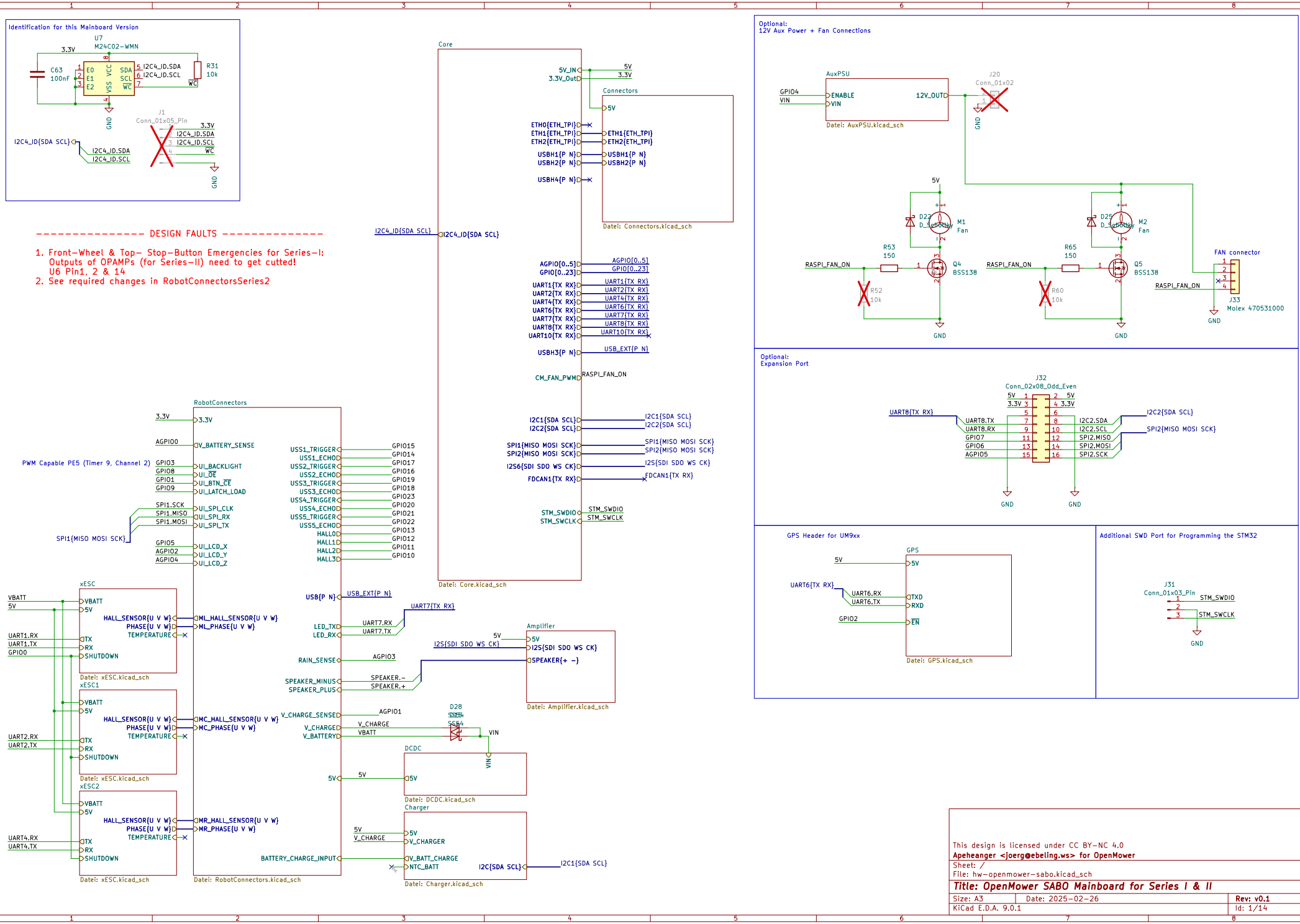
Identification for this Mainboard Version
U7
M24C02-WMN
3.3V
C63
100nF
R31
10k
I2C4_ID.SDA
I2C4_ID.SCL
WC
GND
J1
Conn_01x05_Pin
I2C4_ID{SDA SCL}
DESIGN FAULTS
1. Front-Wheel & Top- Stop-Button Emergencies for Series-I:
Outputs of OPAMPs (for Series-II) need to get cutted!
U6 Pin1, 2 & 14
2. See required changes in RobotConnectorsSeries2
Core
5V_IN
3.3V_Out
Connectors
ETH0{ETH_TPI}
ETH1{ETH_TPI}
ETH2{ETH_TPI}
USBH1{P N}
USBH2{P N}
USBH4{P N}
Datei: Connectors.kicad_sch
AGPIO[0..5]
GPIO[0..23]
UART1{TX RX}
UART2{TX RX}
UART4{TX RX}
UART6{TX RX}
UART7{TX RX}
UART8{TX RX}
UART10{TX RX}
USBH3{P N}
USB_EXT{P N}
CM_FAN_PWM
RASPI_FAN_ON
I2C1{SDA SCL}
I2C2{SDA SCL}
SPI1{MISO MOSI SCK}
SPI2{MISO MOSI SCK}
I2S6{SDI SDO WS CK}
FDCAN1{TX RX}
STM_SWDIO
STM_SWCLK
Datei: Core.kicad_sch
Optional:
12V Aux Power + Fan Connections
AuxPSU
GPIO4
VIN
ENABLE
12V_OUT
Datei: AuxPSU.kicad_sch
J20
Conn_01x02
D22
D_Schottky
M1
Fan
D25
M2
R53
150
Q4
BSS138
R52
10k
R65
Q5
R60
FAN connector
J33
Molex 470531000
Optional:
Expansion Port
J32
Conn_02x08_Odd_Even
UART8.TX
UART8.RX
GPIO7
GPIO6
AGPIO5
I2C2.SDA
I2C2.SCL
SPI2.MISO
SPI2.MOSI
SPI2.SCK
GPS Header for UM9xx
GPS
UART6.RX
UART6.TX
TXD
RXD
EN
Datei: GPS.kicad_sch
Additional SWD Port for Programming the STM32
J31
Conn_01x03_Pin
RobotConnectors
PWM Capable PE5 (Timer 9, Channel 2)
V_BATTERY_SENSE
UI_BACKLIGHT
UI_OE
UI_BTN_CE
UI_LATCH_LOAD
UI_SPI_CLK
UI_SPI_RX
UI_SPI_TX
UI_LCD_X
UI_LCD_Y
UI_LCD_Z
USS1_TRIGGER
USS1_ECHO
USS2_TRIGGER
USS2_ECHO
USS3_TRIGGER
USS3_ECHO
USS4_TRIGGER
USS4_ECHO
USS5_TRIGGER
USS5_ECHO
HALL0
HALL1
HALL2
HALL3
USB{P N}
LED_TX
LED_RX
RAIN_SENSE
SPEAKER_MINUS
SPEAKER_PLUS
V_CHARGE_SENSE
V_CHARGED
V_BATTERY
BATTERY_CHARGE_INPUT
xESC
VBATT
HALL_SENSOR{U V W}
PHASE{U V W}
TEMPERATURE
TX
RX
SHUTDOWN
ML_HALL_SENSOR{U V W}
ML_PHASE{U V W}
Datei: xESC.kicad_sch
xESC1
MC_HALL_SENSOR{U V W}
MC_PHASE{U V W}
xESC2
MR_HALL_SENSOR{U V W}
MR_PHASE{U V W}
Amplifier
SPEAKER{+ -}
Datei: Amplifier.kicad_sch
D28
SS54
DCDC
Datei: DCDC.kicad_sch
Charger
V_CHARGER
V_BATT_CHARGE
NTC_BATT
I2C{SDA SCL}
Datei: Charger.kicad_sch
Datei: RobotConnectors.kicad_sch
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Apeheanger <joerg@ebeling.ws> for OpenMower
Sheet: /
File: hw-openmower-sabo.kicad_sch
Title: OpenMower SABO Mainboard for Series I & II
Size: A3
Date: 2025-02-26
Rev: v0.1
KiCad E.D.A. 9.0.1
Id: 1/14

