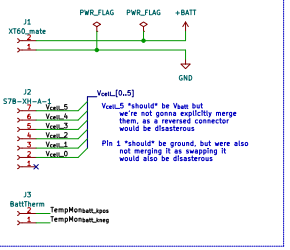
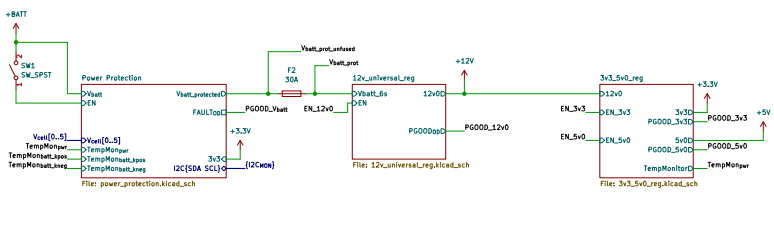
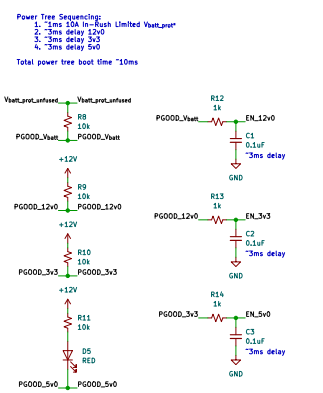
Battery Connection



Power Protection and Regulation



Power Tree Sequencing



Notes

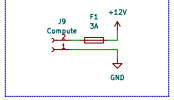
Any datasheet math is contained in the adjacent matlab script titled "motorboard_calcs.m". This will redefine most non-obvious values for things like regulators, resistor dividers, etc.

Unless otherwise notes capacitors are rated for 50V because ESR/package isn't critical.

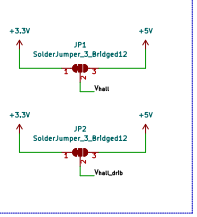
As a rule of thumb, we've put a voltage rating for any cap 47uF or greater, since this has a very large impact on package size and there aren't many of these parts.

Kicker Power Connector

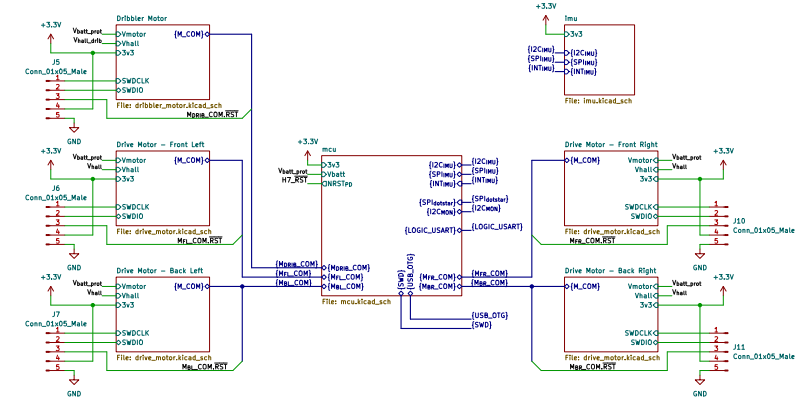
Compute Power Connector



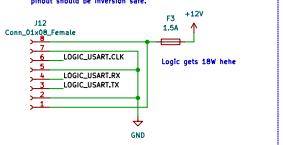
Hall Sensor Voltage Source Selection



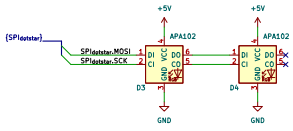
Primary System Block (MCU, Sensing, Motor Drivers)



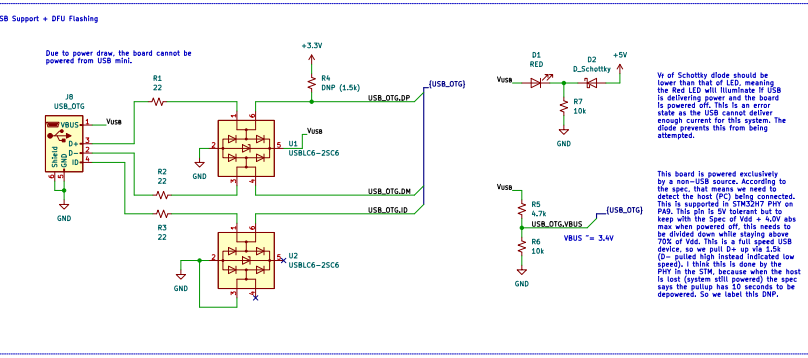
Logic Board Connector (Power + Coms)



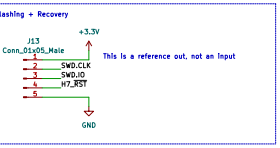
Debug LEDs



USB Support + DFU Flashing



SWD Flashing + Recovery



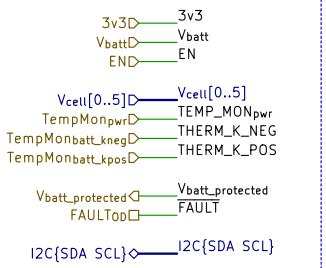
Reviewed By:
Designed By: W. Stuckey & R. Osawa
The A-Team (RC SSL)

Sheet: /
File: motorboard.kicad_sch

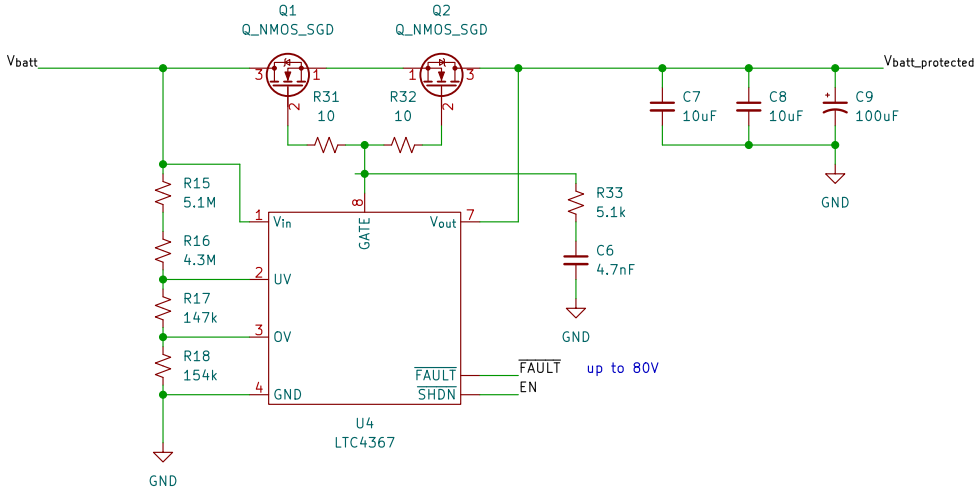
Title: Motorboard

Size: C	Date: 2021-11-14	Rev: 1.0.0
KiCad E.D.A. kicad (5.99.0-12108-ga1521d338e)		Id: 1/21

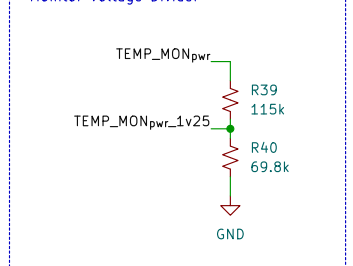
External Nets



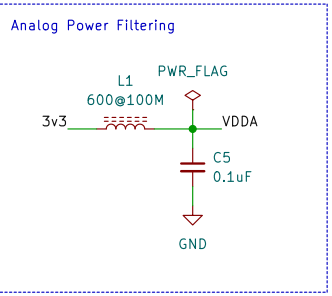
Voltage Lockout, Reverse Polarity Protection, & In-Rush Limiter



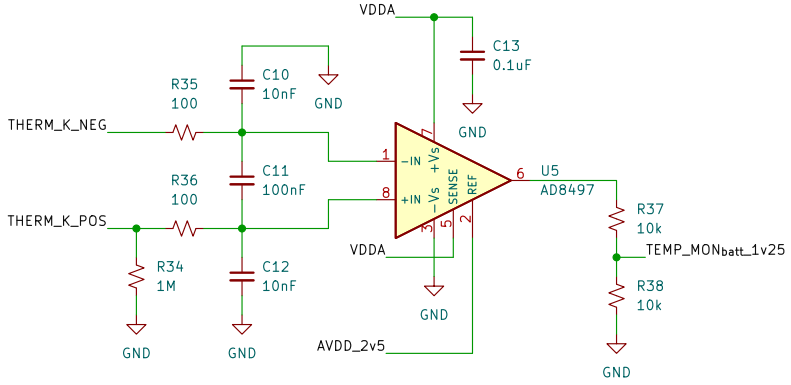
Power Regulator Temperature Monitor Voltage Divider



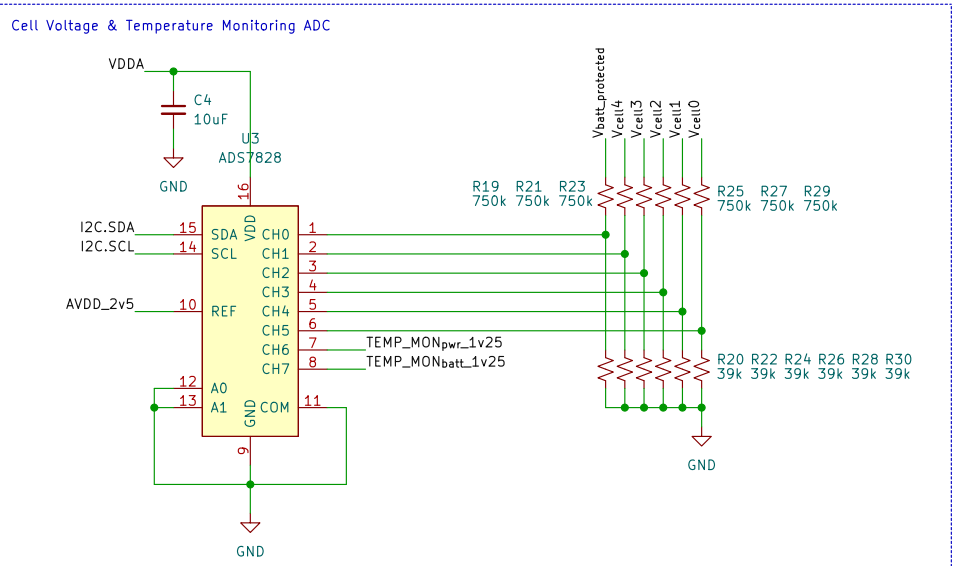
Analog Power Filtering



Thermocouple Sense Amplifier



Cell Voltage & Temperature Monitoring ADC



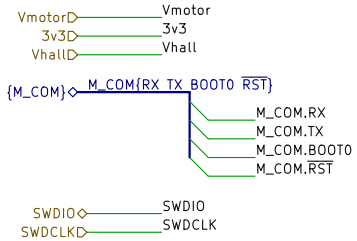
Reviewed By:
Designed By: W. Stuckey & R. Osawa
The A-Team (RC SSL)

