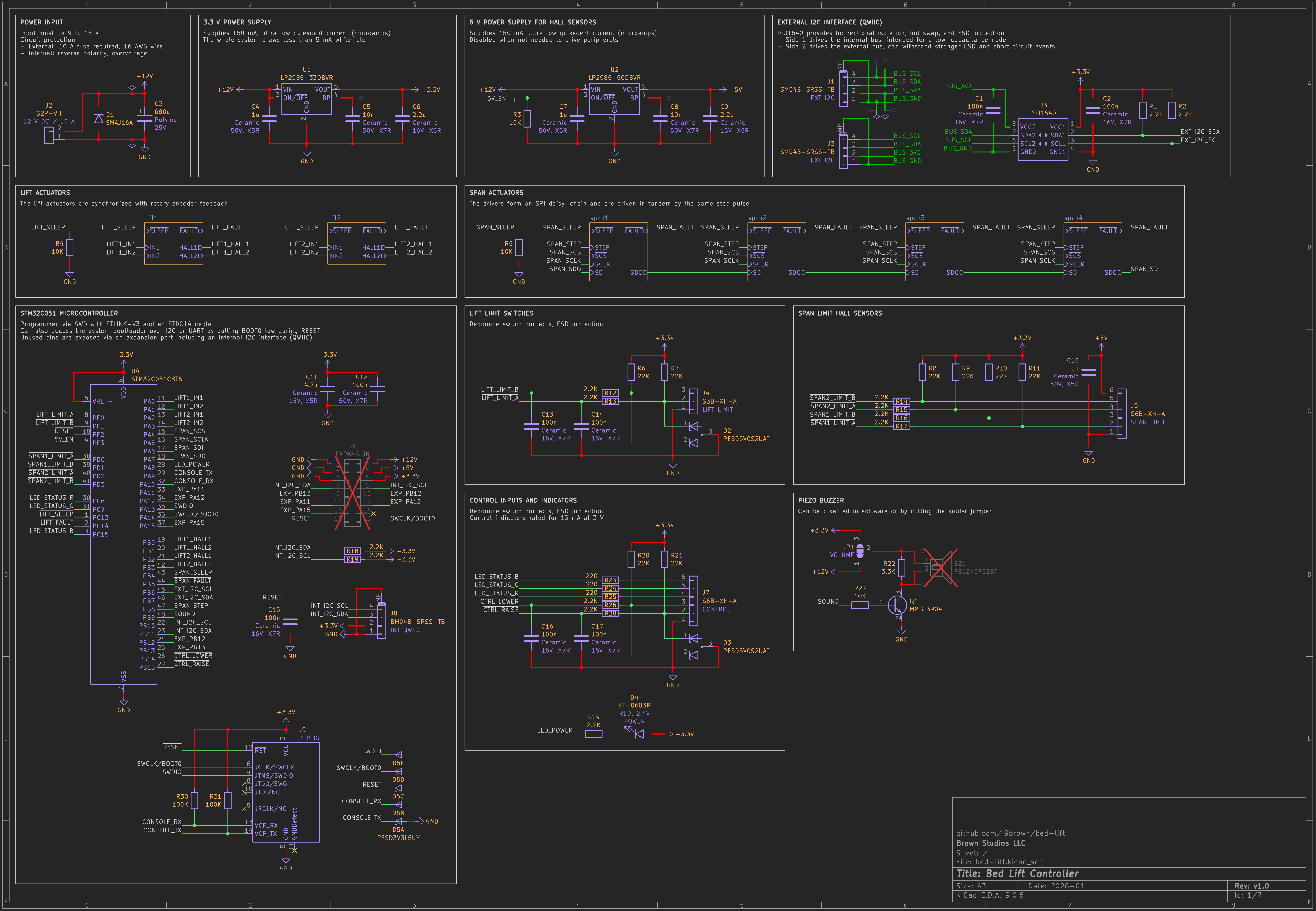


1
2
3
4
5
6
7
8
A
B
C
D
E
F
J2
S2P-VH
12 V DC / 10 A
D1
SMAJ16A
C3
680u
Polymer
25V
+12V
GND
U1
LP2985-33DBVR
VIN
VOUT
ON/OFF
BP
GND
C4
1u
Ceramic
50V, X5R
C5
10n
Ceramic
50V, X7R
C6
2.2u
Ceramic
16V, X5R
+3.3V
U2
LP2985-50DBVR
5V_EN
R3
10K
C7
1u
C8
10n
C9
2.2u
+5V
J1
SM04B-SRSS-TB
EXT I2C
J3
SM04B-SRSS-TB
EXT I2C
BUS_SCL
BUS_SDA
BUS_3V3
BUS_GND
C1
100n
Ceramic
16V, X7R
U3
ISO1640
VCC2
SDA2
SCL2
GND2
VCC1
SDA1
SCL1
GND1
C2
100n
Ceramic
16V, X7R
R1
2.2K
R2
2.2K
EXT_I2C_SDA
EXT_I2C_SCL
LIFT_SLEEP
R4
10K
lift1
SLEEP
FAULT
IN1
IN2
HALL1
HALL2
LIFT1_IN1
LIFT1_IN2
LIFT_FAULT
LIFT1_HALL1
LIFT1_HALL2
lift2
LIFT2_IN1
LIFT2_IN2
LIFT2_HALL1
LIFT2_HALL2
SPAN_SLEEP
R5
10K
span1
span2
span3
span4
STEP
SCS
SCLK
SDI
SDO
SPAN_STEP
SPAN_SCS
SPAN_SCLK
SPAN_SDO
SPAN_SDI
SPAN_FAULT
U4
STM32C051C8T6
VDD
VREF+
VSS
PF0
PF1
PF2
PF3
PD0
PD1
PD2
PD3
PC6
PC7
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
LIFT_LIMIT_A
LIFT_LIMIT_B
RESET
5V_EN
SPAN1_LIMIT_A