5V

5V

USB 2 Power Switches and Connectors
Power is always on, switches are there for safety
(they will deliver max 1A and shut off on overcurrent)

R3
10k

C1
100nF@50V

U1
TPS2065CDBV

C3
470nF@50V

GND

5V

IN
OUT
EN
GND
FLT

R1
10k

C4
470nF@50V

C5
100nF@50V

J16
USB_A_Stacked

VBUS1
VBUS2
D1+
D1-
D2+
D2-
Shield
GND1
GND2

USBH1.P
USBH1.N
USBH2.P
USBH2.N

USBH1{P N}
USBH2{P N}

ETH1{ETH_TPI}

C22
100nF@50V

ETH1.PAIR_A_N
ETH1.PAIR_A_P
ETH1.PAIR_B_N
ETH1.PAIR_C_N
ETH1.PAIR_C_P
ETH1.PAIR_B_P
ETH1.PAIR_D_N
ETH1.PAIR_D_P

R11
300

R12
300

ETH1.LED_G
ETH1.LED_Y

J23
HR911130A

GREEN
YELLOW
SHIELD

ETH2{ETH_TPI}

C23
100nF@50V

ETH2.PAIR_A_N
ETH2.PAIR_A_P
ETH2.PAIR_B_N
ETH2.PAIR_C_N