Sheet: /Power Protection/
File: power_protection.kicad_sch

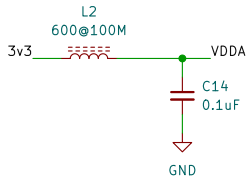
Title: Motorboard

Size: A4	Date: 2021-11-14	**Rev: 1.0.0**
KiCad E.D.A. kicad (5.99.0-12108-ga1521d338e)		Id: 2/21

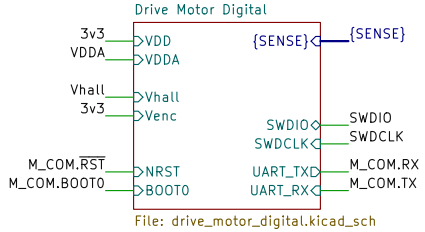
External Nets



VDDA Filtering (Sense Amp. and ADC)

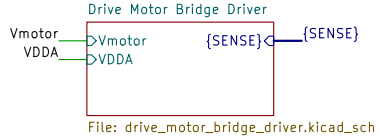


Digital Motor Controller



This is where the tx/rx swap occurs
(e.g. tx of one modules transmits into the rx of another)
(there's no hardware swapping here, so this is essential)

Bridge Driver



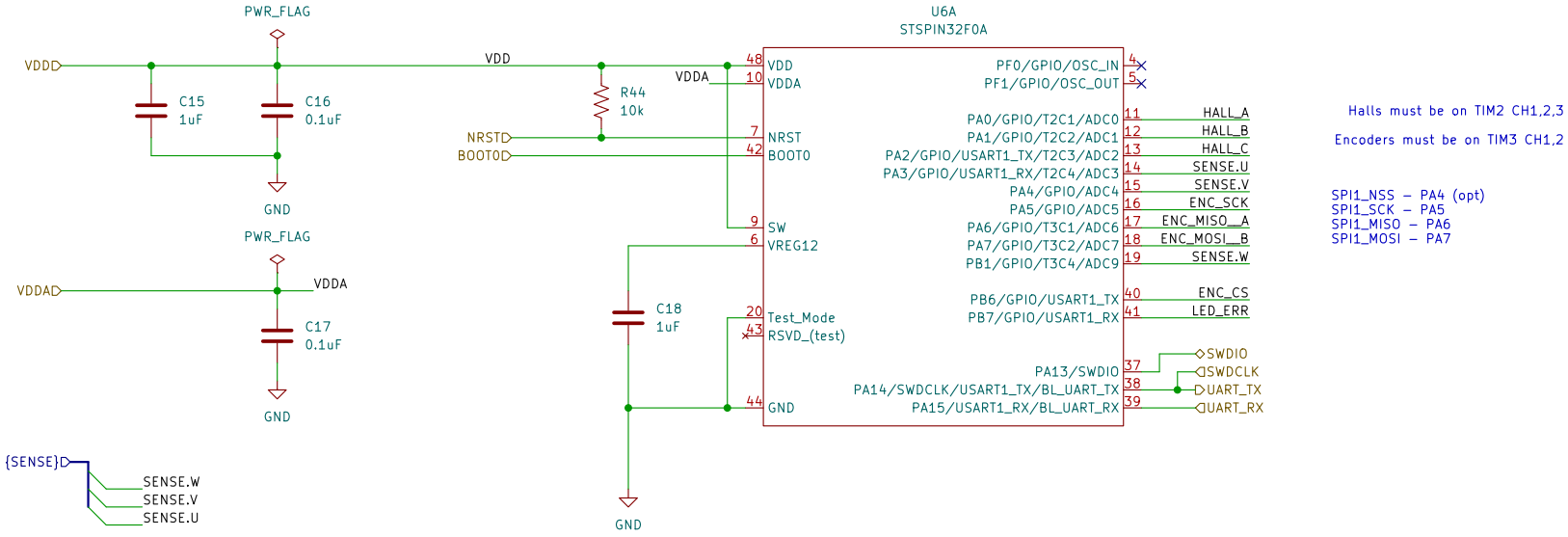
Reviewed By:
Designed By: W. Stuckey & R. Osawa
The A-Team (RC SSL)

Sheet: /Drive Motor - Front Left/
File: drive_motor.kicad_sch

Title: Motorboard

Size: A	Date: 2021-11-14	**Rev: 1.0.0**
KiCad E.D.A. kicad (5.99.0-12108-ga1521d338e)		Id: 4/21

MCU

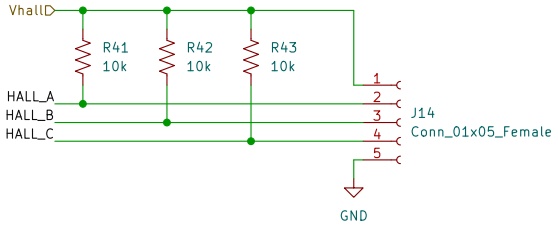


Halls must be on TIM2 CH1,2,3

Encoders must be on TIM3 CH1,2

SPI1_NSS – PA4 (opt)
SPI1_SCK – PA5
SPI1_MISO – PA6
SPI1_MOSI – PA7

Hall Connector



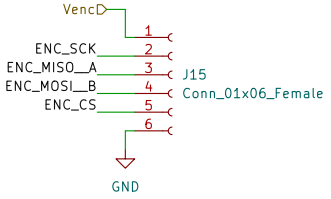
Pull-Ups most be omitted for analog hall sensors, and must be populated for digital hall sensors.

Analog mode prevents the use of the timer channel for phase commutation, but analog hall will give a much more accurate absolute position.

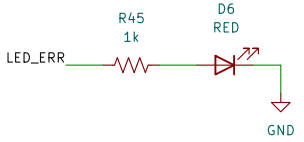
HALL_* nets are routed to pins that are availble on a hardware timer channel and on the ADC, permitting dual use.

Digital is the default mode as many motor manufacturers internall pullup hall sensor feedback, making the only viable mode diigital even if the sensors supported analog.

Encoder Connector



Debug LED

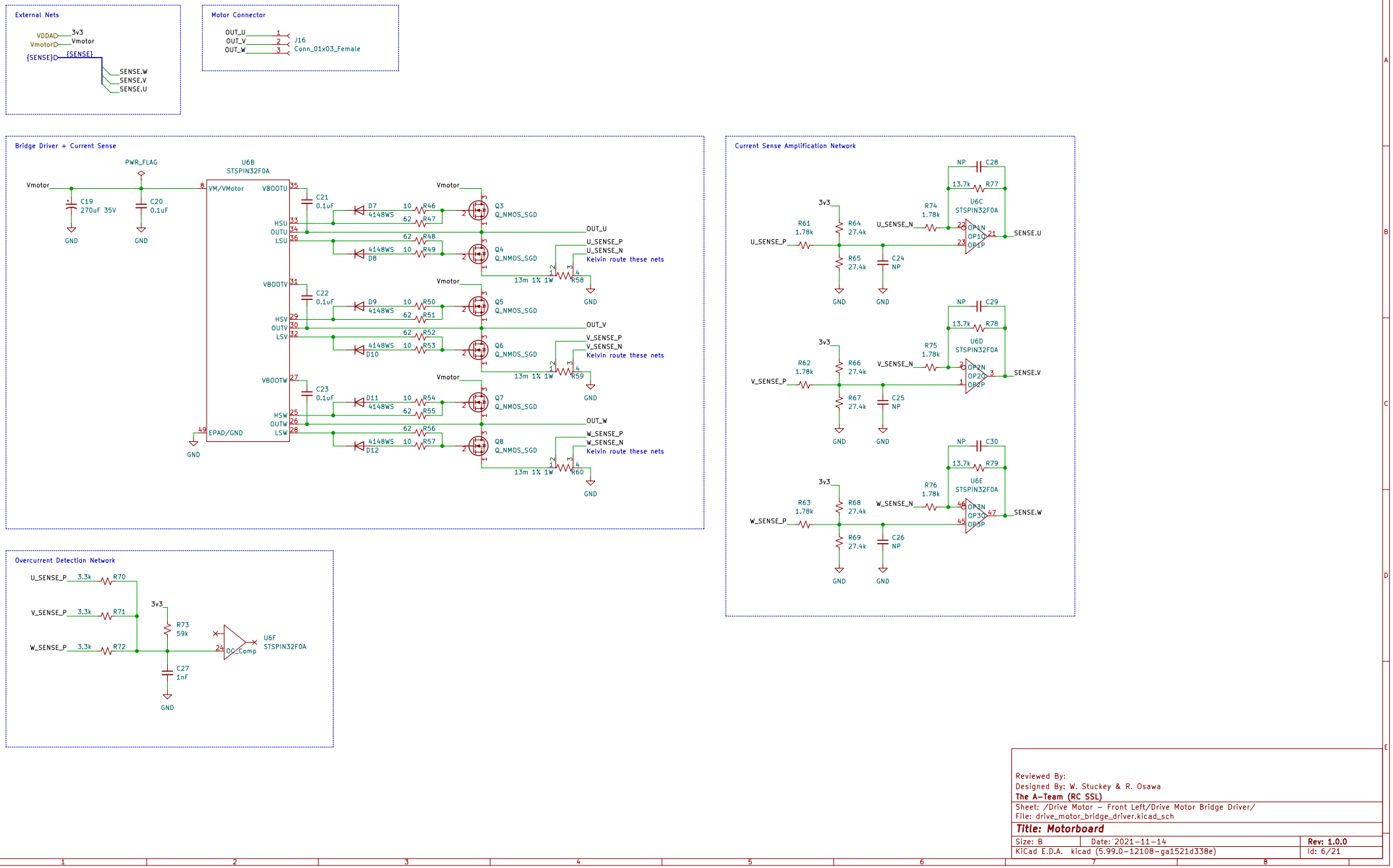


Reviewed By:
Designed By: W. Stuckey & R. Osawa
The A-Team (RC SSL)

Sheet: /Drive Motor – Front Left/Drive Motor Digital/
File: drive_motor_digital.kicad_sch

Title: Motorboard

Size: A	Date: 2021-11-14	**Rev: 1.0.0**
KiCad E.D.A. kicad (5.99.0-12108-ga1521d338e)		Id: 5/21



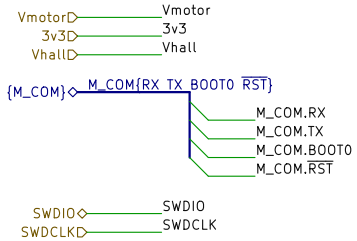
Reviewed By:
Designed By: W. Stuckey & R. Osawa
The A-Team (RC SSL)

Sheet: /Drive Motor - Front Left/Drive Motor Bridge Driver/
File: drive_motor_bridge_driver.kicad_sch

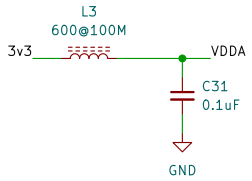
Title: Motorboard

Size: B	Date: 2021-11-14	**Rev: 1.0.0**
KiCad E.D.A. kicad (5.99.0-12108-ga1521d338e)		Id: 6/21