SPAN1_LIMIT_B
SPAN2_LIMIT_A
SPAN2_LIMIT_B
LED_STATUS_R
LED_STATUS_G
LIFT_SLEEP
LIFT_FAULT
LED_STATUS_B
LED_POWER
CONSOLE_TX
CONSOLE_RX
EXP_PA11
EXP_PA12
SWDIO
SWCLK/BOOT0
EXP_PA15
EXT_I2C_SCL
EXT_I2C_SDA
SOUND
INT_I2C_SCL
INT_I2C_SDA
EXP_PB12
EXP_PB13
CTRL_LOWER
CTRL_RAISE
C11
4.7u
Ceramic
16V, X5R
C12
100n
Ceramic
50V, X7R
J6
EXPANSION
INT_I2C_SDA
EXP_PB13
EXP_PA11
EXP_PA15
R18
R19
2.2K
C15
100n
Ceramic
16V, X7R
J8
BM04B-SRSS-TB
INT QWIIC
J9
DEBUG
RST
VCC
JCLK/SWCLK
JTMS/SWDIO
JTDO/SWO
JTDI/NC
JRCLK/NC
VCP_RX
VCP_TX
GND
GNDDetect
R30
100K
R31
100K
D5E
D5D
D5C
D5B
D5A
PESD3V3L5UY
R6
22K
R7
22K
R12
R13
C13
100n
Ceramic
16V, X7R
C14
100n
Ceramic
16V, X7R
J4
S3B-XH-A
LIFT LIMIT
D2
PESD5V0S2UAT
R8
22K
R9
22K
R10
22K
R11
22K
C10
1u
Ceramic
50V, X5R
R14
R15
R16
R17
J5
S6B-XH-A
SPAN LIMIT
R20
22K
R21
22K
R23
R24
R25
220
R26
R27
R28
2.2K
C16
100n
C17
100n
J7
S6B-XH-A
CONTROL
D3
PESD5V0S2UAT
D4
KT-0603R
RED, 2.4V
POWER
R29
2.2K
JP1
VOLUME
R22
3.3K
BZ1
PS1240P02BT
R27
10K
Q1
MMBT3904

