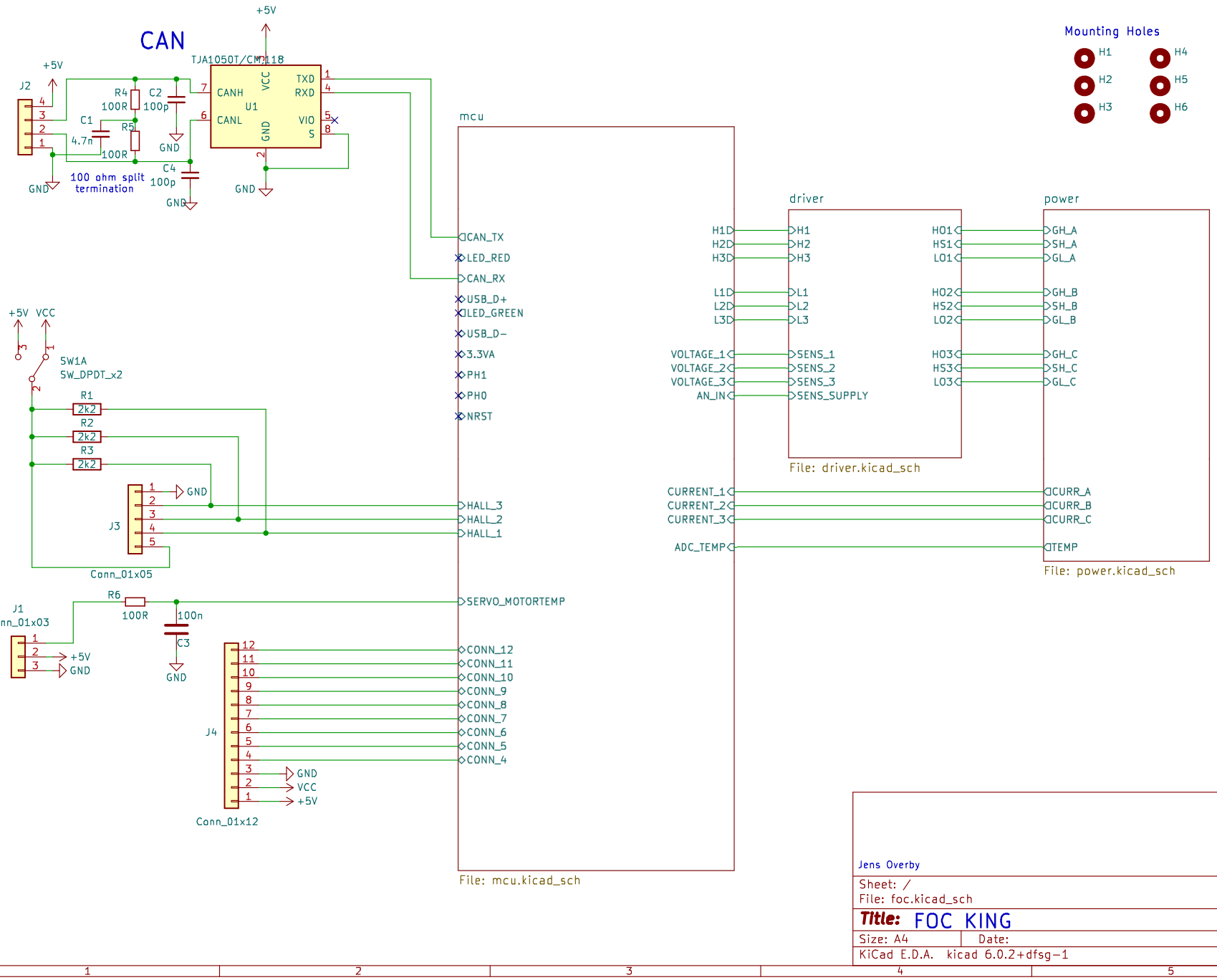
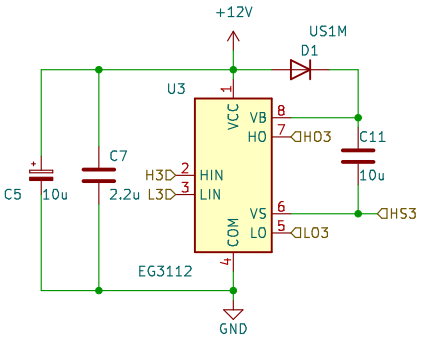
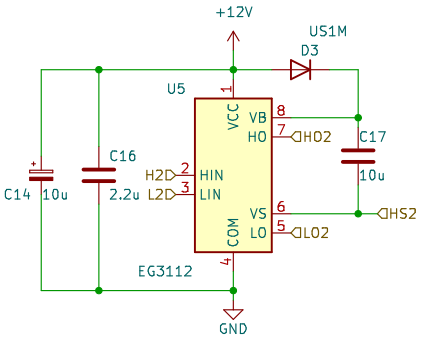
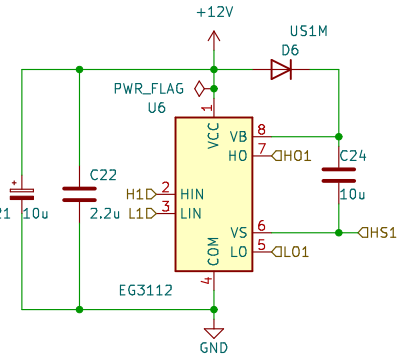
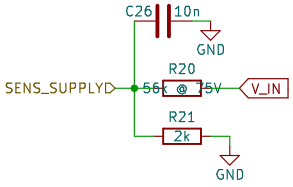
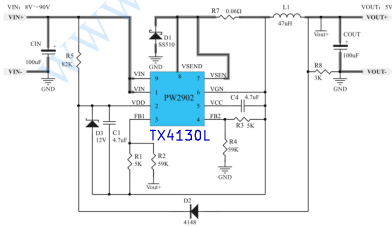