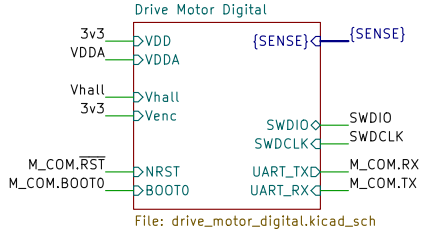
External Nets



VDDA Filtering (Sense Amp. and ADC)

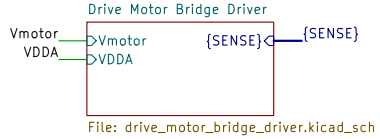


Digital Motor Controller



This is where the tx/rx swap occurs
(e.g. tx of one modules transmits into the rx of another)
(there's no hardware swapping here, so this is essential)

Bridge Driver

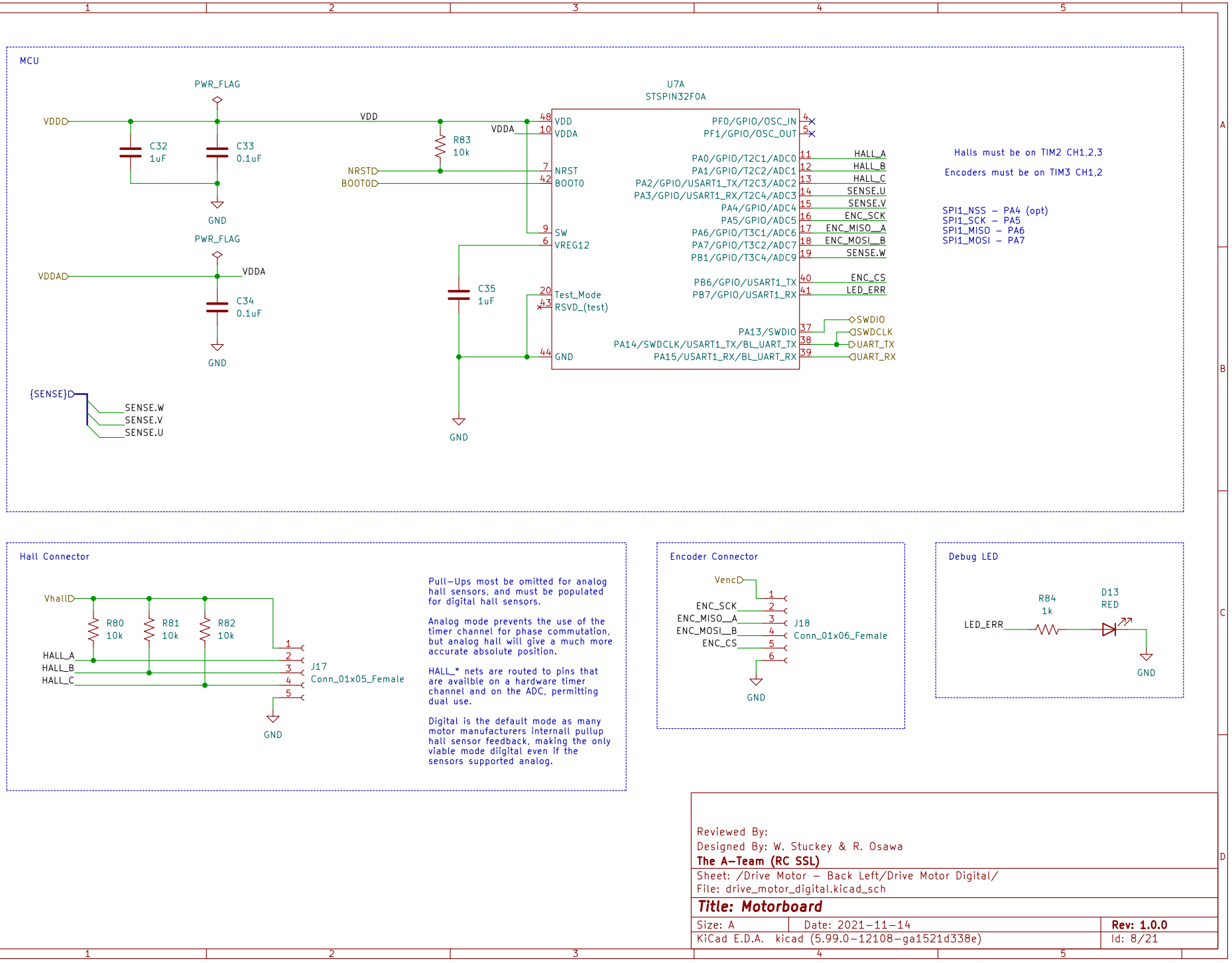


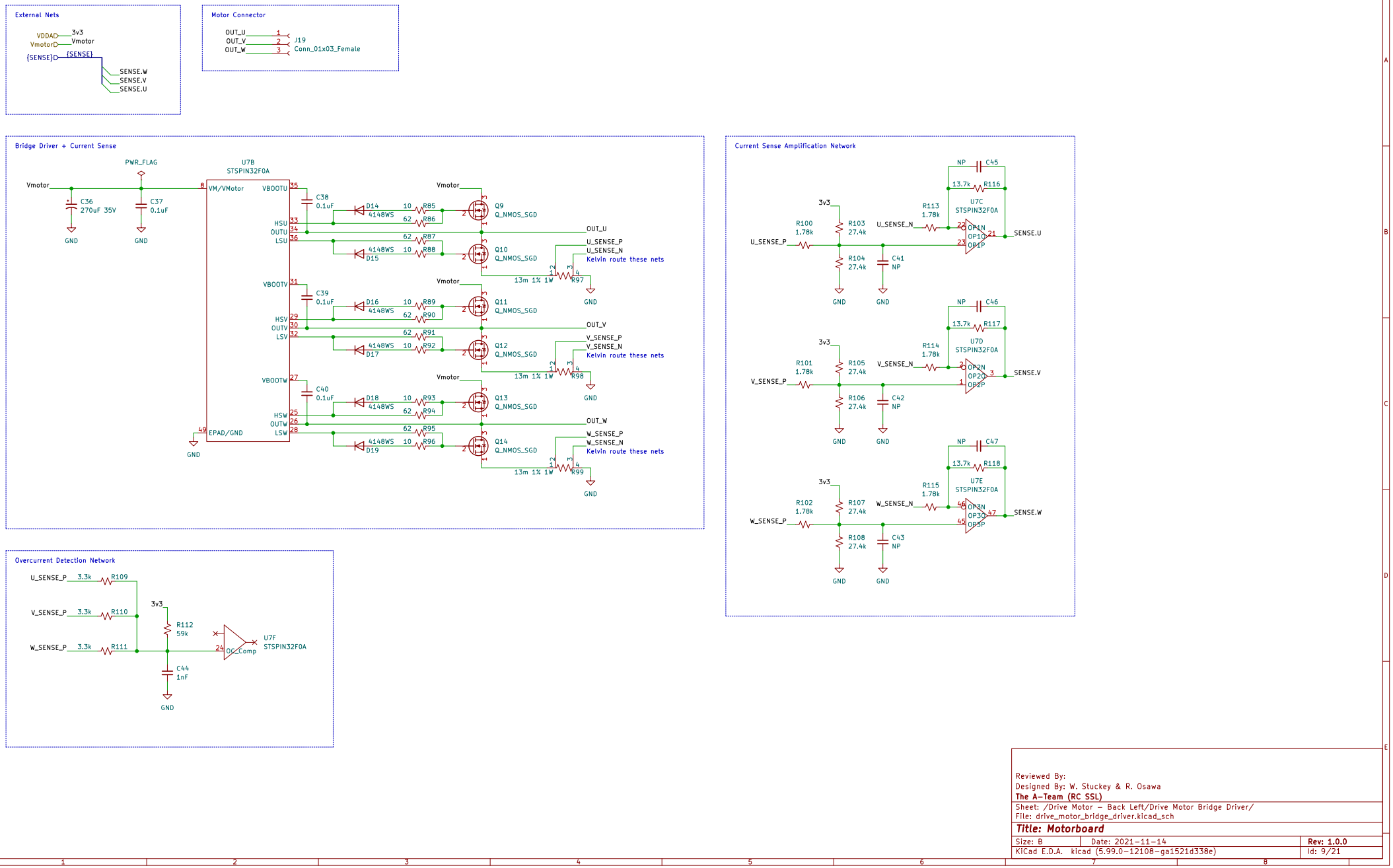
Reviewed By:
Designed By: W. Stuckey & R. Osawa
The A-Team (RC SSL)

Sheet: /Drive Motor - Back Left/
File: drive_motor.kicad_sch

Title: Motorboard

Size: A	Date: 2021-11-14	**Rev: 1.0.0**
KiCad E.D.A. kicad (5.99.0-12108-ga1521d338e)		Id: 7/21


MCU
PWR_FLAG
VDD
C32
1uF
C33
0.1uF
GND
PWR_FLAG
VDDA
C34
0.1uF
GND
{SENSE}
SENSE.W
SENSE.V
SENSE.U
VDD
R83
10k
VDDA
NRST
BOOT0
C35
1uF
GND
U7A
STSPIN32F0A
48 VDD
10 VDDA
7 NRST
42 BOOT0
9 SW
6 VREG12
20 Test_Mode
43 RSVD_(test)
44 GND
PF0/GPIO/OSC_IN 4
PF1/GPIO/OSC_OUT 5
PA0/GPIO/T2C1/ADC0 11 HALL_A
PA1/GPIO/T2C2/ADC1 12 HALL_B
PA2/GPIO/USART1_TX/T2C3/ADC2 13 HALL_C
PA3/GPIO/USART1_RX/T2C4/ADC3 14 SENSE.U
PA4/GPIO/ADC4 15 SENSE.V
PA5/GPIO/ADC5 16 ENC_SCK
PA6/GPIO/T3C1/ADC6 17 ENC_MISO__A
PA7/GPIO/T3C2/ADC7 18 ENC_MOSI__B
PB1/GPIO/T3C4/ADC9 19 SENSE.W
PB6/GPIO/USART1_TX 40 ENC_CS
PB7/GPIO/USART1_RX 41 LED_ERR
PA13/SWDIO 37 SWDIO
PA14/SWDCLK/USART1_TX/BL_UART_TX 38 UART_TX
PA15/USART1_RX/BL_UART_RX 39 UART_RX
SWDCLK
Halls must be on TIM2 CH1,2,3
Encoders must be on TIM3 CH1,2
SPI1_NSS – PA4 (opt)
SPI1_SCK – PA5
SPI1_MISO – PA6
SPI1_MOSI – PA7
Hall Connector
Vhall
R80
10k
R81
10k
R82
10k
HALL_A
HALL_B
HALL_C
J17
Conn_01x05_Female
GND
Pull-Ups most be omitted for analog hall sensors, and must be populated for digital hall sensors.
Analog mode prevents the use of the timer channel for phase commutation, but analog hall will give a much more accurate absolute position.
HALL_* nets are routed to pins that are availble on a hardware timer channel and on the ADC, permitting dual use.
Digital is the default mode as many motor manufacturers internall pullup hall sensor feedback, making the only viable mode diigital even if the sensors supported analog.
Encoder Connector
Venc
ENC_SCK
ENC_MISO__A
ENC_MOSI__B
ENC_CS
J18
Conn_01x06_Female
GND
Debug LED
LED_ERR
R84
1k
D13
RED
GND
Reviewed By:
Designed By: W. Stuckey & R. Osawa
The A-Team (RC SSL)
Sheet: /Drive Motor - Back Left/Drive Motor Digital/
File: drive_motor_digital.kicad_sch
Title: Motorboard
Size: A
Date: 2021-11-14
Rev: 1.0.0
KiCad E.D.A. kicad (5.99.0-12108-ga1521d338e)
Id: 8/21