POWER INPUT

Input must be 9 to 16 V
Circuit protection
- External: 10 A fuse required, 16 AWG wire
- Internal: reverse polarity, overvoltage

3.3 V POWER SUPPLY

Supplies 150 mA, ultra low quiescent current (microamps)
The whole system draws less than 5 mA while idle

5 V POWER SUPPLY FOR HALL SENSORS

Supplies 150 mA, ultra low quiescent current (microamps)
Disabled when not needed to drive peripherals

EXTERNAL I2C INTERFACE (QWIIC)

ISO1640 provides bidirectional isolation, hot swap, and ESD protection
- Side 1 drives the internal bus, intended for a low-capacitance node
- Side 2 drives the external bus, can withstand stronger ESD and short circuit events

LIFT ACTUATORS

The lift actuators are synchronized with rotary encoder feedback

SPAN ACTUATORS

The drivers form an SPI daisy-chain and are driven in tandem by the same step pulse

STM32C051 MICROCONTROLLER

Programmed via SWD with STLINK-V3 and an STDC14 cable
Can also access the system bootloader over I2C or UART by pulling BOOT0 low during RESET
Unused pins are exposed via an expansion port including an internal I2C interface (QWIIC)

LIFT LIMIT SWITCHES

Debounce switch contacts, ESD protection

SPAN LIMIT HALL SENSORS

CONTROL INPUTS AND INDICATORS

Debounce switch contacts, ESD protection
Control indicators rated for 15 mA at 3 V

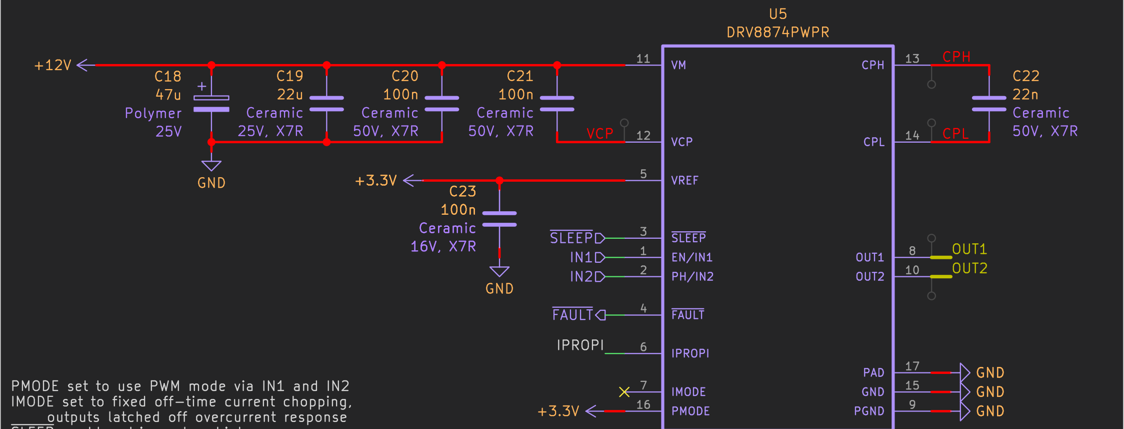
PIEZO BUZZER

Can be disabled in software or by cutting the solder jumper

github.com/j9brown/bed-lift
Brown Studios LLC
Sheet: /
File: bed-lift.kicad_sch
Title: Bed Lift Controller
Size: A3 Date: 2026-01 **Rev: v1.0**
KiCad E.D.A. 9.0.6 Id: 1/7

LIFT ACTUATOR MOTOR DRIVER

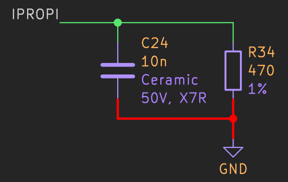
Designed for 12 V DC motor load up to 3 A (driver is rated for 6 A peak)


