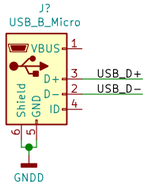


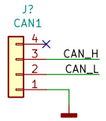


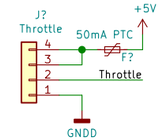


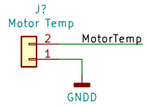


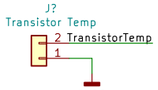


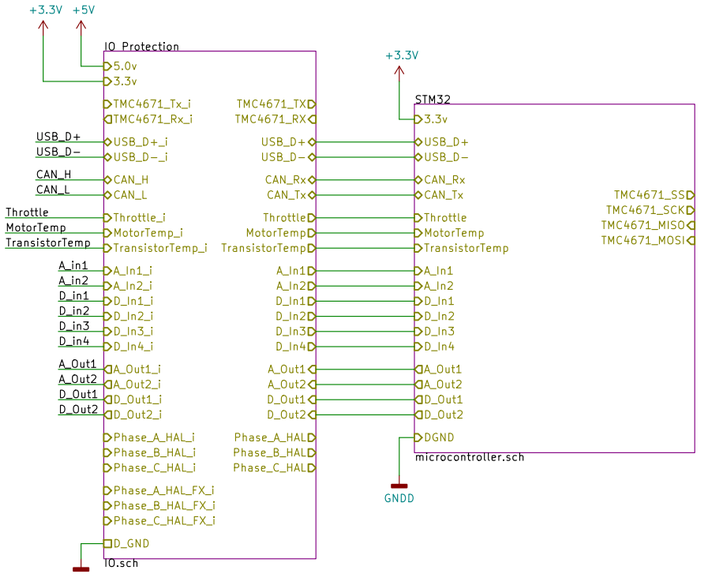


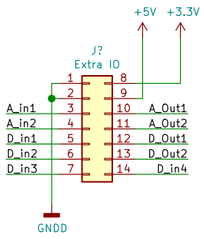


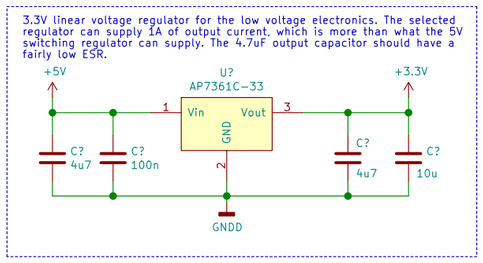