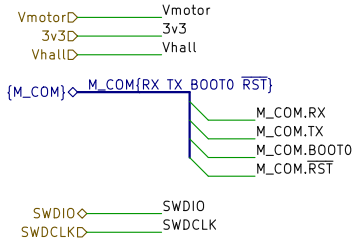
Reviewed By:
Designed By: W. Stuckey & R. Osawa
The A-Team (RC SSL)

Sheet: /Drive Motor - Back Left/Drive Motor Bridge Driver/
File: drive_motor_bridge_driver.kicad_sch

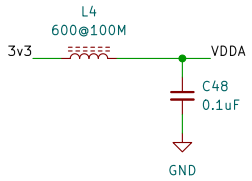
Title: Motorboard

Size: B	Date: 2021-11-14	**Rev: 1.0.0**
KiCad E.D.A. kicad (5.99.0-12108-ga1521d338e)		Id: 9/21

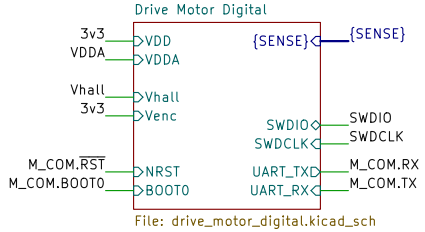
External Nets



VDDA Filtering (Sense Amp. and ADC)

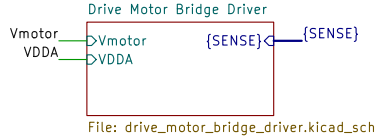


Digital Motor Controller



This is where the tx/rx swap occurs
(e.g. tx of one modules transmits into the rx of another)
(there's no hardware swapping here, so this is essential)

Bridge Driver



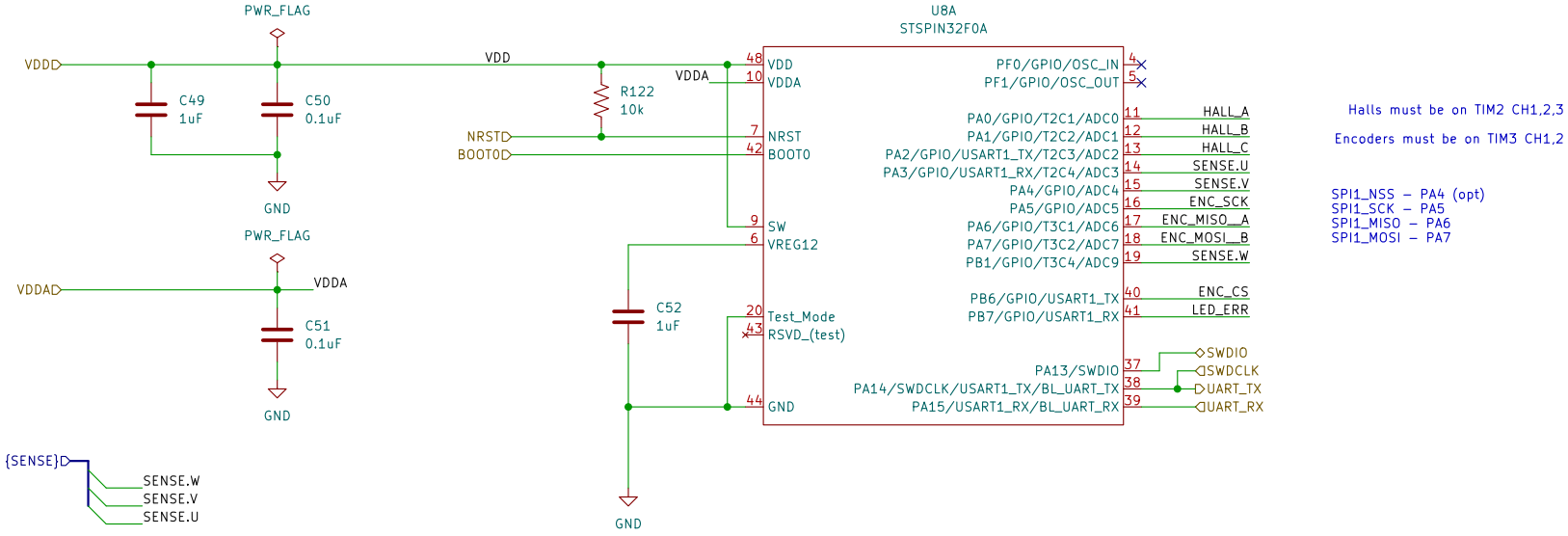
Reviewed By:
Designed By: W. Stuckey & R. Osawa
The A-Team (RC SSL)

Sheet: /Drive Motor - Back Right/
File: drive_motor.kicad_sch

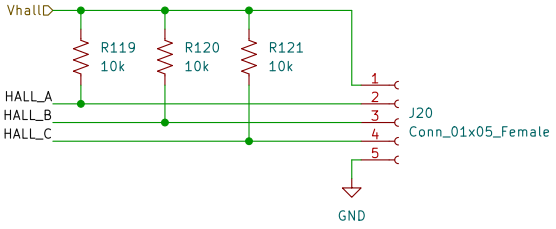
Title: Motorboard

Size: A	Date: 2021-11-14	**Rev: 1.0.0**
KiCad E.D.A. kicad (5.99.0-12108-ga1521d338e)		Id: 10/21

MCU



Hall Connector



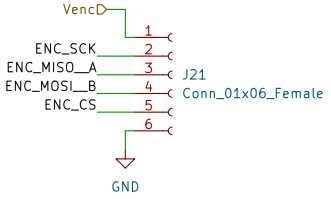
Pull-Ups most be omitted for analog hall sensors, and must be populated for digital hall sensors.

Analog mode prevents the use of the timer channel for phase commutation, but analog hall will give a much more accurate absolute position.

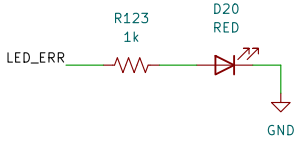
HALL_* nets are routed to pins that are availble on a hardware timer channel and on the ADC, permitting dual use.

Digital is the default mode as many motor manufacturers internall pullup hall sensor feedback, making the only viable mode diigital even if the sensors supported analog.

Encoder Connector



Debug LED

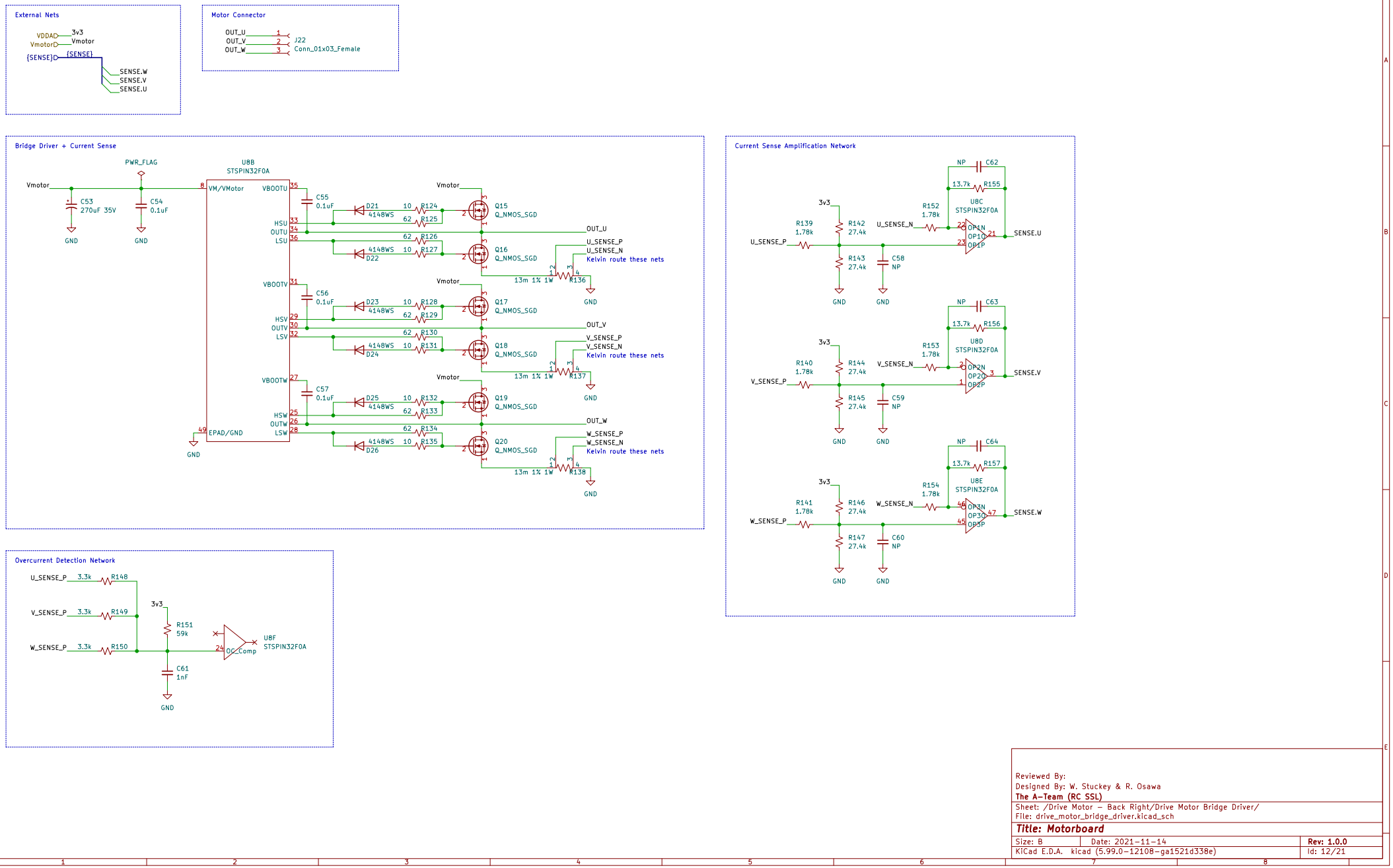


Reviewed By:
Designed By: W. Stuckey & R. Osawa
The A-Team (RC SSL)

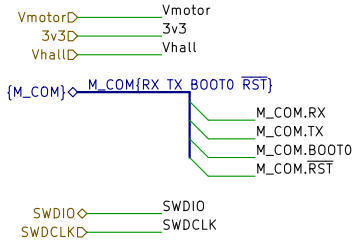
Sheet: /Drive Motor – Back Right/Drive Motor Digital/
File: drive_motor_digital.kicad_sch

Title: Motorboard

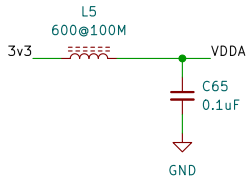
Size: A	Date: 2021-11-14	**Rev: 1.0.0**
KiCad E.D.A. kicad (5.99.0-12108-ga1521d338e)		Id: 11/21