U5
DRV8874PWPR
+12V
C18
47u
Polymer
25V
C19
22u
Ceramic
25V, X7R
C20
100n
Ceramic
50V, X7R
C21
100n
Ceramic
50V, X7R
VCP
GND
+3.3V
C23
100n
Ceramic
16V, X7R
GND
$\overline{\mathrm{SLEEP}}$
IN1
IN2
$\overline{\mathrm{FAULT}}$
IPROPI
+3.3V
11 VM
12 VCP
5 VREF
3 $\overline{\mathrm{SLEEP}}$
1 EN/IN1
2 PH/IN2
4 $\overline{\mathrm{FAULT}}$
6 IPROPI
7 IMODE
16 PMODE
13 CPH
14 CPL
8 OUT1
10 OUT2
17 PAD
15 GND
9 PGND
CPH
CPL
C22
22n
Ceramic
50V, X7R
OUT1
OUT2
GND
GND
GND

PMODE set to use PWM mode via IN1 and IN2
IMODE set to fixed off-time current chopping,
outputs latched off overcurrent response
$\overline{\mathrm{SLEEP}}$ enables driver when high
$\overline{\mathrm{FAULT}}$ is open-drain

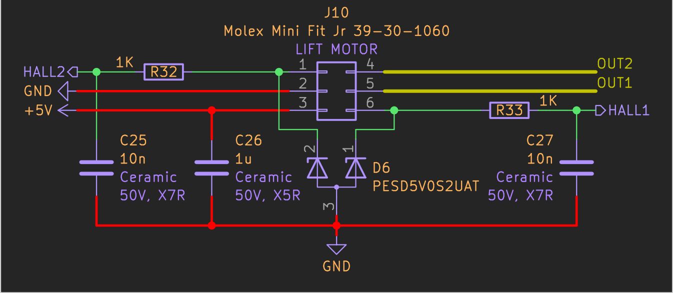
CURRENT LIMIT

Set overcurrent protection trip current
Itrip (A) = 450 * Vref (V) / Ripropi (Ω)
Given Vref = 3.3 V, Ripropi = 470 Ω, Itrip = 3.16 A


IPROPI
C24
10n
Ceramic
50V, X7R
R34
470
1%
GND

CONNECTOR FOR PA-09 LINEAR ACTUATOR

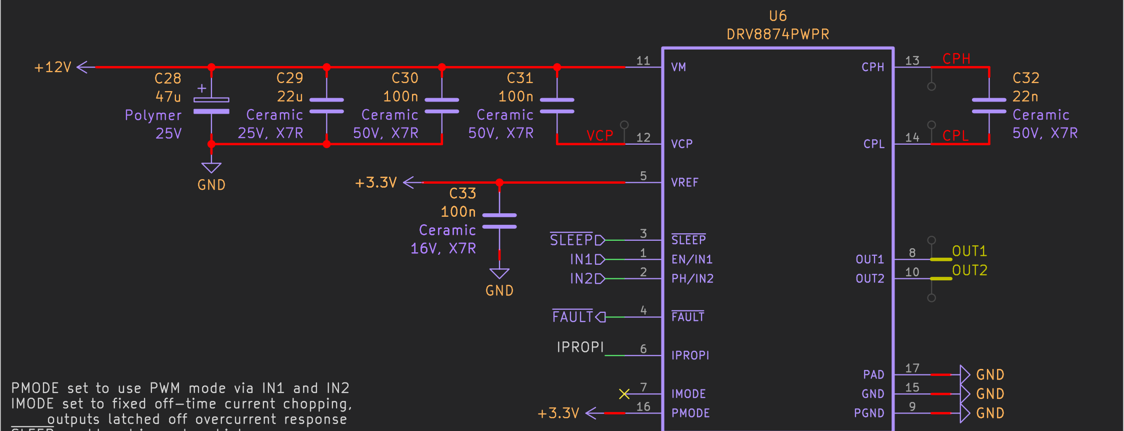
The hall sensor outputs are push-pull at 5 V, RC filter cutoff at 15.9 kHz