ETH2.PAIR_C_P
ETH2.PAIR_B_P
ETH2.PAIR_D_N
ETH2.PAIR_D_P

R13
300

R14
300

ETH2.LED_G
ETH2.LED_Y

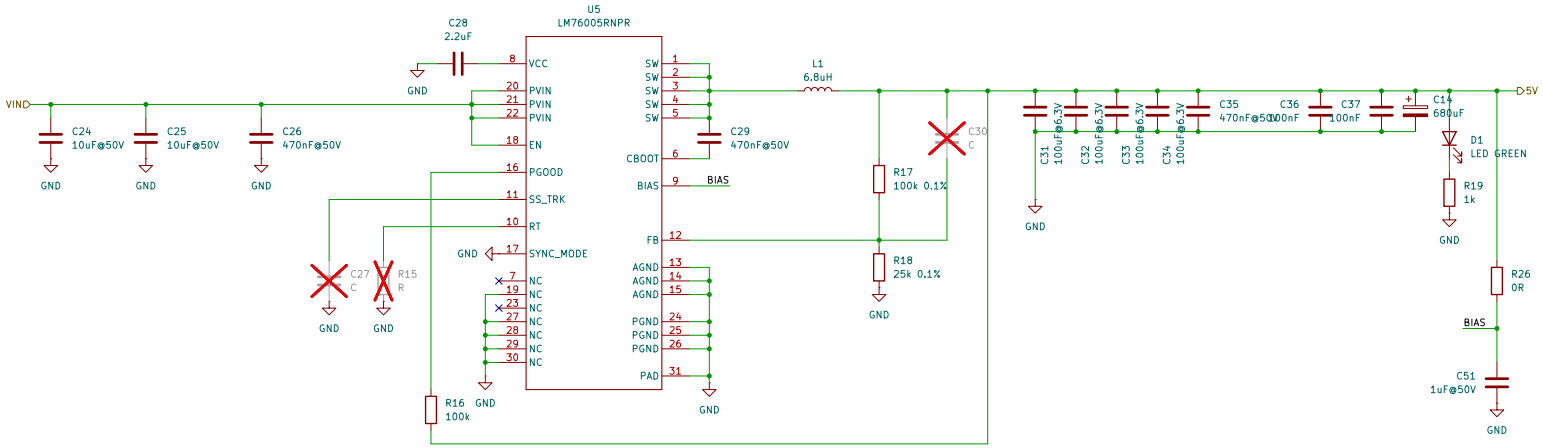
J24
HR911130A

Apeheanger <joerg@ebeling.ws> for OpenMower

Sheet: /Connectors/
File: Connectors.kicad_sch

Title: OpenMower SABO Mainboard for Series I & II

Size: A3	Date: 2025-02-26	Rev: v0.1
KiCad E.D.A. 9.0.1		Id: 2/14



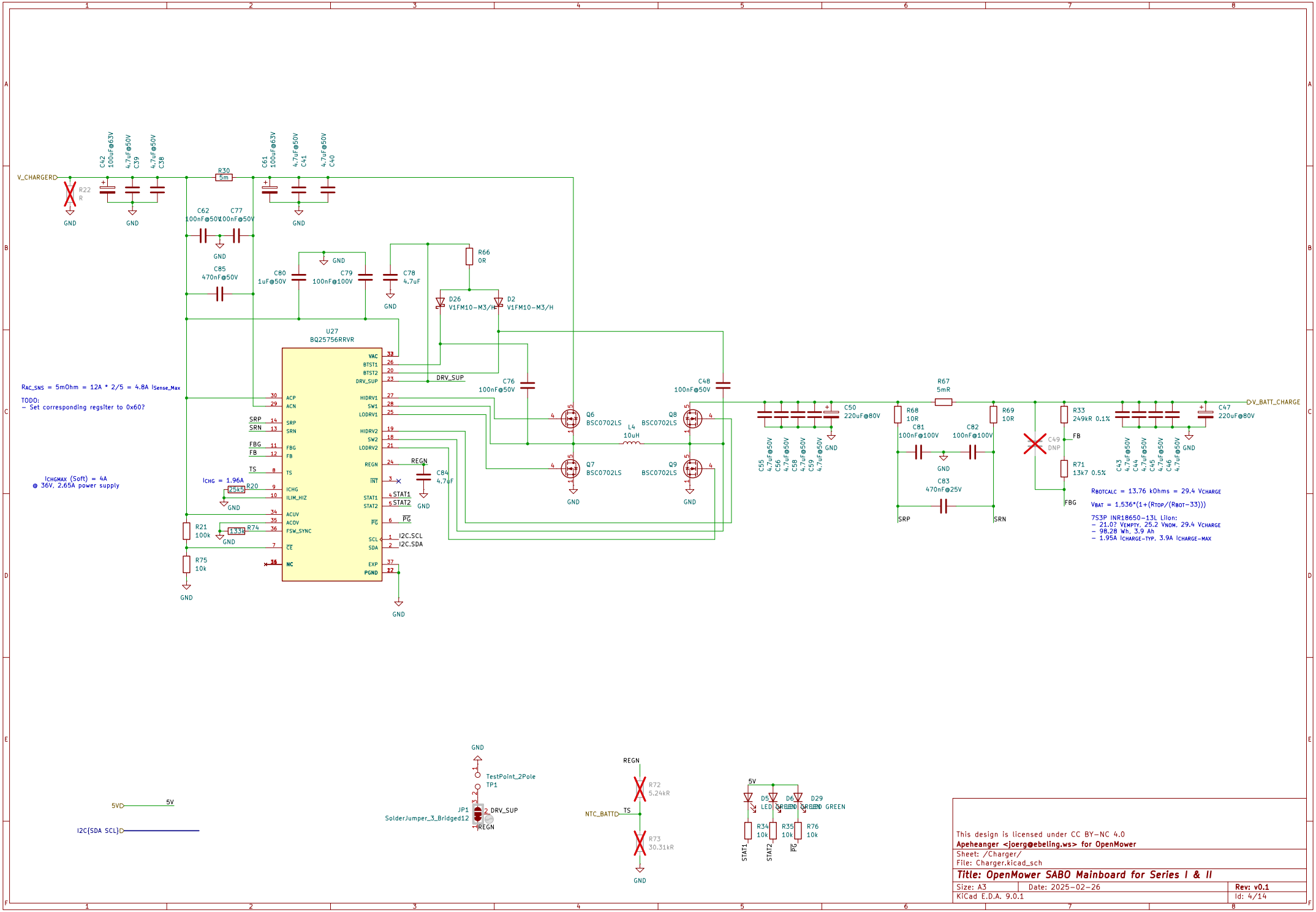
Apeheanger <joerg@ebeling.ws> for OpenMower

Sheet: /DCDC/

File: DCDC.kicad_sch

Title: OpenMower SABO Mainboard for Series I & II

Size: A3	Date: 2025-02-26	Rev: v0.1
KiCad E.D.A. 9.0.1		Id: 3/14



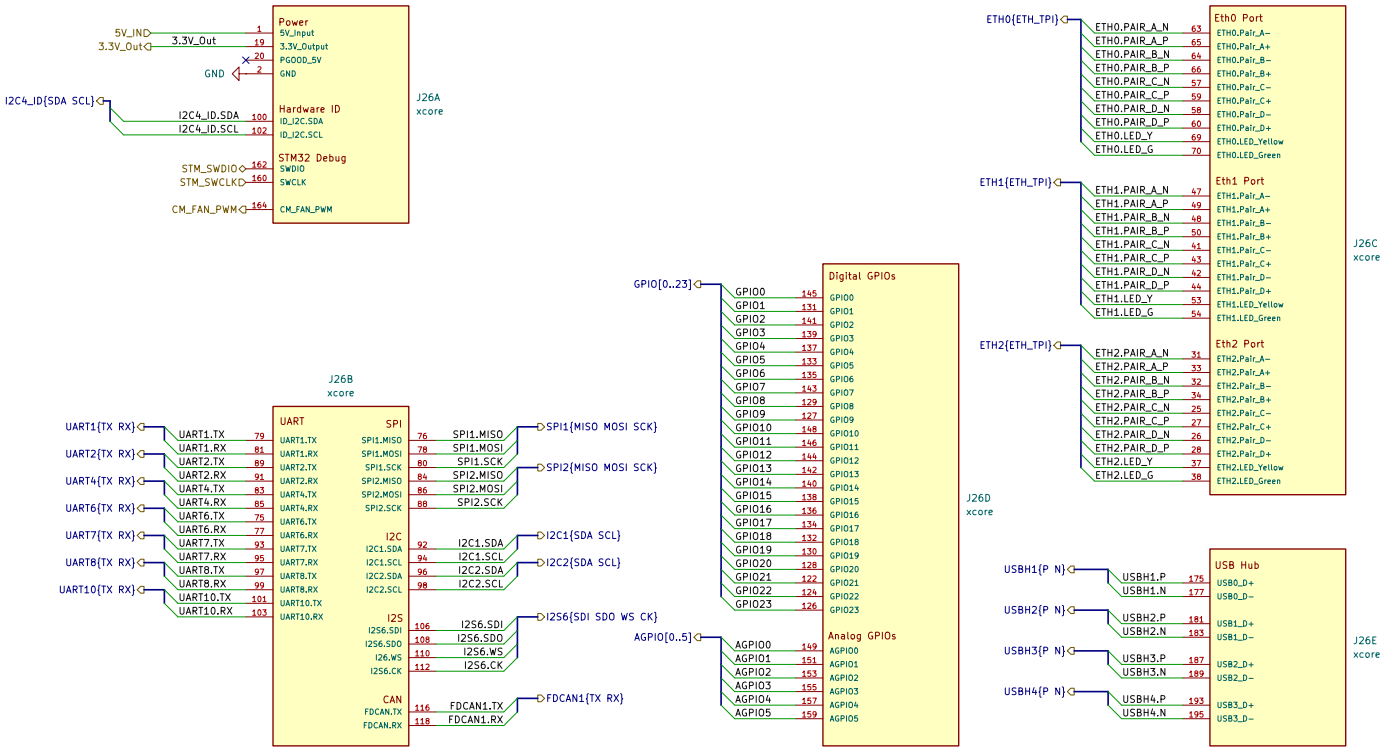
Apeheanger <joerg@ebeling.ws> for OpenMower