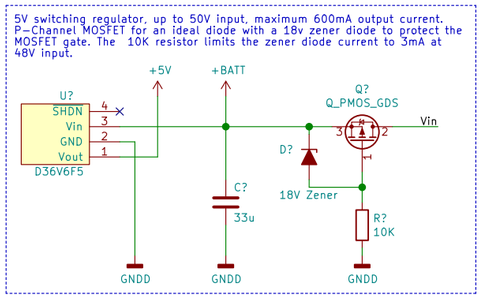


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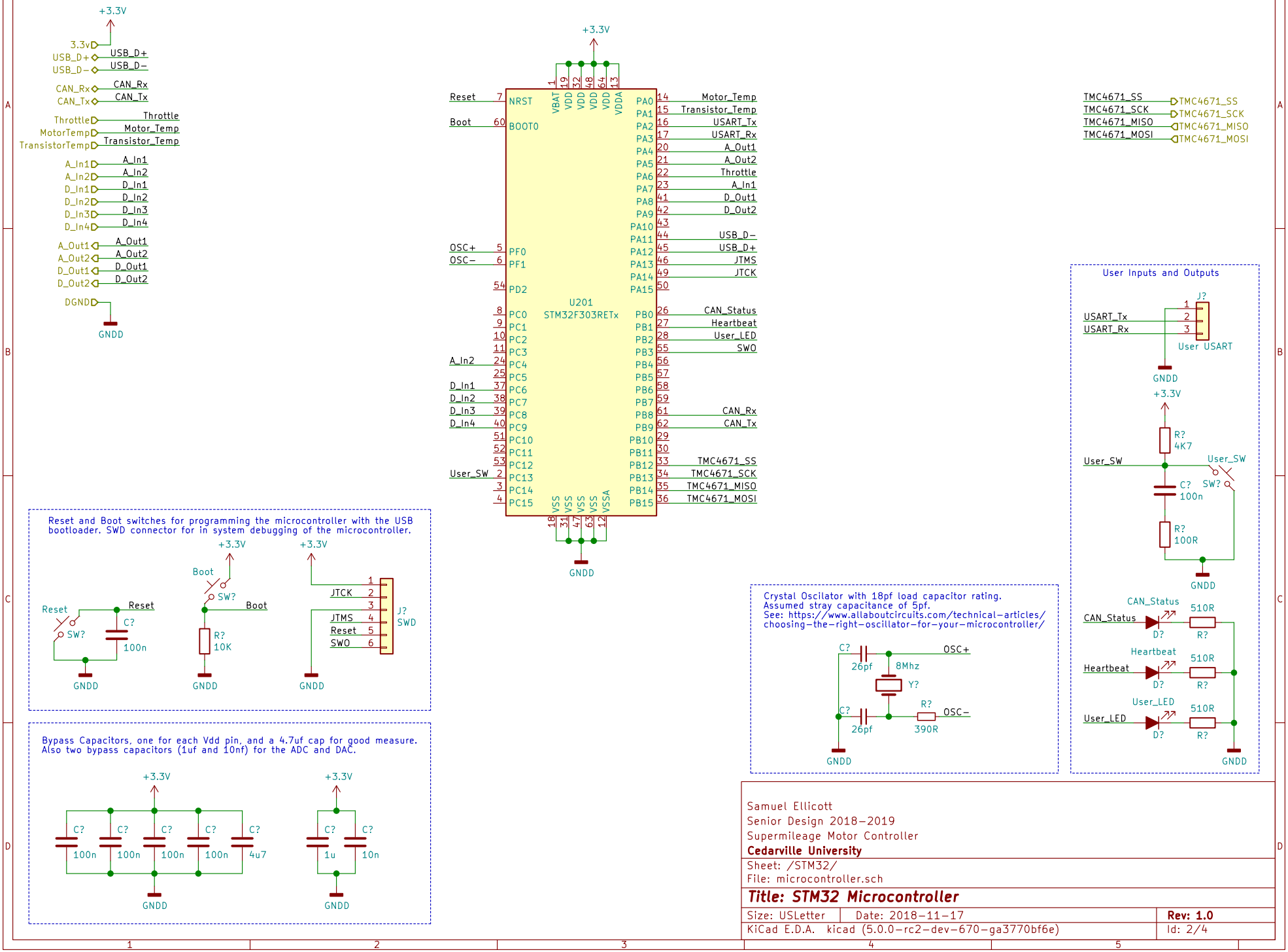
Sheet: /
File: motor-controller-hw.sch

***Title: Motor Controller Control Board***

| Size: USLedger | Date: 2018-11-17 | **Rev: 1.0** |
|---|---|---|
| KiCad E.D.A. kicad (5.0.0-rc2-dev-670-ga3770bf6e) | | Id: 1/4 |