J10
Molex Mini Fit Jr 39-30-1060
LIFT MOTOR
HALL2
GND
+5V
1K
R32
1
2
3
4
5
6
OUT2
OUT1
1K
R33
HALL1
C25
10n
Ceramic
50V, X7R
C26
1u
Ceramic
50V, X5R
2
1
3
D6
PESD5V0S2UAT
C27
10n
Ceramic
50V, X7R
GND

github.com/j9brown/bed-lift
Brown Studios LLC
Sheet: /lift1/
File: lift.kicad_sch
Title: Bed Lift Controller
Size: A4 Date: 2026-01 **Rev: v1.0**
KiCad E.D.A. 9.0.6 Id: 2/7

LIFT ACTUATOR MOTOR DRIVER

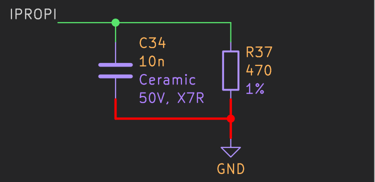
Designed for 12 V DC motor load up to 3 A (driver is rated for 6 A peak)


U6
DRV8874PWPR
+12V
C28
47u
Polymer
25V
C29
22u
Ceramic
25V, X7R
C30
100n
Ceramic
50V, X7R
C31
100n
Ceramic
50V, X7R
GND
VCP
+3.3V
C33
100n
Ceramic
16V, X7R
GND
SLEEP
IN1
IN2
FAULT
IPROPI
+3.3V
11 VM
12 VCP
5 VREF
3 SLEEP
1 EN/IN1
2 PH/IN2
4 FAULT
6 IPROPI
7 IMODE
16 PMODE
CPH 13
CPL 14
OUT1 8
OUT2 10
PAD 17
GND 15
PGND 9
CPH
CPL
C32
22n
Ceramic
50V, X7R
OUT1
OUT2
GND
GND
GND

PMODE set to use PWM mode via IN1 and IN2
IMODE set to fixed off-time current chopping,
outputs latched off overcurrent response
SLEEP enables driver when high
FAULT is open-drain

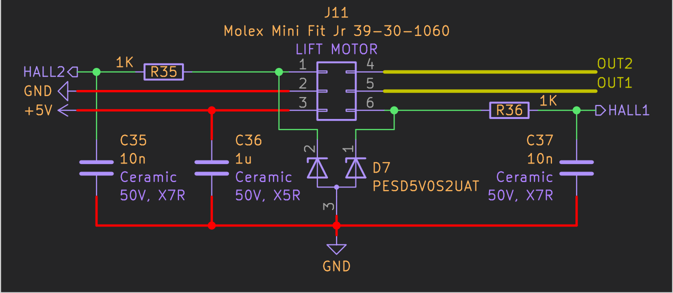
CURRENT LIMIT

Set overcurrent protection trip current
Itrip (A) = 450 * Vref (V) / Ripropi (Ω)
Given Vref = 3.3 V, Ripropi = 470 Ω, Itrip = 3.16 A