External Nets
VDDA
3v3
Vmotor
Vmotor
{SENSE}
{SENSE}
SENSE.W
SENSE.V
SENSE.U
Motor Connector
OUT_U
OUT_V
OUT_W
1
2
3
J22
Conn_01x03_Female
Bridge Driver + Current Sense
PWR_FLAG
U8B
STSPIN32F0A
VM/VMotor
EPAD/GND
VBOOTU
HSU
OUTU
LSU
VBOOTV
HSV
OUTV
LSV
VBOOTW
HSW
OUTW
LSW
C53
270uF 35V
C54
0.1uF
C55
0.1uF
C56
0.1uF
C57
0.1uF
D21
D22
D23
D24
D25
D26
4148WS
R124
R125
R126
R127
R128
R129
R130
R131
R132
R133
R134
R135
10
62
Q15
Q16
Q17
Q18
Q19
Q20
Q_NMOS_SGD
OUT_U
OUT_V
OUT_W
U_SENSE_P
U_SENSE_N
V_SENSE_P
V_SENSE_N
W_SENSE_P
W_SENSE_N
Kelvin route these nets
13m 1% 1W
R136
R137
R138
GND
Current Sense Amplification Network
3v3
NP
C62
C63
C64
13.7k
R155
R156
R157
U8C
U8D
U8E
STSPIN32F0A
R139
R140
R141
1.78k
R142
R144
R146
27.4k
R143
R145
R147
C58
C59
C60
R152
R153
R154
U_SENSE_N
V_SENSE_N
W_SENSE_N
U_SENSE_P
V_SENSE_P
W_SENSE_P
SENSE.U
SENSE.V
SENSE.W
Overcurrent Detection Network
U_SENSE_P
V_SENSE_P
W_SENSE_P
3.3k
R148
R149
R150
3v3
R151
59k
OC_Comp
U8F
STSPIN32F0A
C61
1nF
GND
Reviewed By:
Designed By: W. Stuckey & R. Osawa
The A-Team (RC SSL)
Sheet: /Drive Motor - Back Right/Drive Motor Bridge Driver/
File: drive_motor_bridge_driver.kicad_sch
Title: Motorboard
Size: B
Date: 2021-11-14
Rev: 1.0.0
KiCad E.D.A. kicad (5.99.0-12108-ga1521d338e)
Id: 12/21

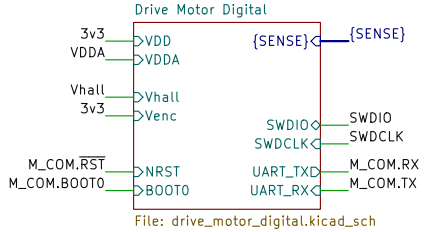
External Nets



VDDA Filtering (Sense Amp. and ADC)

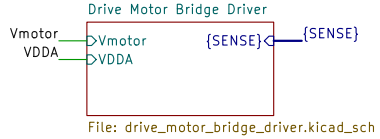


Digital Motor Controller



This is where the tx/rx swap occurs
(e.g. tx of one modules transmits into the rx of another)
(there's no hardware swapping here, so this is essential)

Bridge Driver

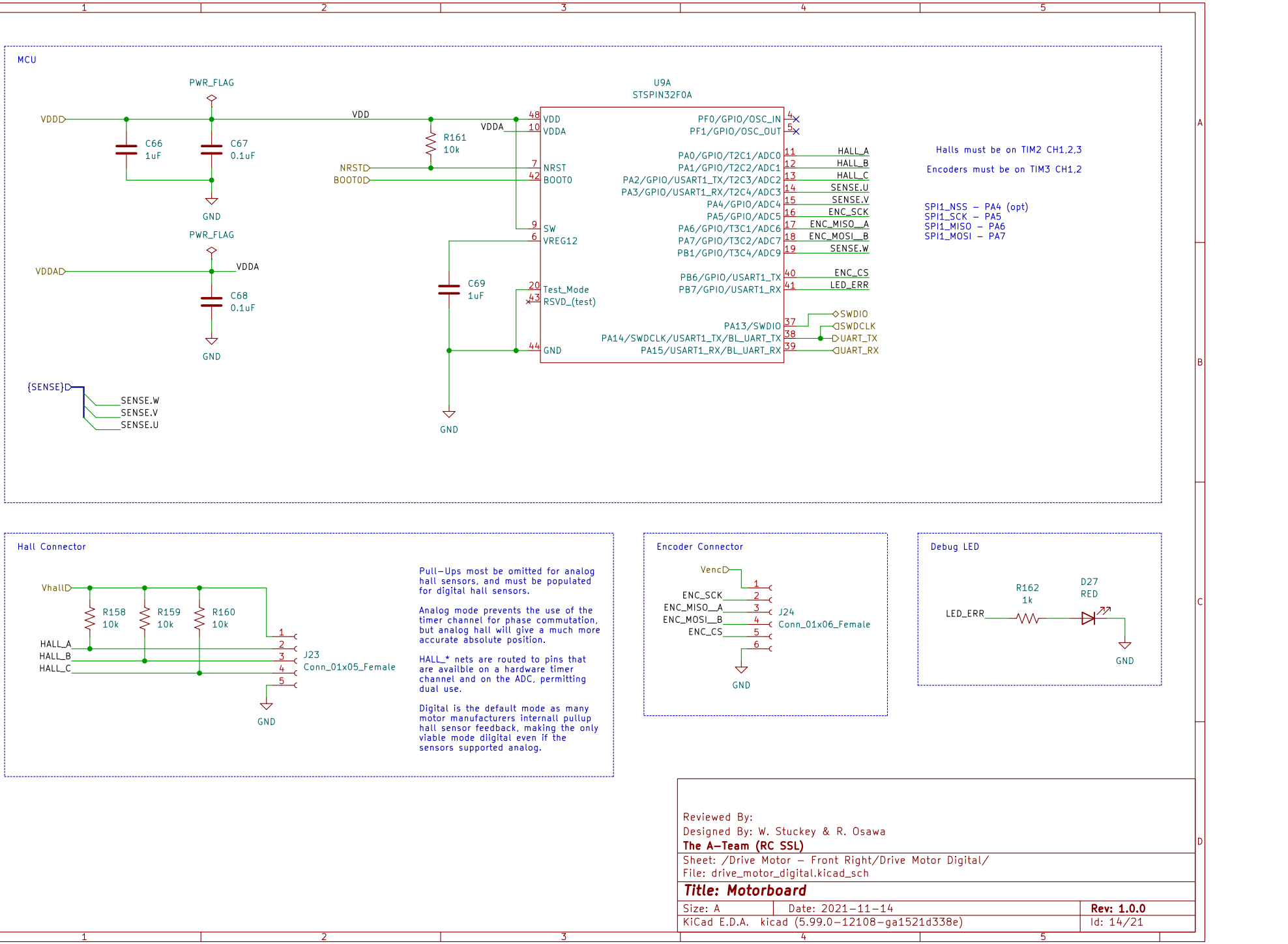


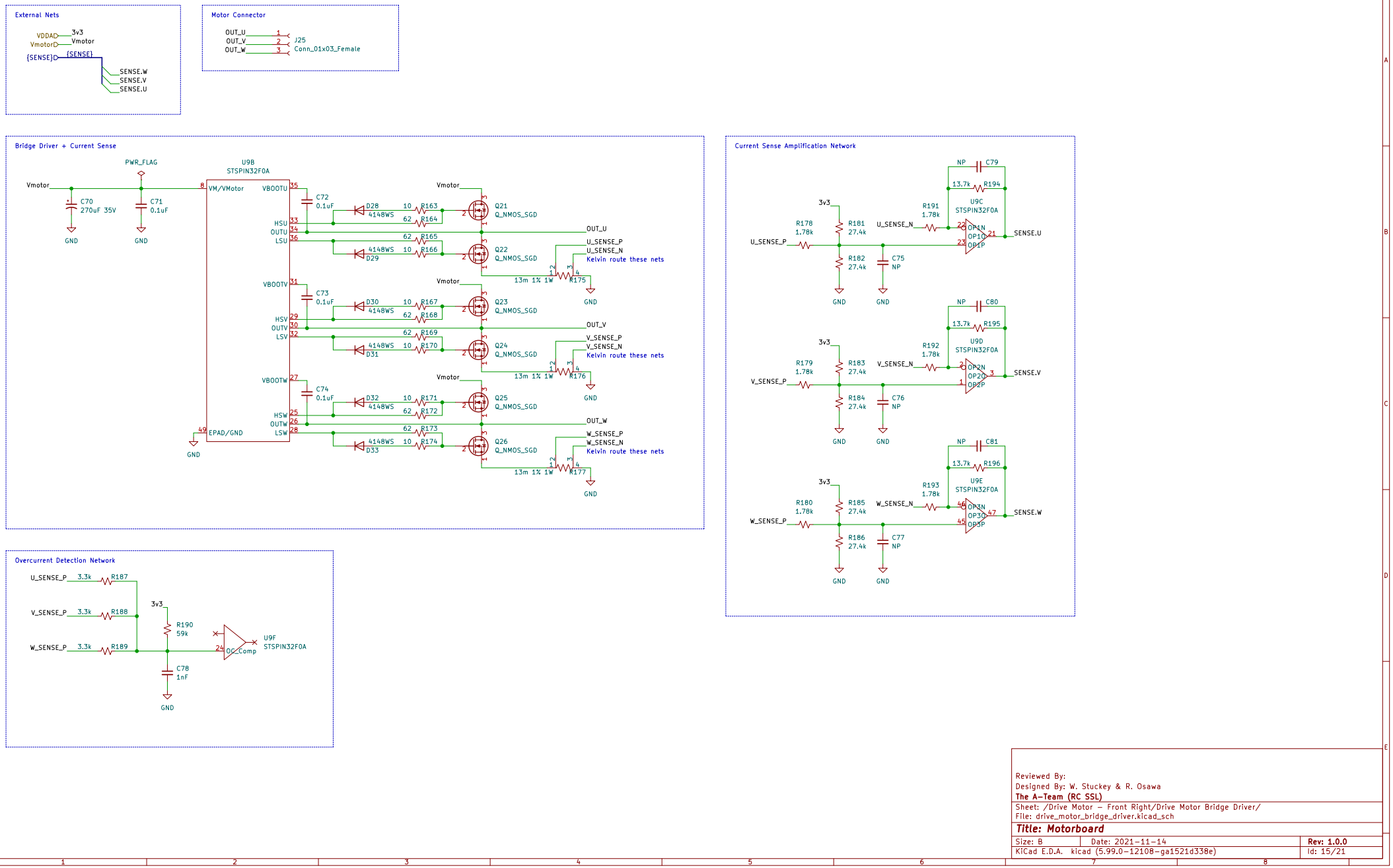
Reviewed By:
Designed By: W. Stuckey & R. Osawa
The A-Team (RC SSL)

Sheet: /Drive Motor - Front Right/
File: drive_motor.kicad_sch

Title: Motorboard

Size: A	Date: 2021-11-14	**Rev: 1.0.0**
KiCad E.D.A. kicad (5.99.0-12108-ga1521d338e)		Id: 13/21