+3.3V
3.3v
USB_D+
USB_D−
CAN_Rx
CAN_Tx
Throttle
MotorTemp
TransistorTemp
A_In1
A_In2
D_In1
D_In2
D_In3
D_In4
A_Out1
A_Out2
D_Out1
D_Out2
DGND
GNDD
U201
STM32F303RETx
NRST
BOOT0
PF0
PF1
PD2
PC0
PC1
PC2
PC3
PC4
PC5
PC6
PC7
PC8
PC9
PC10
PC11
PC12
PC13
PC14
PC15
PA0
PA1
PA2
PA3
PA4
PA5
PA6
PA7
PA8
PA9
PA10
PA11
PA12
PA13
PA14
PA15
PB0
PB1
PB2
PB3
PB4
PB5
PB6
PB7
PB8
PB9
PB10
PB11
PB12
PB13
PB14
PB15
VBAT
VDD
VDDA
VSS
VSSA
Reset
Boot
OSC+
OSC−
Motor_Temp
Transistor_Temp
USART_Tx
USART_Rx
A_Out1
A_Out2
Throttle
A_In1
D_Out1
D_Out2
USB_D−
USB_D+
JTMS
JTCK
CAN_Status
Heartbeat
User_LED
SWO
CAN_Rx
CAN_Tx
TMC4671_SS
TMC4671_SCK
TMC4671_MISO
TMC4671_MOSI
User_SW
TMC4671_SS
TMC4671_SCK
TMC4671_MISO
TMC4671_MOSI
User Inputs and Outputs
J?
User USART
R?
4K7
C?
100n
SW?
R?
100R
510R
D?
Reset and Boot switches for programming the microcontroller with the USB bootloader. SWD connector for in system debugging of the microcontroller.
SW?
C?
100n
R?
10K
J?
SWD
Crystal Oscilator with 18pf load capacitor rating.
Assumed stray capacitance of 5pf.
See: https://www.allaboutcircuits.com/technical-articles/choosing-the-right-oscillator-for-your-microcontroller/
26pf
8Mhz
Y?
390R
Bypass Capacitors, one for each Vdd pin, and a 4.7uf cap for good measure.
Also two bypass capacitors (1uf and 10nf) for the ADC and DAC.
100n
4u7
1u
10n
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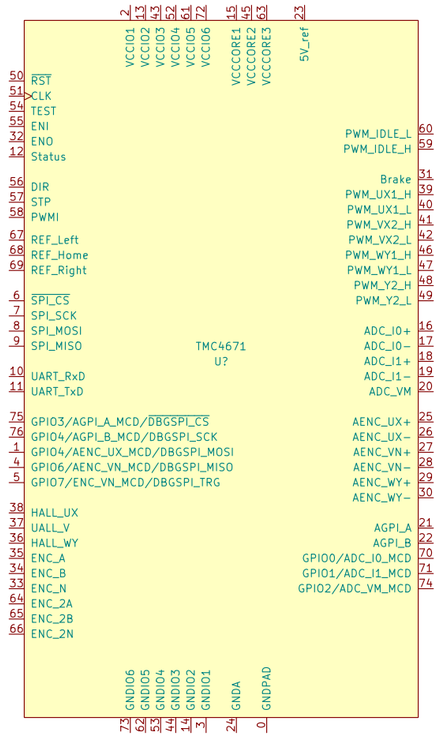
Sheet: /STM32/
File: microcontroller.sch
Title: STM32 Microcontroller
Size: USLetter
Date: 2018-11-17
Rev: 1.0
KiCad E.D.A. kicad (5.0.0-rc2-dev-670-ga3770bf6e)
Id: 2/4

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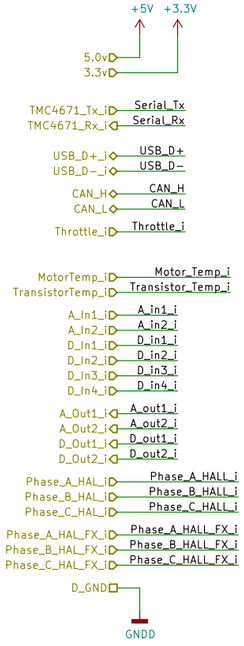
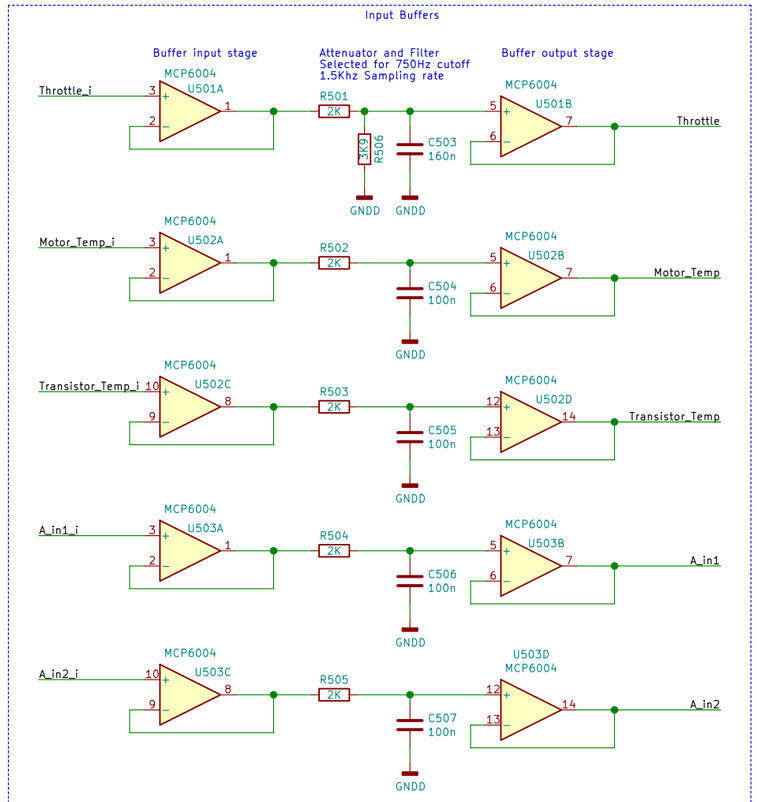
Sheet: /TMC4671/
File: TMC4671.sch