IPROPI
C34
10n
Ceramic
50V, X7R
R37
470
1%
GND

CONNECTOR FOR PA-09 LINEAR ACTUATOR

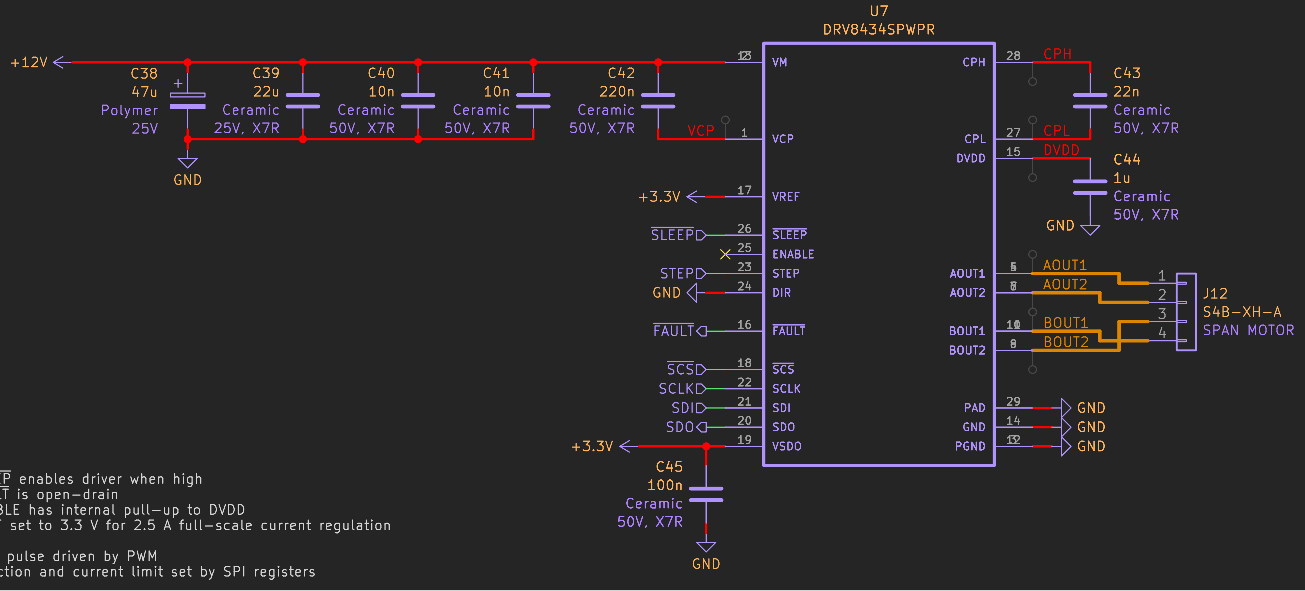
The hall sensor outputs are push-pull at 5 V, RC filter cutoff at 15.9 kHz


J11
Molex Mini Fit Jr 39-30-1060
LIFT MOTOR
HALL2
GND
+5V
1K
R35
1
2
3
4
5
6
OUT2
OUT1
R36
1K
HALL1
C35
10n
Ceramic
50V, X7R
C36
1u
Ceramic
50V, X5R
2
1
3
D7
PESD5V0S2UAT
C37
10n
Ceramic
50V, X7R
GND

github.com/j9brown/bed-lift
Brown Studios LLC
Sheet: /lift2/
File: lift.kicad_sch
Title: Bed Lift Controller
Size: A4
Date: 2026-01
Rev: v1.0
KiCad E.D.A. 9.0.6
Id: 3/7

SPAN ACTUATOR MOTOR DRIVER

Designed for 12 V DC stepper motor load up to 1.8 A rms


U7
DRV8434SPWPR
+12V
C38
47u
Polymer
25V
C39
22u
Ceramic
25V, X7R
C40
10n
Ceramic
50V, X7R
C41
10n
Ceramic
50V, X7R
C42
220n
Ceramic
50V, X7R
GND
VCP
VM
VCP
VREF
+3.3V
SLEEP
ENABLE
STEP
DIR
GND
FAULT
SCS
SCLK
SDI
SDO
VSDO
+3.3V
C45
100n
Ceramic
50V, X7R
GND
CPH
CPL
DVDD
C43
22n
Ceramic
50V, X7R
C44
1u
Ceramic
50V, X7R
GND
AOUT1
AOUT2
BOUT1
BOUT2
J12
S4B-XH-A
SPAN MOTOR
PAD
GND
PGND
GND
GND
GND