CAN
TJA1050T/CM7118
U1
CANH
CANL
VCC
GND
TXD
RXD
VIO
S
+5V
J2
R4
100R
C2
100p
C1
4.7n
R5
100R
C4
100p
100 ohm split termination
mcu
CAN_TX
LED_RED
CAN_RX
USB_D+
LED_GREEN
USB_D-
3.3VA
PH1
PH0
NRST
SW1A
SW_DPDT_x2
VCC
R1
2k2
R2
2k2
R3
2k2
J3
Conn_01x05
HALL_3
HALL_2
HALL_1
J1
Conn_01x03
R6
100R
100n
C3
SERVO_MOTORTEMP
J4
Conn_01x12
CONN_12
CONN_11
CONN_10
CONN_9
CONN_8
CONN_7
CONN_6
CONN_5
CONN_4
File: mcu.kicad_sch
driver
H1
H2
H3
L1
L2
L3
VOLTAGE_1
VOLTAGE_2
VOLTAGE_3
AN_IN
SENS_1
SENS_2
SENS_3
SENS_SUPPLY
HO1
HS1
LO1
HO2
HS2
LO2
HO3
HS3
LO3
File: driver.kicad_sch
power
GH_A
SH_A
GL_A
GH_B
SH_B
GL_B
GH_C
SH_C
GL_C
CURRENT_1
CURRENT_2
CURRENT_3
ADC_TEMP
CURR_A
CURR_B
CURR_C
TEMP
File: power.kicad_sch
Mounting Holes
H1
H2
H3
H4
H5
H6
Jens Overby
Sheet: /
File: foc.kicad_sch
Title: FOC KING
Size: A4
Date:
Rev:
KiCad E.D.A. kicad 6.0.2+dfsg-1
Id: 1/4