Sheet: /Charger/

File: Charger.kicad_sch

Title: OpenMower SABO Mainboard for Series I & II

Size: A3	Date: 2025-02-26	Rev: v0.1
KiCad E.D.A. 9.0.1		Id: 4/14



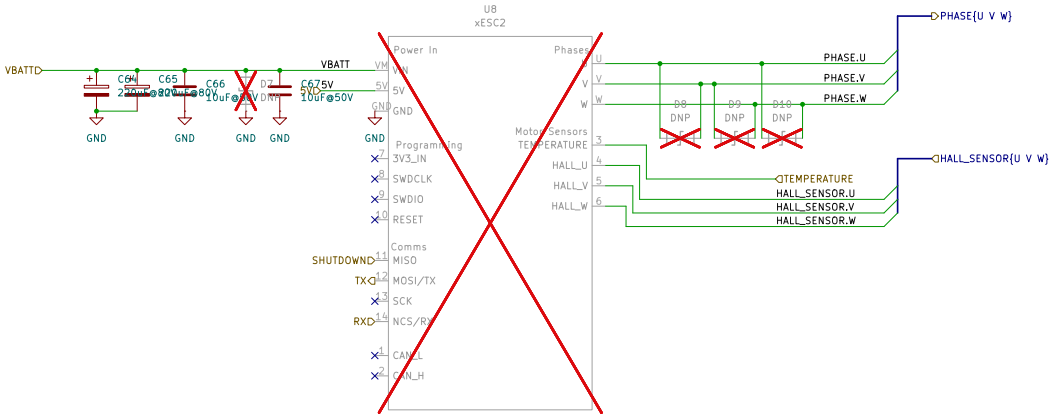
Apeheanger <joerg@ebeling.ws> for OpenMower

Sheet: /Core/

File: Core.kicad_sch

Title: OpenMower SABO Mainboard for Series I & II

Size: A3	Date: 2025-02-26	**Rev: v0.1**
KiCad E.D.A. 9.0.1		Id: 5/14



Dummy Symbol, Only for Assembly	U30 2.54mm 1x6 socket
Dummy Symbol, Only for Assembly	U33 2.54mm 1x6 socket
Dummy Symbol, Only for Assembly	U36 2.54mm 1x9 socket
Dummy Symbol, Only for Assembly	U39 2.54mm 1x5 socket

Dummy Symbol, Only for Assembly	U18 2.54mm 2x2 socket
Dummy Symbol, Only for Assembly	U21 2.54mm 2x2 socket
Dummy Symbol, Only for Assembly	U24 2.54mm 2x2 socket

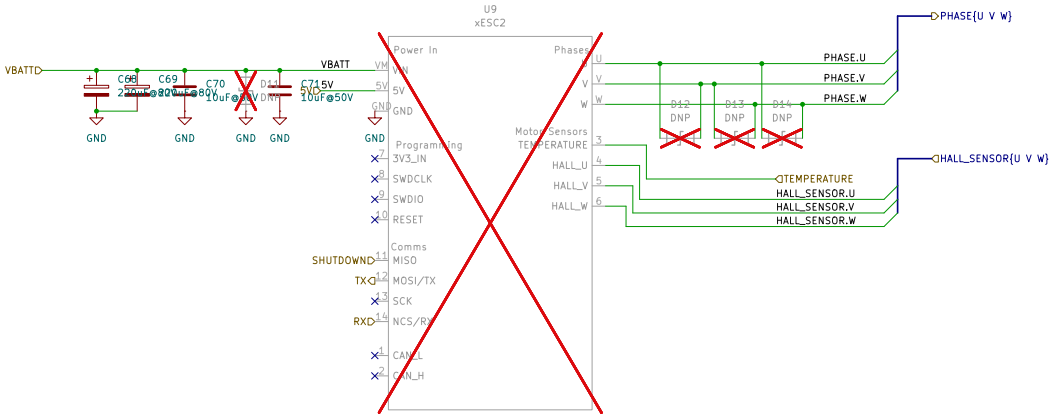
Apeheanger <joerg@ebeling.ws> for OpenMower

Sheet: /xESC/

File: xESC.kicad_sch

Title: OpenMower SABO Mainboard for Series I & II

Size: A3	Date: 2025-02-26	Rev: v0.1
KiCad E.D.A. 9.0.1		Id: 6/14



Dummy Symbol, Only for Assembly	U31 2.54mm 1x6 socket
Dummy Symbol, Only for Assembly	U34 2.54mm 1x6 socket
Dummy Symbol, Only for Assembly	U37 2.54mm 1x9 socket
Dummy Symbol, Only for Assembly	U40 2.54mm 1x5 socket