MCU
PWR_FLAG
VDD
C66
1uF
C67
0.1uF
GND
PWR_FLAG
VDDA
C68
0.1uF
GND
{SENSE}
SENSE.W
SENSE.V
SENSE.U
VDD
R161
10k
VDDA
NRST
BOOT0
C69
1uF
GND
U9A
STSPIN32F0A
48 VDD
10 VDDA
7 NRST
42 BOOT0
9 SW
6 VREG12
20 Test_Mode
43 RSVD_(test)
44 GND
PF0/GPIO/OSC_IN 4
PF1/GPIO/OSC_OUT 5
PA0/GPIO/T2C1/ADC0 11 HALL_A
PA1/GPIO/T2C2/ADC1 12 HALL_B
PA2/GPIO/USART1_TX/T2C3/ADC2 13 HALL_C
PA3/GPIO/USART1_RX/T2C4/ADC3 14 SENSE.U
PA4/GPIO/ADC4 15 SENSE.V
PA5/GPIO/ADC5 16 ENC_SCK
PA6/GPIO/T3C1/ADC6 17 ENC_MISO__A
PA7/GPIO/T3C2/ADC7 18 ENC_MOSI__B
PB1/GPIO/T3C4/ADC9 19 SENSE.W
PB6/GPIO/USART1_TX 40 ENC_CS
PB7/GPIO/USART1_RX 41 LED_ERR
PA13/SWDIO 37 SWDIO
PA14/SWDCLK/USART1_TX/BL_UART_TX 38 SWDCLK UART_TX
PA15/USART1_RX/BL_UART_RX 39 UART_RX
Halls must be on TIM2 CH1,2,3
Encoders must be on TIM3 CH1,2
SPI1_NSS – PA4 (opt)
SPI1_SCK – PA5
SPI1_MISO – PA6
SPI1_MOSI – PA7
Hall Connector
Vhall
R158
10k
R159
10k
R160
10k
HALL_A
HALL_B
HALL_C
J23
Conn_01x05_Female
GND
Pull-Ups most be omitted for analog hall sensors, and must be populated for digital hall sensors.
Analog mode prevents the use of the timer channel for phase commutation, but analog hall will give a much more accurate absolute position.
HALL_* nets are routed to pins that are availble on a hardware timer channel and on the ADC, permitting dual use.
Digital is the default mode as many motor manufacturers internall pullup hall sensor feedback, making the only viable mode diigital even if the sensors supported analog.
Encoder Connector
Venc
ENC_SCK
ENC_MISO__A
ENC_MOSI__B
ENC_CS
J24
Conn_01x06_Female
GND
Debug LED
LED_ERR
R162
1k
D27
RED
GND
Reviewed By:
Designed By: W. Stuckey & R. Osawa
The A-Team (RC SSL)
Sheet: /Drive Motor - Front Right/Drive Motor Digital/
File: drive_motor_digital.kicad_sch
Title: Motorboard
Size: A
Date: 2021-11-14
Rev: 1.0.0
KiCad E.D.A. kicad (5.99.0-12108-ga1521d338e)
Id: 14/21



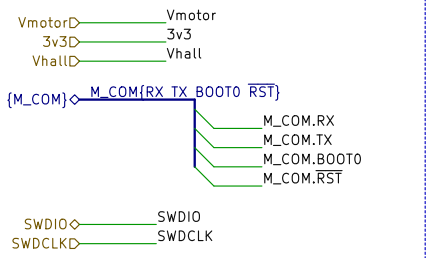
Reviewed By:
Designed By: W. Stuckey & R. Osawa
The A-Team (RC SSL)

Sheet: /Drive Motor - Front Right/Drive Motor Bridge Driver/
File: drive_motor_bridge_driver.kicad_sch

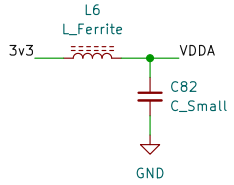
Title: Motorboard

Size: B	Date: 2021-11-14	**Rev: 1.0.0**
KiCad E.D.A. kicad (5.99.0-12108-ga1521d338e)		Id: 15/21

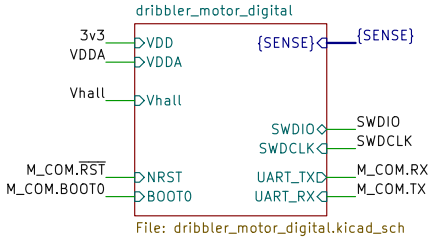
External Nets



VDDA Filtering (Sense Amp. and ADC)



Digital Motor Controller



This is where the tx/rx swap occurs
(e.g. tx of one modules transmits into the rx of another)
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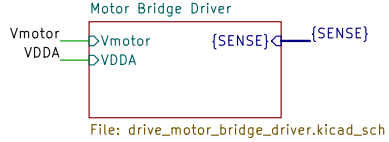
Bridge Driver

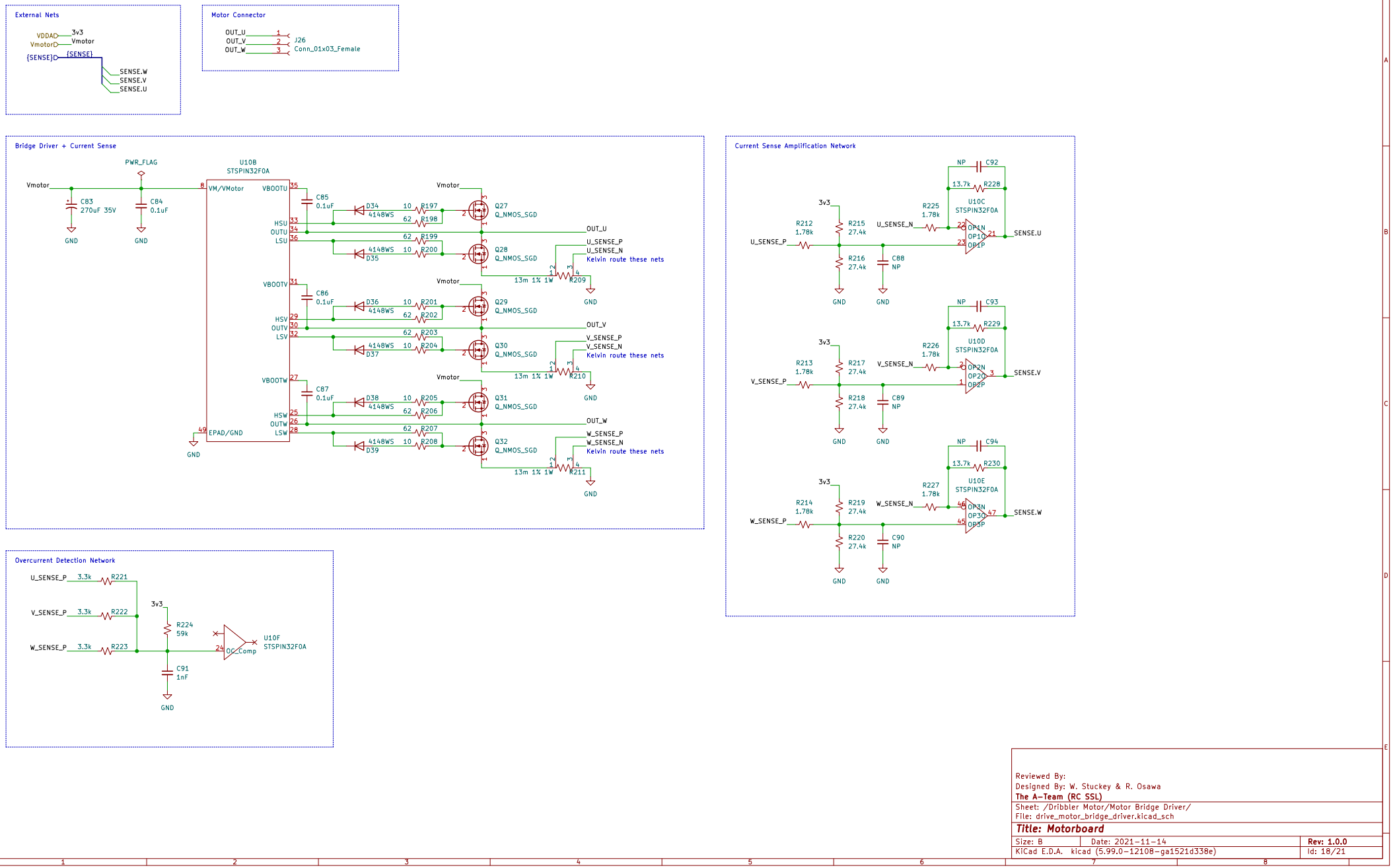


Reviewed By:
Designed By: W. Stuckey & R. Osawa
The A-Team (RC SSL)

Sheet: /Dribbler Motor/
File: dribbler_motor.kicad_sch

Title: Motorboard

Size: A4	Date: 2021-11-14	**Rev: 1.0.0**
KiCad E.D.A. kicad (5.99.0-12108-ga1521d338e)		Id: 16/21