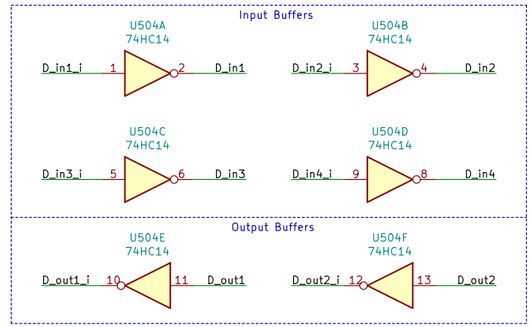
***Title: TMC4671***

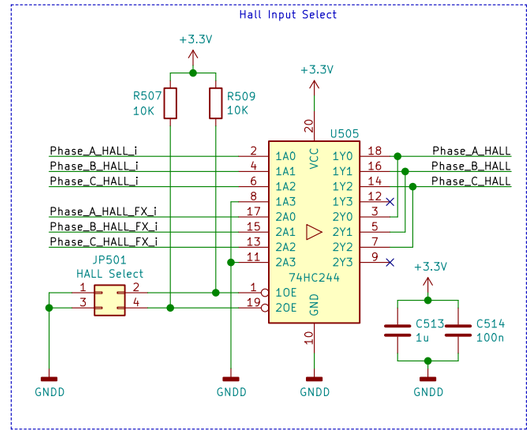
| Size: USLedger | Date: 2018–11–20 | **Rev: 1.0** |
|---|---|---|
| KiCad E.D.A. kicad (5.0.0–rc2–dev–670–ga3770bf6e) | | Id: 3/4 |

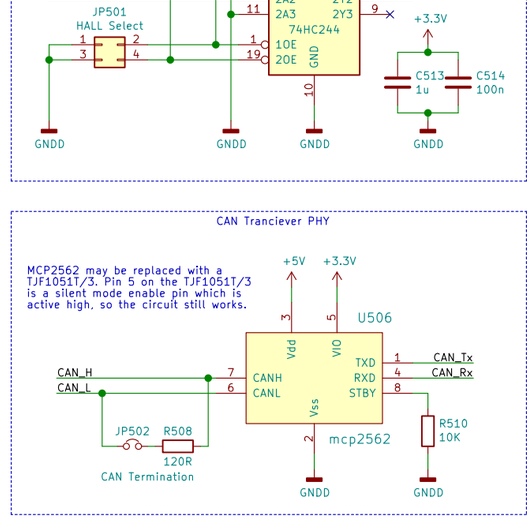
This sheet contains input/output proteciton and conditioning circuitry.
Note that the TMC4671 and stm32 USB lines pass through this sheet
without modification.

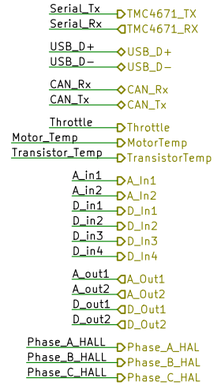




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Sheet: /IO Protection/
File: IO.sch

***Title: Input Protection and Filtering***

| Size: USLedger | Date: 2018-11-17 | **Rev: 1.0** |
|---|---|---|
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