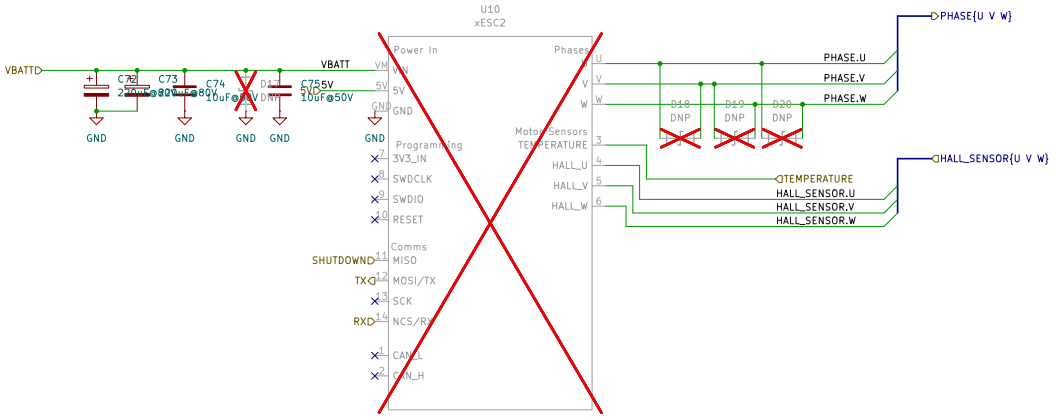
Dummy Symbol, Only for Assembly	U19 2.54mm 2x2 socket
Dummy Symbol, Only for Assembly	U22 2.54mm 2x2 socket
Dummy Symbol, Only for Assembly	U25 2.54mm 2x2 socket

Apeheanger <joerg@ebeling.ws> for OpenMower

Sheet: /xESC1/
File: xESC.kicad_sch

Title: OpenMower SABO Mainboard for Series I & II

Size: A3	Date: 2025-02-26	**Rev: v0.1**
KiCad E.D.A. 9.0.1		Id: 7/14



Dummy Symbol, Only for Assembly	U32 2.54mm 1x6 socket
Dummy Symbol, Only for Assembly	U35 2.54mm 1x6 socket
Dummy Symbol, Only for Assembly	U38 2.54mm 1x9 socket
Dummy Symbol, Only for Assembly	U41 2.54mm 1x5 socket

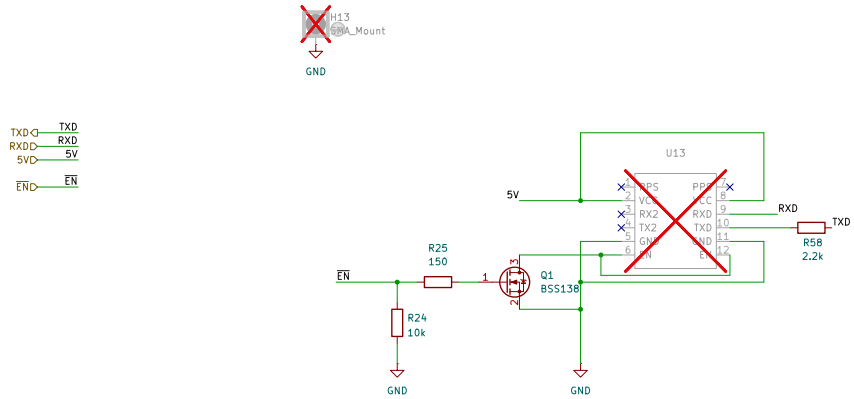
Dummy Symbol, Only for Assembly	U20 2.54mm 2x2 socket
Dummy Symbol, Only for Assembly	U23 2.54mm 2x2 socket
Dummy Symbol, Only for Assembly	U26 2.54mm 2x2 socket

Apeheanger <joerg@ebeling.ws> for OpenMower

Sheet: /xESC2/
File: xESC.kicad_sch

Title: OpenMower SABO Mainboard for Series I & II

Size: A3	Date: 2025-02-26	**Rev: v0.1**
KiCad E.D.A. 9.0.1		Id: 8/14



Dummy Symbol, Only for Assembly

U46
2.54mm 2x6 socket

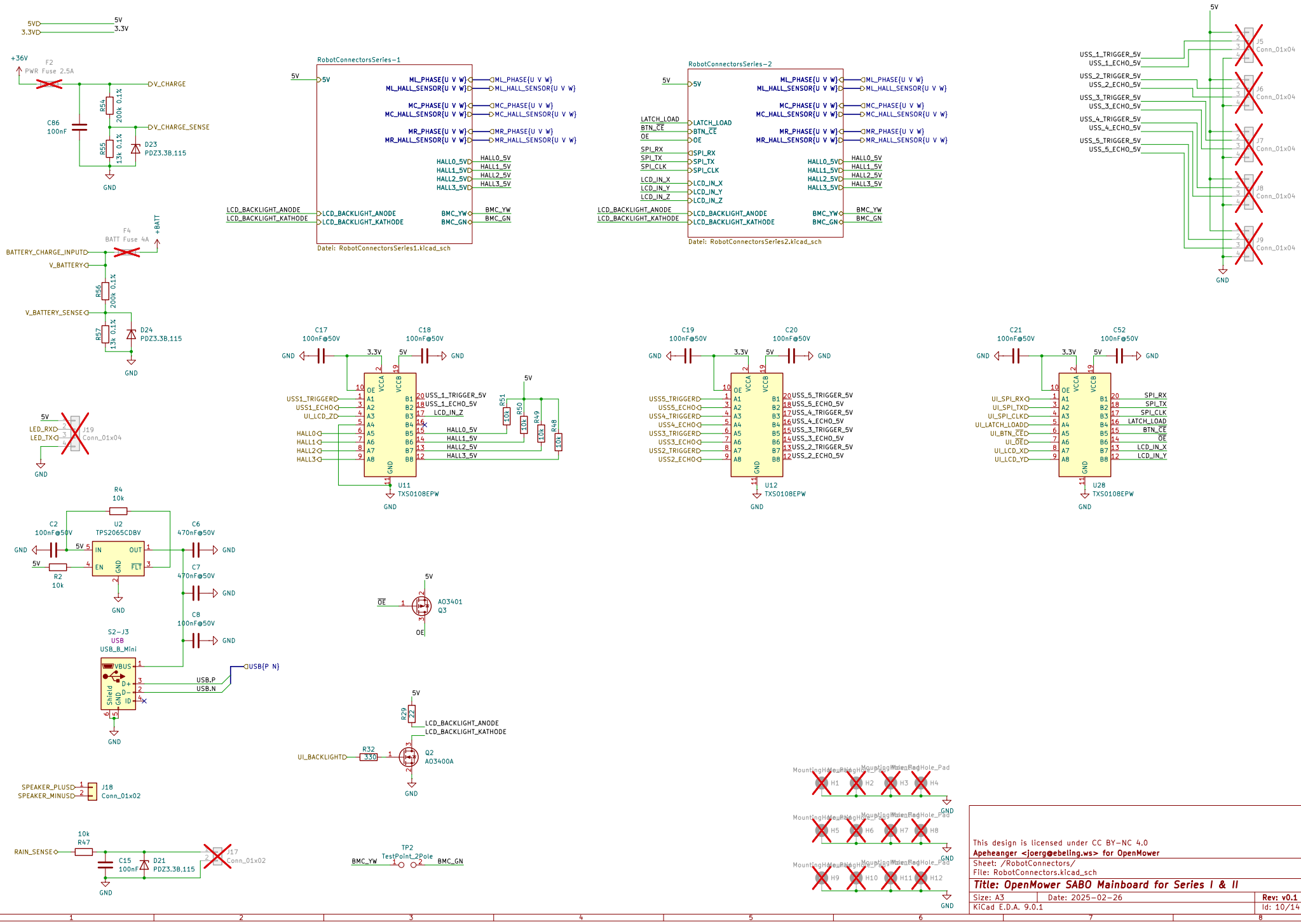
Dummy symbols to generate positions and BOM entries for assembly