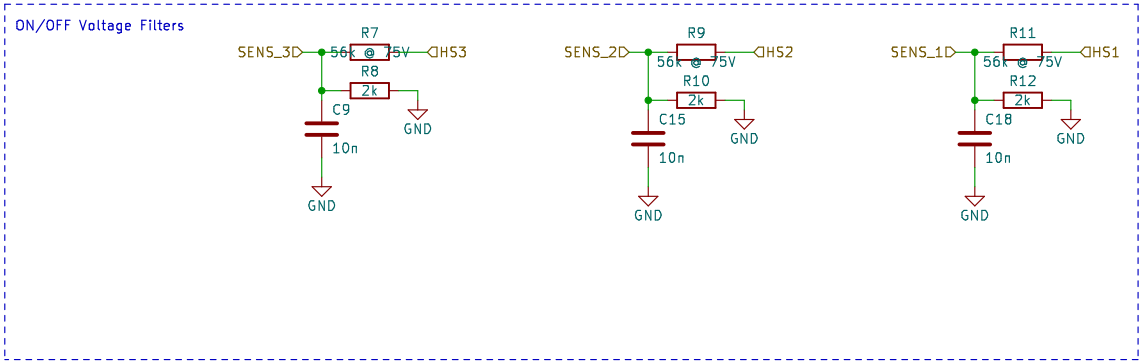


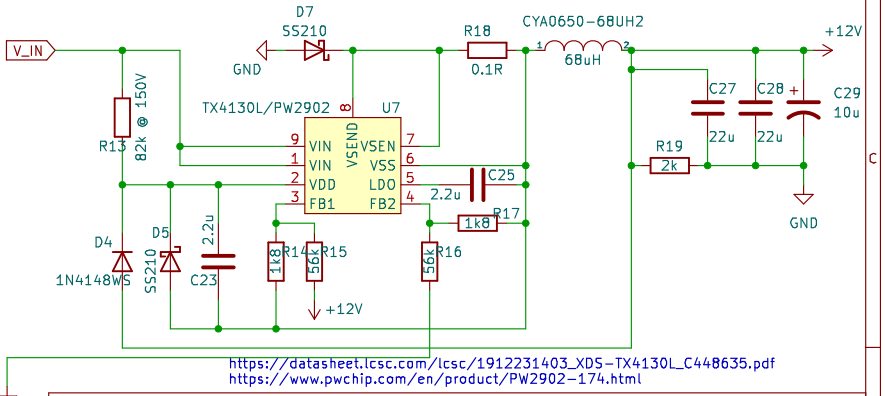


典型应用电路图：Vout: 5V/2A

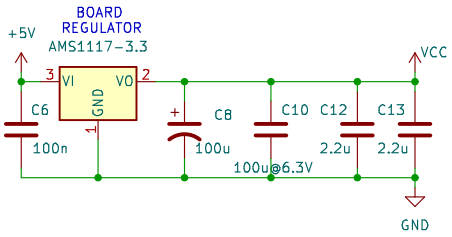
TX4130L:
VFB: min=369 typ=380 max=391 mV
VCS: min=145 typ=150 max=155 mV

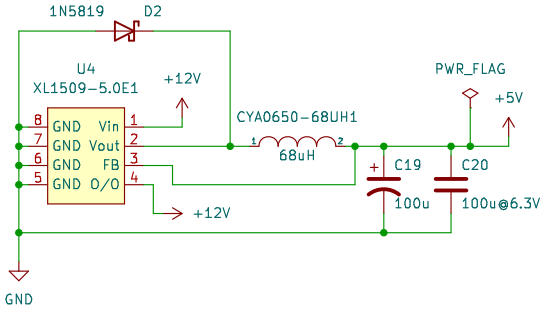
R1 = R3
R2 = R4
Vout= VFB * (R2+R1)/R1
Iout=VCS/R7 (R7=0.06R -> Io=2.6A)
Frequency: Fixed 140kHz
Inductance: 33uH-100uH





https://datasheet.lcsc.com/lcsc/1912231403_XDS-TX4130L_C448635.pdf
https://www.pwchip.com/en/product/PW2902-174.html