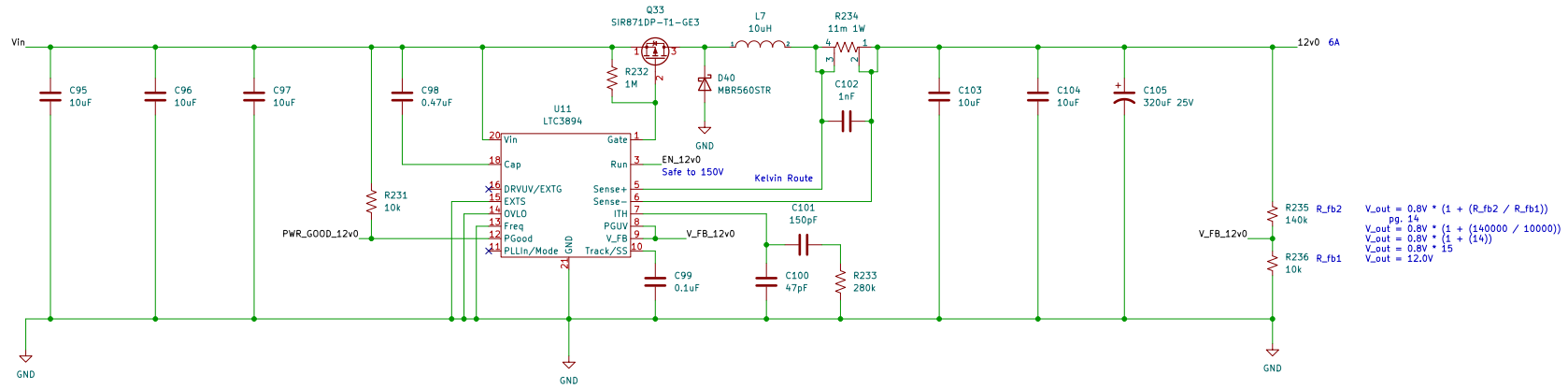

External Nets
VDDA
3v3
Vmotor
Vmotor
{SENSE}
{SENSE}
SENSE.W
SENSE.V
SENSE.U
Motor Connector
OUT_U
OUT_V
OUT_W
1
2
3
J26
Conn_01x03_Female
Bridge Driver + Current Sense
PWR_FLAG
U10B
STSPIN32F0A
VM/VMotor
EPAD/GND
VBOOTU
HSU
OUTU
LSU
VBOOTV
HSV
OUTV
LSV
VBOOTW
HSW
OUTW
LSW
C83
270uF 35V
C84
0.1uF
C85
0.1uF
C86
0.1uF
C87
0.1uF
D34
D35
D36
D37
D38
D39
4148WS
R197
R198
R199
R200
R201
R202
R203
R204
R205
R206
R207
R208
10
62
Q27
Q28
Q29
Q30
Q31
Q32
Q_NMOS_SGD
OUT_U
OUT_V
OUT_W
U_SENSE_P
U_SENSE_N
V_SENSE_P
V_SENSE_N
W_SENSE_P
W_SENSE_N
Kelvin route these nets
13m 1% 1W
R209
R210
R211
GND
Current Sense Amplification Network
3v3
NP
C92
C93
C94
13.7k
R228
R229
R230
U10C
U10D
U10E
STSPIN32F0A
R212
R213
R214
1.78k
R225
R226
R227
R215
R216
R217
R218
R219
R220
27.4k
C88
C89
C90
NP
U_SENSE_P
U_SENSE_N
V_SENSE_P
V_SENSE_N
W_SENSE_P
W_SENSE_N
SENSE.U
SENSE.V
SENSE.W
Overcurrent Detection Network
U_SENSE_P
V_SENSE_P
W_SENSE_P
3.3k
R221
R222
R223
3v3
R224
59k
C91
1nF
OC_Comp
U10F
STSPIN32F0A
GND
Reviewed By:
Designed By: W. Stuckey & R. Osawa
The A-Team (RC SSL)
Sheet: /Dribbler Motor/Motor Bridge Driver/
File: drive_motor_bridge_driver.kicad_sch
Title: Motorboard
Size: B
Date: 2021-11-14
Rev: 1.0.0
KiCad E.D.A. kicad (5.99.0-12108-ga1521d338e)
Id: 18/21

External Nets

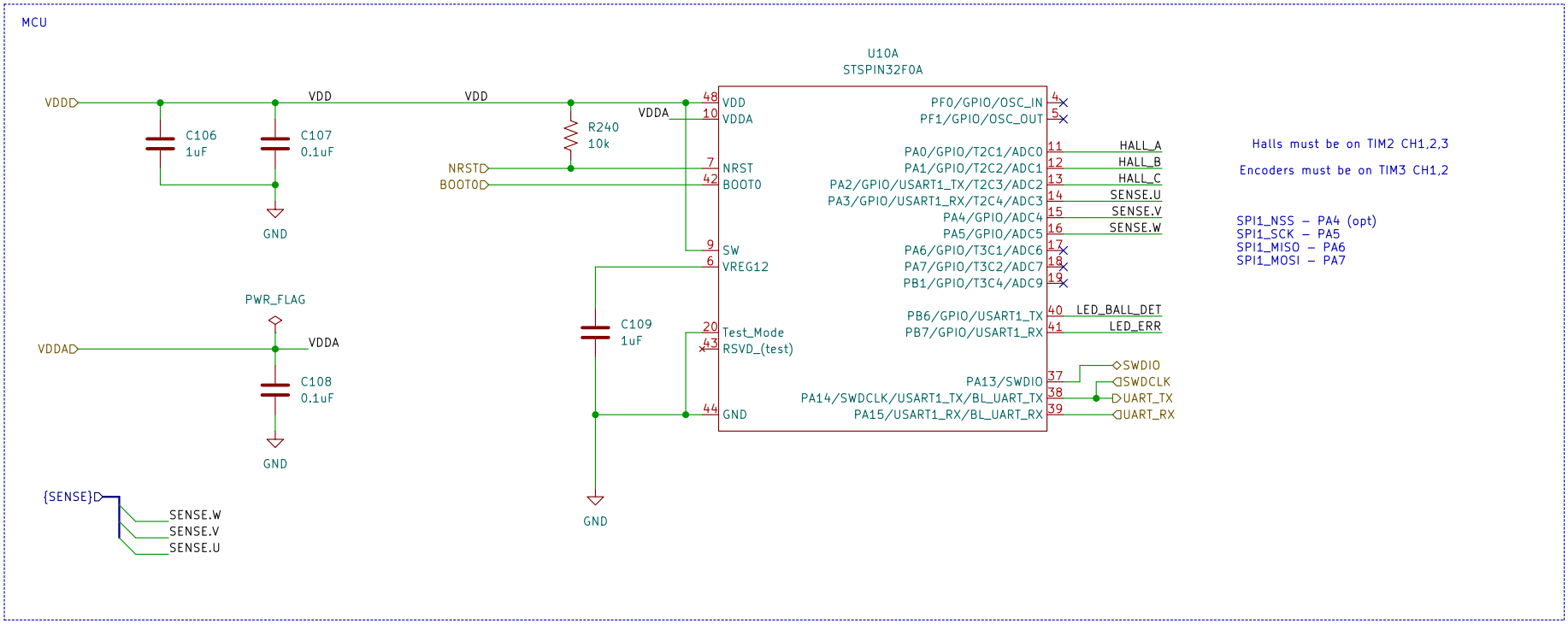
Vbatt_6s — Vin
12v0 — 12v0

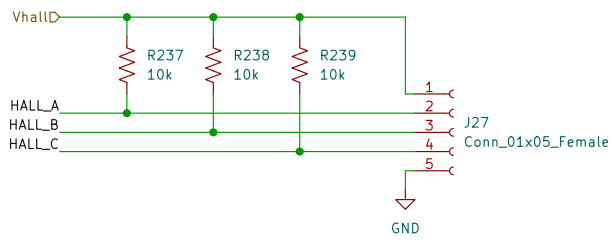
END — EN_12v0
PGOODDDP — PWR_GOOD_12v0

12V Regulation



Reviewed By:		
Designed By: W. Stuckey & R. Osawa		
The A-Team (RC SSL)		
Sheet: /12v_universal_reg/		
File: 12v_universal_reg.kicad_sch		
Title: Motorboard		
Size: B	Date: 2021-11-14	**Rev: 1.0.0**
KiCad E.D.A. kicad (5.99.0-12108-ga1521d338e)		Id: 19/21



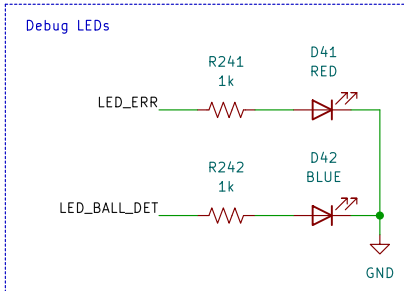


Pull-Ups most be omitted for analog hall sensors, and must be populated for digital hall sensors.

Analog mode prevents the use of the timer channel for phase commutation, but analog hall will give a much more accurate absolute position.

HALL_* nets are routed to pins that are availble on a hardware timer channel and on the ADC, permitting dual use.

Digital is the default mode as many motor manufacturers internall pullup hall sensor feedback, making the only viable mode diigital even if the sensors supported analog.



It should be possible to detect ball presence based on torque/current. We'll see if that actually pans out...

Reviewed By:
Designed By: W. Stuckey & R. Osawa
The A-Team (RC SSL)

Sheet: /Dribbler Motor/dribbler_motor_digital/
File: dribbler_motor_digital.kicad_sch

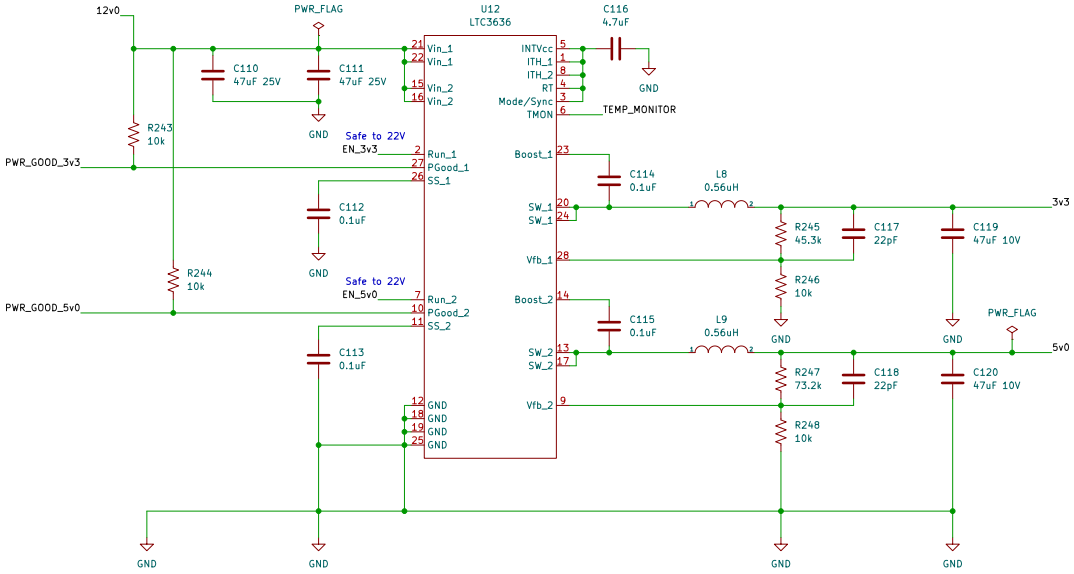
Title: Motorboard

Size: A4	Date: 2021-11-14	**Rev: 1.0.0**
KiCad E.D.A. kicad (5.99.0-12108-ga1521d338e)		Id: 19/21

External Nets

12v0 — 12v0
3v3 — 3v3
5v0 — 5v0
EN_3v3 — EN_3v3
EN_5v0 — EN_5v0
PGOOD_3v3 — PWR_GOOD_3v3
PGOOD_5v0 — PWR_GOOD_5v0
TempMonitor — TEMP_MONITOR