Apeheanger <joerg@ebeling.ws> for OpenMower

Sheet: /GPS/
File: GPS.kicad_sch

Title: OpenMower SABO Mainboard for Series I & II

Size: A3	Date: 2025-02-26	**Rev: v0.1**
KiCad E.D.A. 9.0.1		Id: 9/14


5V
3.3V
+36V
F2
PWR Fuse 2.5A
V_CHARGE
V_CHARGE_SENSE
C86
100nF
R54
200k 0.1%
R55
13k 0.1%
D23
PDZ3.3B,115
GND
RobotConnectorsSeries-1
ML_PHASE{U V W}
ML_HALL_SENSOR{U V W}
MC_PHASE{U V W}
MC_HALL_SENSOR{U V W}
MR_PHASE{U V W}
MR_HALL_SENSOR{U V W}
HALL0_5V
HALL1_5V
HALL2_5V
HALL3_5V
LCD_BACKLIGHT_ANODE
LCD_BACKLIGHT_KATHODE
BMC_YW
BMC_GN
Datei: RobotConnectorsSeries1.kicad_sch
RobotConnectorsSeries-2
LATCH_LOAD
BTN_CE
OE
SPI_RX
SPI_TX
SPI_CLK
LCD_IN_X
LCD_IN_Y
LCD_IN_Z
Datei: RobotConnectorsSeries2.kicad_sch
USS_1_TRIGGER_5V
USS_1_ECHO_5V
USS_2_TRIGGER_5V
USS_2_ECHO_5V
USS_3_TRIGGER_5V
USS_3_ECHO_5V
USS_4_TRIGGER_5V
USS_4_ECHO_5V
USS_5_TRIGGER_5V
USS_5_ECHO_5V
J5
J6
J7
J8
J9
Conn_01x04
F4
BATT Fuse 4A
+BATT
BATTERY_CHARGE_INPUT
V_BATTERY
V_BATTERY_SENSE
R56
200k 0.1%
R57
13k 0.1%
D24
PDZ3.3B,115
C17
C18
C19
C20
C21
C52
100nF@50V
U11
U12
U28
TXS0108EPW
USS1_TRIGGER
USS1_ECHO
UI_LCD_Z
LCD_IN_Z
R51
R50
R49
R48
10k
J19
LED_RXD
LED_TXD
R4
C2
C6
C7
C8
U2
TPS2065CDBV
R2
S2-J3
USB
USB_B_Mini
USB.P
USB.N
USB{P N}
Q3
AO3401
R29
220
R32
330
Q2
AO3400A
SPEAKER_PLUSD
SPEAKER_MINUSD
J18
Conn_01x02
RAIN_SENSE
R47
C15
D21
J17
TP2
TestPoint_2Pole
MountingHole_Pad
H1
H2
H3
H4
H5
H6
H7
H8
H9
H10
H11
H12
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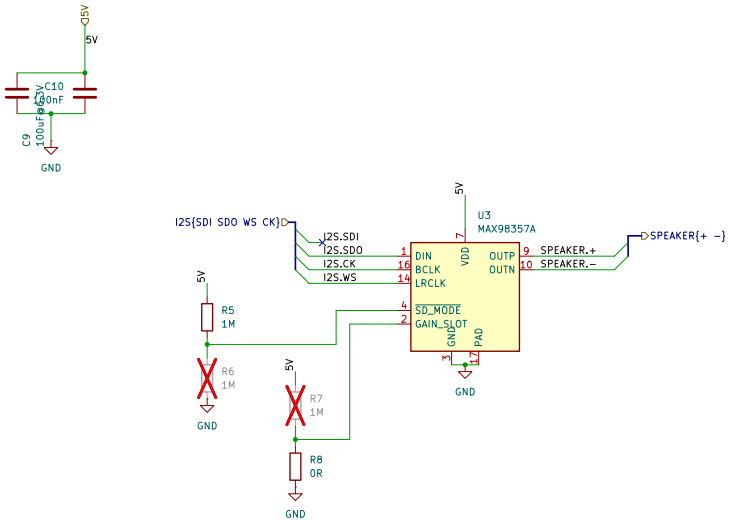
Apeheanger <joerg@ebeling.ws> for OpenMower
Sheet: /RobotConnectors/
File: RobotConnectors.kicad_sch
Title: OpenMower SABO Mainboard for Series I & II
Size: A3
Date: 2025-02-26
Rev: v0.1
KiCad E.D.A. 9.0.1
Id: 10/14



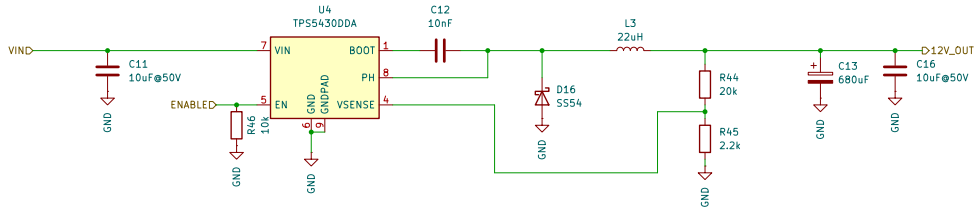
Apeheanger <joerg@ebeling.ws> for OpenMower