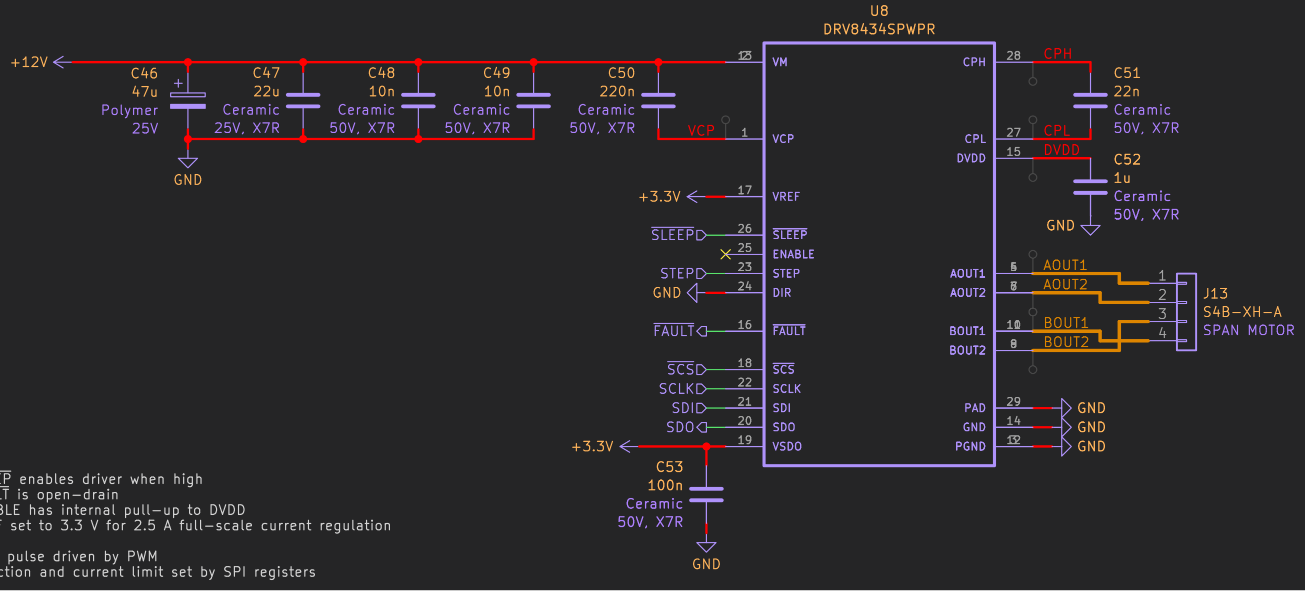
$\overline{\text{SLEEP}}$ enables driver when high
$\overline{\text{FAULT}}$ is open-drain
ENABLE has internal pull-up to DVDD
VREF set to 3.3 V for 2.5 A full-scale current regulation

Step pulse driven by PWM
Direction and current limit set by SPI registers

github.com/j9brown/bed-lift
Brown Studios LLC
Sheet: /span1/
File: span.kicad_sch
Title: Bed Lift Controller
Size: A4
Date: 2026-01
Rev: v1.0
KiCad E.D.A. 9.0.6
Id: 4/7

SPAN ACTUATOR MOTOR DRIVER

Designed for 12 V DC stepper motor load up to 1.8 A rms


U8
DRV8434SPWPR
+12V
C46
47u
Polymer
25V
C47
22u
Ceramic
25V, X7R
C48
10n
Ceramic
50V, X7R
C49
10n
Ceramic
50V, X7R
C50
220n
Ceramic
50V, X7R
GND
VCP
VM
VCP
VREF
+3.3V
SLEEP
ENABLE
STEP
DIR
FAULT
SCS
SCLK
SDI
SDO
VSDO
+3.3V
C53
100n
Ceramic
50V, X7R
GND
CPH
CPL
DVDD
C51
22n
Ceramic
50V, X7R
C52
1u
Ceramic
50V, X7R
GND
AOUT1
AOUT2
BOUT1
BOUT2
J13
S4B-XH-A
SPAN MOTOR
PAD
GND
PGND
GND
GND
GND