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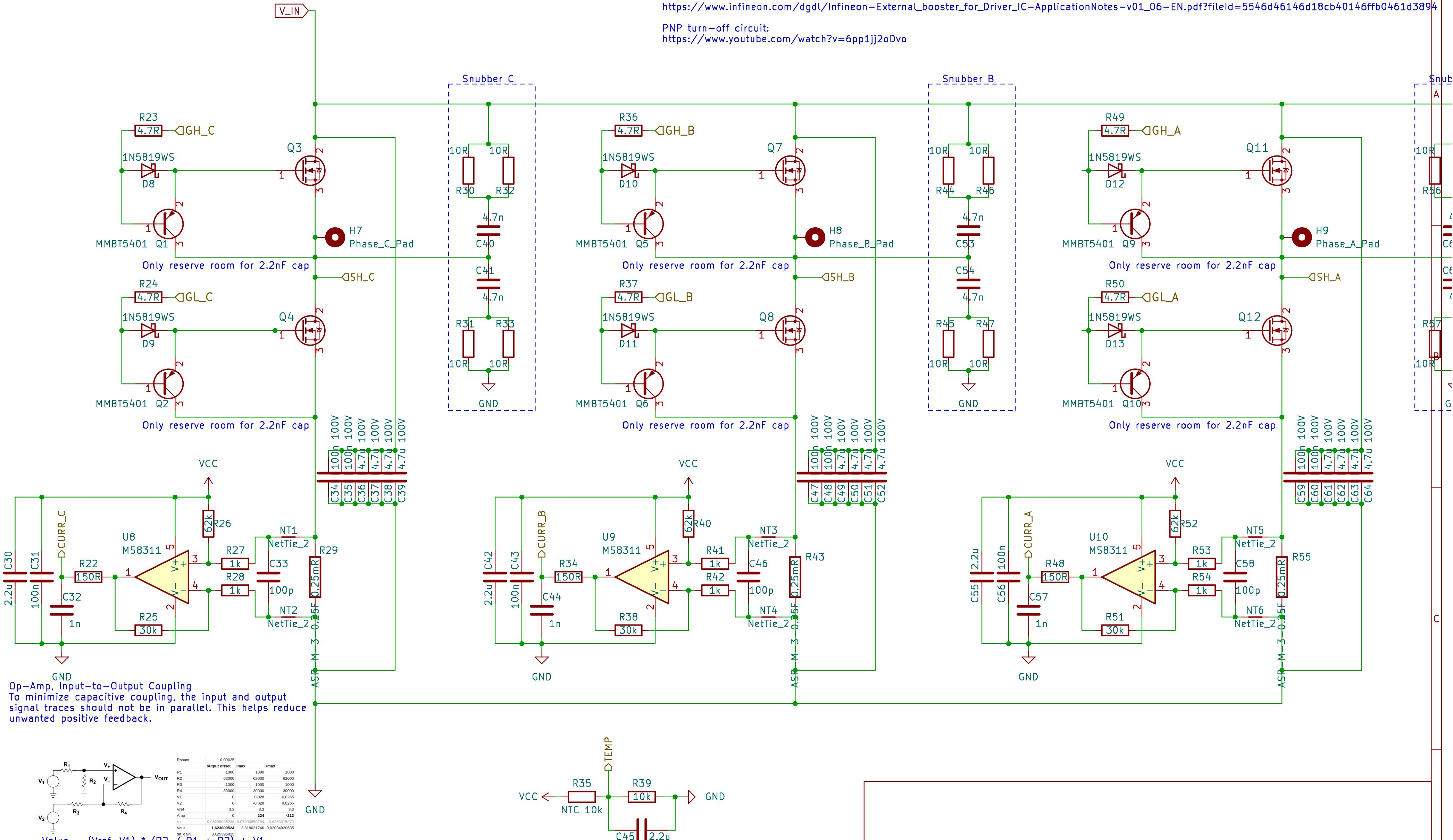
Sheet: /driver/
File: driver.kicad_sch

Title: FOC KING

Size: A4	Date:	**Rev:**
KiCad E.D.A. kicad 6.0.2+dfsg-1		Id: 6/4

External booster drive:
https://www.infineon.com/dgdl/Infineon-External_booster_for_Driver_IC-ApplicationNotes-v01_06-EN.pdf?fileId=5546d46146d18cb40146ffb0461d3894

PNP turn-off circuit:
https://www.youtube.com/watch?v=6pp1jj2oDvo



Op-Amp, Input-to-Output Coupling
To minimize capacitive coupling, the input and output signal traces should not be in parallel. This helps reduce unwanted positive feedback.