Sheet: /Amplifier/

File: Amplifier.kicad_sch

Title: OpenMower SABO Mainboard for Series I & II

Size: A3	Date: 2025-02-26	Rev: v0.1
KiCad E.D.A. 9.0.1		Id: 11/14



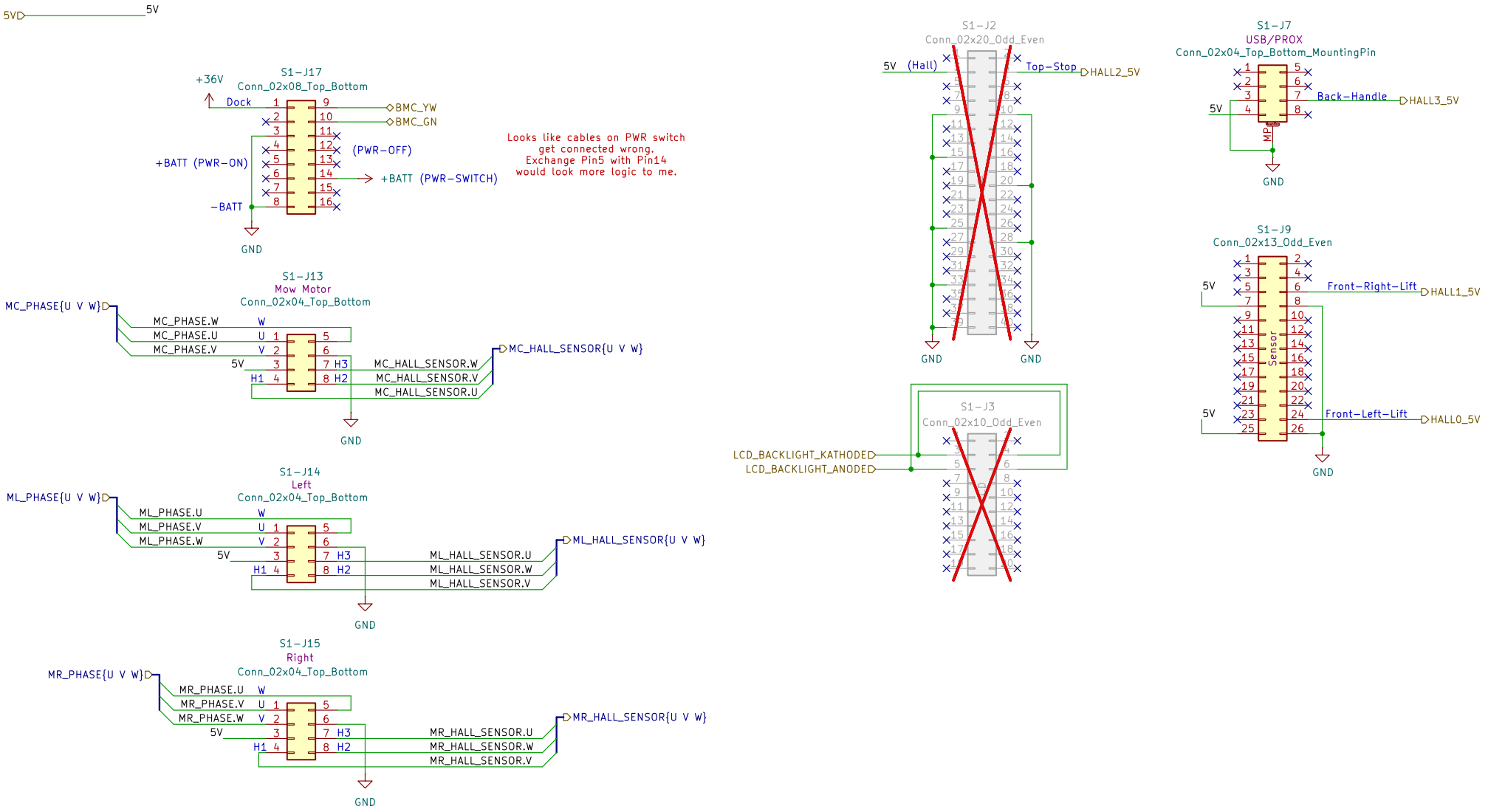
Apeheanger <joerg@ebeling.ws> for OpenMower