3.3V and 5.0V Regulation

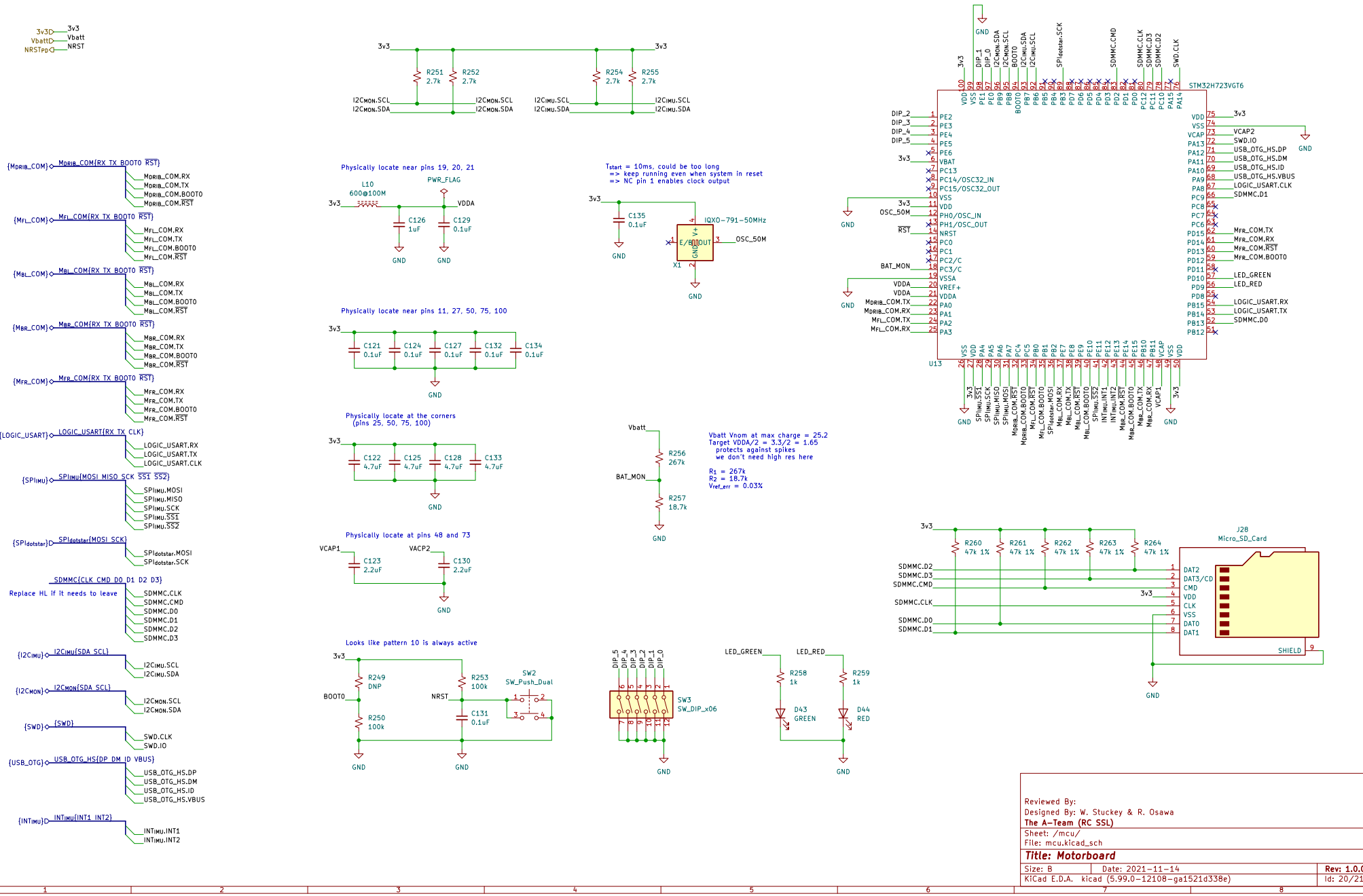


Reviewed By:
Designed By: W. Stuckey & R. Osawa
The A-Team (RC SSL)

Sheet: /3v3_5v0_reg/
File: 3v3_5v0_reg.kicad_sch

Title: Motorboard

Size: B	Date: 2021-11-14	**Rev: 1.0.0**
KiCad E.D.A. kicad (5.99.0-12108-ga1521d338e)		Id: 20/21

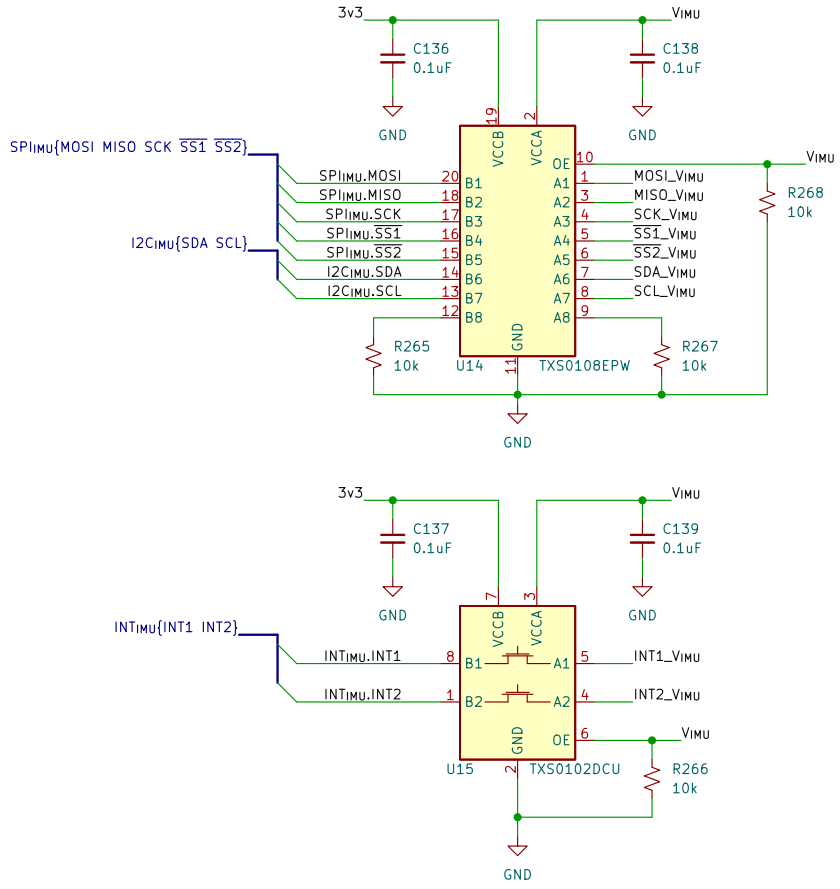

3v3
Vbatt
NRST
R251 2.7k
R252 2.7k
R254 2.7k
R255 2.7k
I2C_MON.SCL
I2C_MON.SDA
I2C_IMU.SCL
I2C_IMU.SDA
Physically locate near pins 19, 20, 21
L10 600@100M
PWR_FLAG
VDDA
C126 1uF
C129 0.1uF
GND
Tstart = 10ms, could be too long
=> keep running even when system in reset
=> NC pin 1 enables clock output
C135 0.1uF
IQXO-791-50MHz
OSC_50M
X1
Physically locate near pins 11, 27, 50, 75, 100
C121 0.1uF
C124 0.1uF
C127 0.1uF
C132 0.1uF
C134 0.1uF
Physically locate at the corners
(pins 25, 50, 75, 100)
C122 4.7uF
C125 4.7uF
C128 4.7uF
C133 4.7uF
Physically locate at pins 48 and 73
VCAP1
VACP2
C123 2.2uF
C130 2.2uF
Looks like pattern 10 is always active
R249 DNP
R250 100k
R253 100k
C131 0.1uF
SW2 SW_Push_Dual
BOOT0
NRST
Vbatt
R256 267k
R257 18.7k
BAT_MON
Vbatt Vnom at max charge = 25.2
Target VDDA/2 = 3.3/2 = 1.65
protects against spikes
we don't need high res here
R1 = 267k
R2 = 18.7k
Vref_err = 0.03%
SW3 SW_DIP_x06
LED_GREEN
LED_RED
R258 1k
R259 1k
D43 GREEN
D44 RED
STM32H723VGT6
U13
R260 47k 1%
R261 47k 1%
R262 47k 1%
R263 47k 1%
R264 47k 1%
J28
Micro_SD_Card
SHIELD
{MDRIB_COM} MDRIB_COM{RX TX BOOT0 RST}
MDRIB_COM.RX
MDRIB_COM.TX
MDRIB_COM.BOOT0
MDRIB_COM.RST
{MFL_COM} MFL_COM{RX TX BOOT0 RST}
MFL_COM.RX
MFL_COM.TX
MFL_COM.BOOT0
MFL_COM.RST
{MBL_COM} MBL_COM{RX TX BOOT0 RST}
MBL_COM.RX
MBL_COM.TX
MBL_COM.BOOT0
MBL_COM.RST
{MBR_COM} MBR_COM{RX TX BOOT0 RST}
MBR_COM.RX
MBR_COM.TX
MBR_COM.BOOT0
MBR_COM.RST
{MFR_COM} MFR_COM{RX TX BOOT0 RST}
MFR_COM.RX
MFR_COM.TX
MFR_COM.BOOT0
MFR_COM.RST
{LOGIC_USART} LOGIC_USART{RX TX CLK}
LOGIC_USART.RX
LOGIC_USART.TX
LOGIC_USART.CLK
{SPI_IMU} SPI_IMU{MOSI MISO SCK SS1 SS2}
SPI_IMU.MOSI
SPI_IMU.MISO
SPI_IMU.SCK
SPI_IMU.SS1
SPI_IMU.SS2
{SPI_dotstar} SPI_dotstar{MOSI SCK}
SPI_dotstar.MOSI
SPI_dotstar.SCK
SDMMC{CLK CMD D0 D1 D2 D3}
Replace HL if it needs to leave
SDMMC.CLK
SDMMC.CMD
SDMMC.D0
SDMMC.D1
SDMMC.D2
SDMMC.D3
{I2C_IMU} I2C_IMU{SDA SCL}
I2C_IMU.SCL
I2C_IMU.SDA
{I2C_MON} I2C_MON{SDA SCL}
I2C_MON.SCL
I2C_MON.SDA
{SWD} {SWD}
SWD.CLK
SWD.IO
{USB_OTG} USB_OTG_HS{DP DM ID VBUS}
USB_OTG_HS.DP
USB_OTG_HS.DM
USB_OTG_HS.ID
USB_OTG_HS.VBUS
{INT_IMU} INT_IMU{INT1 INT2}
INT_IMU.INT1
INT_IMU.INT2
Reviewed By:
Designed By: W. Stuckey & R. Osawa
The A-Team (RC SSL)
Sheet: /mcu/
File: mcu.kicad_sch
Title: Motorboard
Size: B
Date: 2021-11-14
Rev: 1.0.0
KiCad E.D.A. kicad (5.99.0-12108-ga1521d338e)
Id: 20/21

External Nets

3v3 ▷ 3v3
{I2CIMU} ▷ I2CIMU{SDA SCL}
{SPIIMU} ▷ SPIIMU{MOSI MISO SCK SS1 SS2}
{INTIMU} ▷ INTIMU{INT1 INT2}

Level Shifting

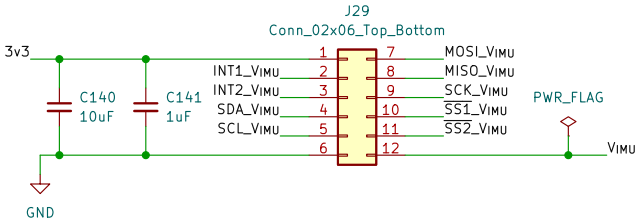
VCCA <= VCCB, so max IMU voltage is 3.3V



External IMU Connection

IMU module should step down 3v3 if
necessary and feedback the final voltage
via the VIMU net for the level shifters

if I2C is used, module is responsible for pullups
if INT(s) are used in OD, module is responsible for pullups



Reviewed By:
Designed By: W. Stuckey & R. Osawa
The A-Team (RC SSL)

Sheet: /imu/
File: imu.kicad_sch

Title: Motorboard

Size: A4	Date: 2021-11-14	**Rev: 1.0.0**
KiCad E.D.A. kicad (5.99.0-12108-ga1521d338e)		Id: 21/21