Vplus = (Vref-V1) * (R2 / R1 + R2) + V1
Vout = Vplus*(1 + (R4 / R3)) - V2*(R4 / R3)

Calculate cut-off freq of low pass filter, pg 3:
https://www.st.com/resource/en/application_note/an4304-how-to-filter-the-input-of-a-highside-current-sensing-stmicroelectronics.pdf

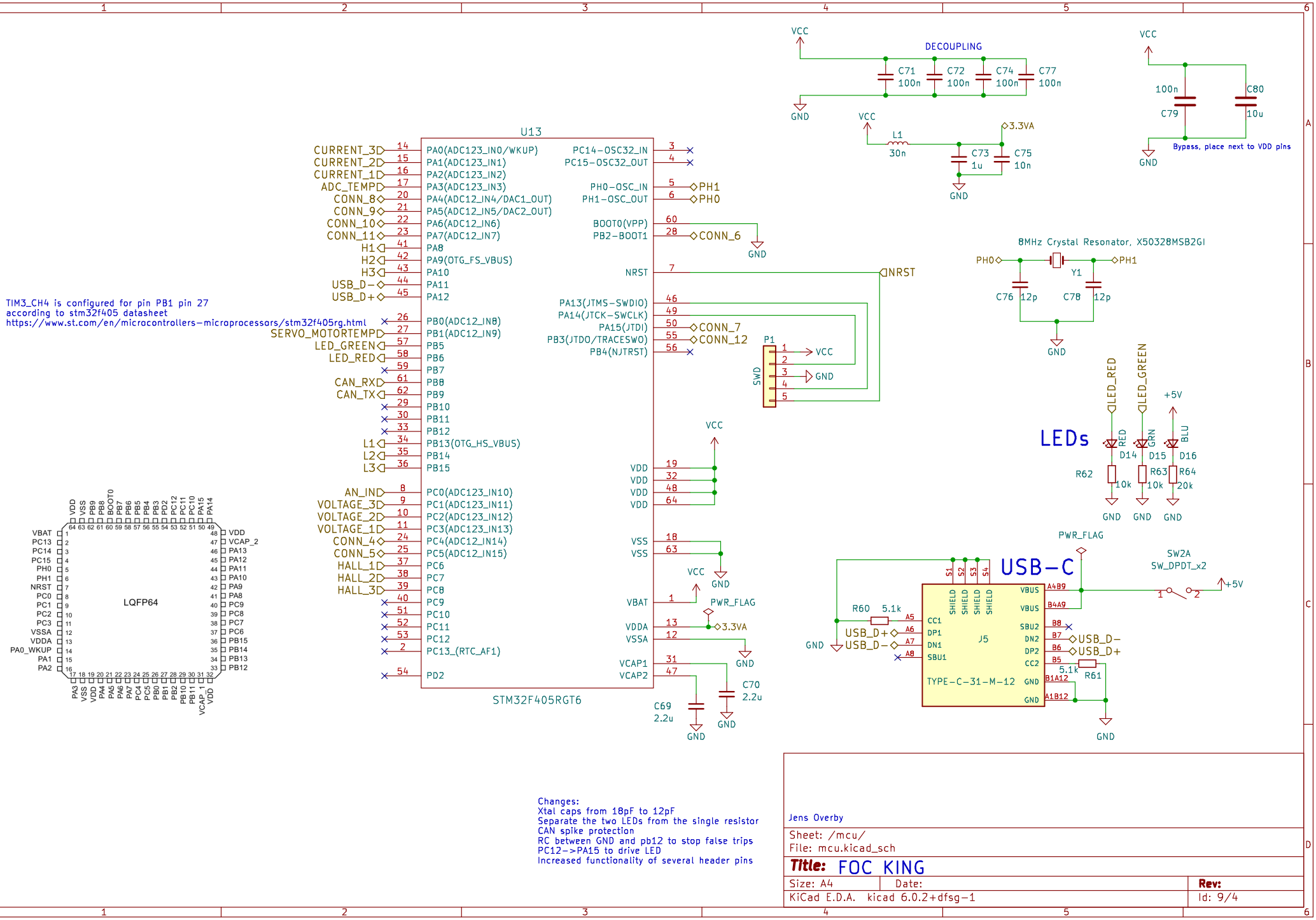
Current sensing:
https://www.ti.com/lit/eb/slyy154a/slyy154a.pdf?ts=1678787132262&ref_url=https%253A%252F%252Fwww.startpage.com%252F
pg 4, pg 15