Sheet: /AuxPSU/

File: AuxPSU.kicad_sch

Title: OpenMower SABO Mainboard for Series I & II

Size: A3	Date: 2025-02-26	**Rev: v0.1**
KiCad E.D.A. 9.0.1		Id: 12/14

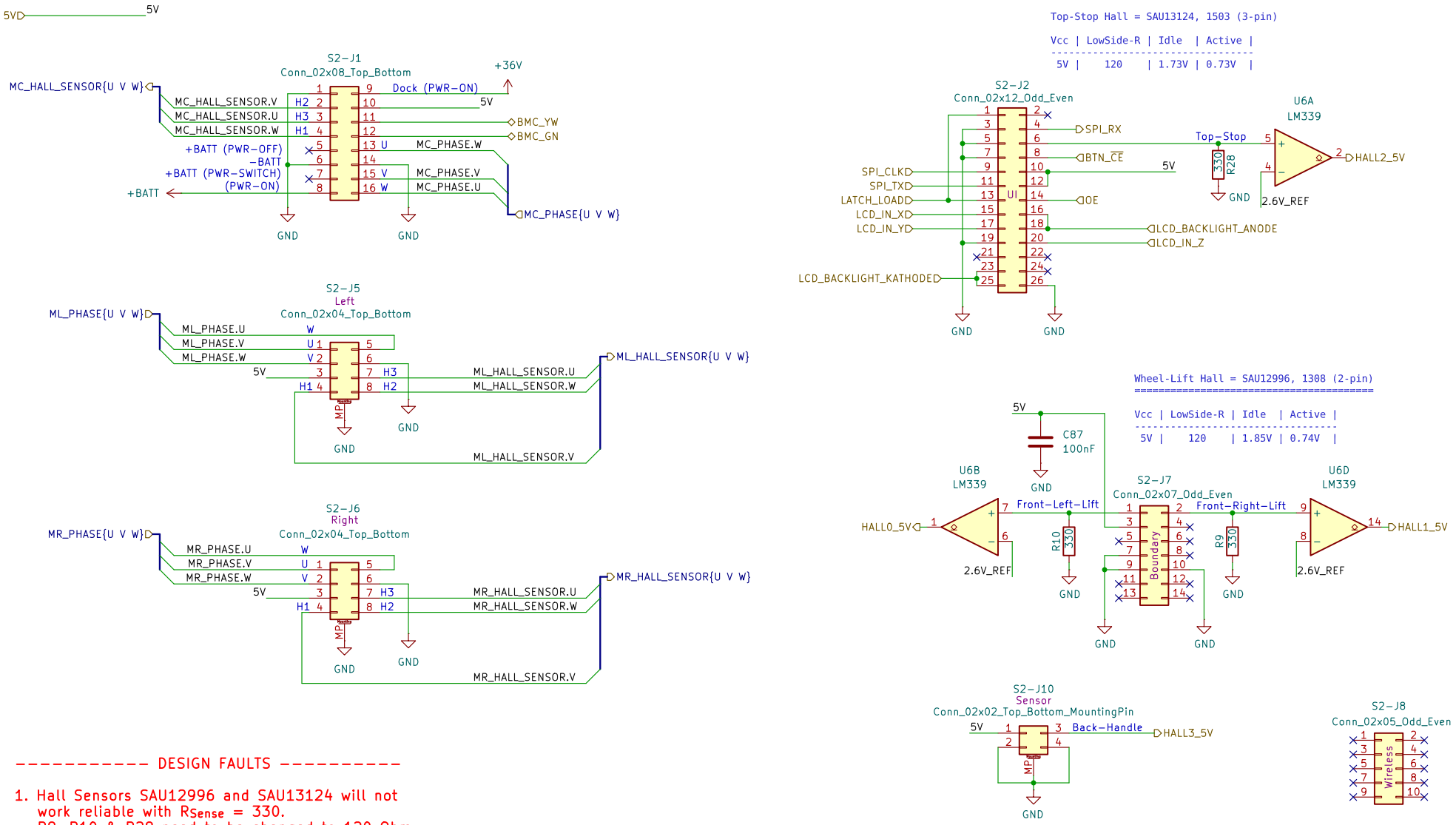


Apeheanger <joerg@ebeling.ws> for OpenMower

Sheet: /RobotConnectors/RobotConnectorsSeries-1/
File: RobotConnectorsSeries1.kicad_sch

Title: OpenMower SABO Mainboard for Series I & II

Size: A4	Date: 2025-02-26	**Rev: v0.1**
KiCad E.D.A. 9.0.1		Id: 13/14


5V
5V
S2-J1
Conn_02x08_Top_Bottom
+36V
MC_HALL_SENSOR{U V W}
MC_HALL_SENSOR.V
MC_HALL_SENSOR.U
MC_HALL_SENSOR.W
+BATT (PWR-OFF)
-BATT
+BATT (PWR-SWITCH)
(PWR-ON)
+BATT
Dock (PWR-ON)
5V
BMC_YW
BMC_GN
MC_PHASE.W
MC_PHASE.V
MC_PHASE.U
MC_PHASE{U V W}
GND
GND
Top-Stop Hall = SAU13124, 1503 (3-pin)
Vcc | LowSide-R | Idle | Active |
5V | 120 | 1.73V | 0.73V |
S2-J2
Conn_02x12_Odd_Even
U6A
LM339
SPI_RX
BTN_CE
SPI_CLK
SPI_TX
LATCH_LOAD
LCD_IN_X
LCD_IN_Y
OE
LCD_BACKLIGHT_ANODE
LCD_IN_Z
LCD_BACKLIGHT_KATHODE
Top-Stop
R28
330
HALL2_5V
2.6V_REF
GND
GND
S2-J5
Left
Conn_02x04_Top_Bottom
ML_PHASE{U V W}
ML_PHASE.U
ML_PHASE.V
ML_PHASE.W
ML_HALL_SENSOR.U
ML_HALL_SENSOR.W
ML_HALL_SENSOR.V
ML_HALL_SENSOR{U V W}
GND
GND
Wheel-Lift Hall = SAU12996, 1308 (2-pin)
Vcc | LowSide-R | Idle | Active |
5V | 120 | 1.85V | 0.74V |
C87
100nF
U6B
LM339
U6D
LM339
S2-J7
Conn_02x07_Odd_Even
Front-Left-Lift
Front-Right-Lift
HALL0_5V
HALL1_5V
R10
330
R9
330
Boundary
2.6V_REF
2.6V_REF
GND
GND
GND
S2-J6
Right
Conn_02x04_Top_Bottom
MR_PHASE{U V W}
MR_PHASE.U
MR_PHASE.V
MR_PHASE.W
MR_HALL_SENSOR.U
MR_HALL_SENSOR.W
MR_HALL_SENSOR.V
MR_HALL_SENSOR{U V W}
GND
GND
S2-J10
Sensor
Conn_02x02_Top_Bottom_MountingPin
Back-Handle
HALL3_5V
GND
S2-J8
Conn_02x05_Odd_Even
Wireless
----------- DESIGN FAULTS -----------
1. Hall Sensors SAU12996 and SAU13124 will not work reliable with RSense = 330. R9, R10 & R28 need to be changed to 120 Ohm.
2. In consequence of 1. R23 need to be changed to 3k3 to get a VRef of 1.24V
3. Comparator VRef inputs Pin 4, 6 & 8 need an 100k R in series so that an oscillation comparator doesn't affect VRef.
4. The unused "C" comparator need to get an 10k pull-up on "-" input and a 10k pull-down on "+" input. Otherwise it tend to oscillate.
U6C
LM339
5V
R27
10k
2.6V_REF
R23
11k
GND
5V
C53
100nF
U6E
LM339
GND
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Apeheanger <joerg@ebeling.ws> for OpenMower
Sheet: /RobotConnectors/RobotConnectorsSeries-2/
File: RobotConnectorsSeries2.kicad_sch
Title: OpenMower SABO Mainboard for Series I & II
Size: A4
Date: 2025-02-26
Rev: v0.1
KiCad E.D.A. 9.0.1
Id: 14/14