Jens Overby

Sheet: /power/
File: power.kicad_sch

Title: FOC KING

Size: A4 Date: Rev:
KiCad E.D.A. kicad 6.0.2+dfsg-1 Id: 7/4


U13
STM32F405RGT6
PA0(ADC123_IN0/WKUP)
PA1(ADC123_IN1)
PA2(ADC123_IN2)
PA3(ADC123_IN3)
PA4(ADC12_IN4/DAC1_OUT)
PA5(ADC12_IN5/DAC2_OUT)
PA6(ADC12_IN6)
PA7(ADC12_IN7)
PA8
PA9(OTG_FS_VBUS)
PA10
PA11
PA12
PB0(ADC12_IN8)
PB1(ADC12_IN9)
PB5
PB6
PB7
PB8
PB9
PB10
PB11
PB12
PB13(OTG_HS_VBUS)
PB14
PB15
PC0(ADC123_IN10)
PC1(ADC123_IN11)
PC2(ADC123_IN12)
PC3(ADC123_IN13)
PC4(ADC12_IN14)
PC5(ADC12_IN15)
PC6
PC7
PC8
PC9
PC10
PC11
PC12
PC13_(RTC_AF1)
PD2
PC14-OSC32_IN
PC15-OSC32_OUT
PH0-OSC_IN
PH1-OSC_OUT
BOOT0(VPP)
PB2-BOOT1
NRST
PA13(JTMS-SWDIO)
PA14(JTCK-SWCLK)
PA15(JTDI)
PB3(JTDO/TRACESWO)
PB4(NJTRST)
VDD
VSS
VBAT
VDDA
VSSA
VCAP1
VCAP2
CURRENT_3
CURRENT_2
CURRENT_1
ADC_TEMP
CONN_8
CONN_9
CONN_10
CONN_11
H1
H2
H3
USB_D-
USB_D+
SERVO_MOTORTEMP
LED_GREEN
LED_RED
CAN_RX
CAN_TX
L1
L2
L3
AN_IN
VOLTAGE_3
VOLTAGE_2
VOLTAGE_1
CONN_4
CONN_5
HALL_1
HALL_2
HALL_3
PH1
PH0
CONN_6
CONN_7
CONN_12
NRST
PWR_FLAG
3.3VA
GND
VCC
TIM3_CH4 is configured for pin PB1 pin 27
according to stm32f405 datasheet
https://www.st.com/en/microcontrollers-microprocessors/stm32f405rg.html
LQFP64
DECOUPLING
C71 100n
C72 100n
C74 100n
C77 100n
L1 30n
C73 1u
C75 10n
100n C79
C80 10u
Bypass, place next to VDD pins
8MHz Crystal Resonator, X50328MSB2GI
Y1
C76 12p
C78 12p
P1
SWD
LEDs
LED_RED
LED_GREEN
+5V
D14 RED
D15 GRN
D16 BLU
R62 10k
R63 10k
R64 20k
USB-C
J5
TYPE-C-31-M-12
R60 5.1k
R61 5.1k
USB_D+
USB_D-
SW2A
SW_DPDT_x2
C69 2.2u
C70 2.2u
Changes:
Xtal caps from 18pF to 12pF
Separate the two LEDs from the single resistor
CAN spike protection
RC between GND and pb12 to stop false trips
PC12->PA15 to drive LED
Increased functionality of several header pins
Jens Overby
Sheet: /mcu/
File: mcu.kicad_sch
Title: FOC KING
Size: A4
Date:
Rev:
KiCad E.D.A. kicad 6.0.2+dfsg-1
Id: 9/4