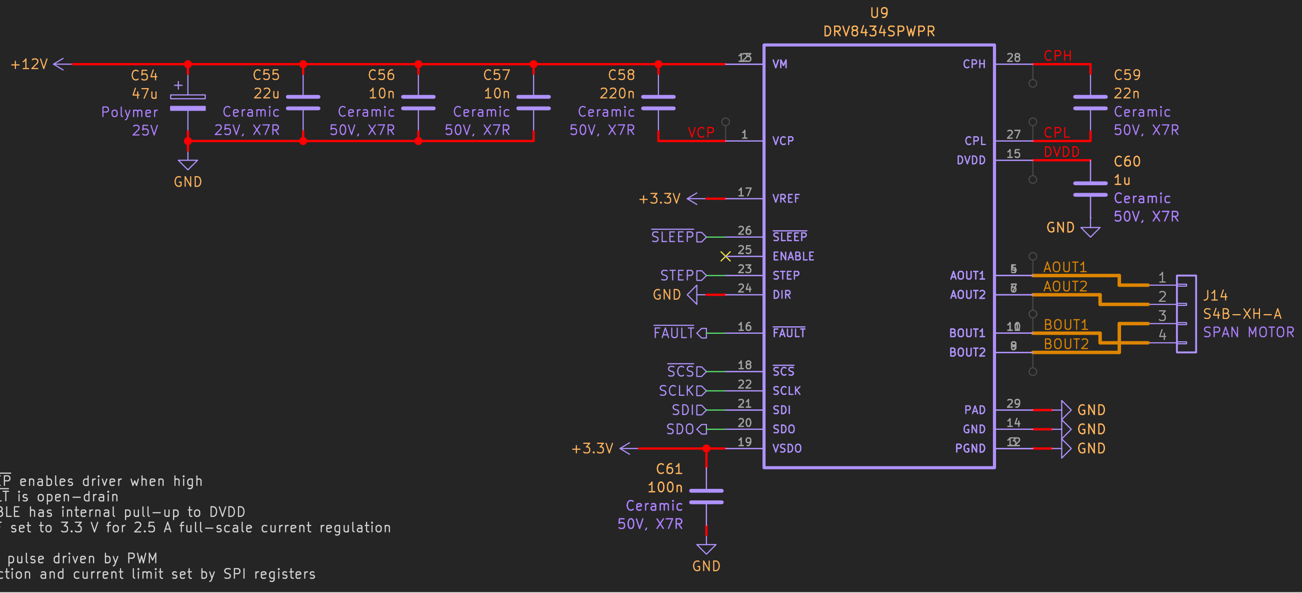
SLEEP enables driver when high
FAULT is open–drain
ENABLE has internal pull–up to DVDD
VREF set to 3.3 V for 2.5 A full–scale current regulation

Step pulse driven by PWM
Direction and current limit set by SPI registers

github.com/j9brown/bed–lift
Brown Studios LLC
Sheet: /span2/
File: span.kicad_sch
Title: Bed Lift Controller
Size: A4
Date: 2026–01
Rev: v1.0
KiCad E.D.A. 9.0.6
Id: 5/7

SPAN ACTUATOR MOTOR DRIVER

Designed for 12 V DC stepper motor load up to 1.8 A rms


U9
DRV8434SPWPR
+12V
C54
47u
Polymer
25V
C55
22u
Ceramic
25V, X7R
C56
10n
Ceramic
50V, X7R
C57
10n
Ceramic
50V, X7R
C58
220n
Ceramic
50V, X7R
GND
VCP
VM
VCP
VREF
SLEEP
ENABLE
STEP
DIR
FAULT
SCS
SCLK
SDI
SDO
VSDO
+3.3V
SLEEP
STEP
GND
FAULT
SCS
SCLK
SDI
SDO
+3.3V
C61
100n
Ceramic
50V, X7R
GND
CPH
CPL
DVDD
AOUT1
AOUT2
BOUT1
BOUT2
PAD
GND
PGND
CPH
CPL
DVDD
C59
22n
Ceramic
50V, X7R
C60
1u
Ceramic
50V, X7R
GND
AOUT1
AOUT2
BOUT1
BOUT2
J14
S4B-XH-A
SPAN MOTOR
GND
GND
GND

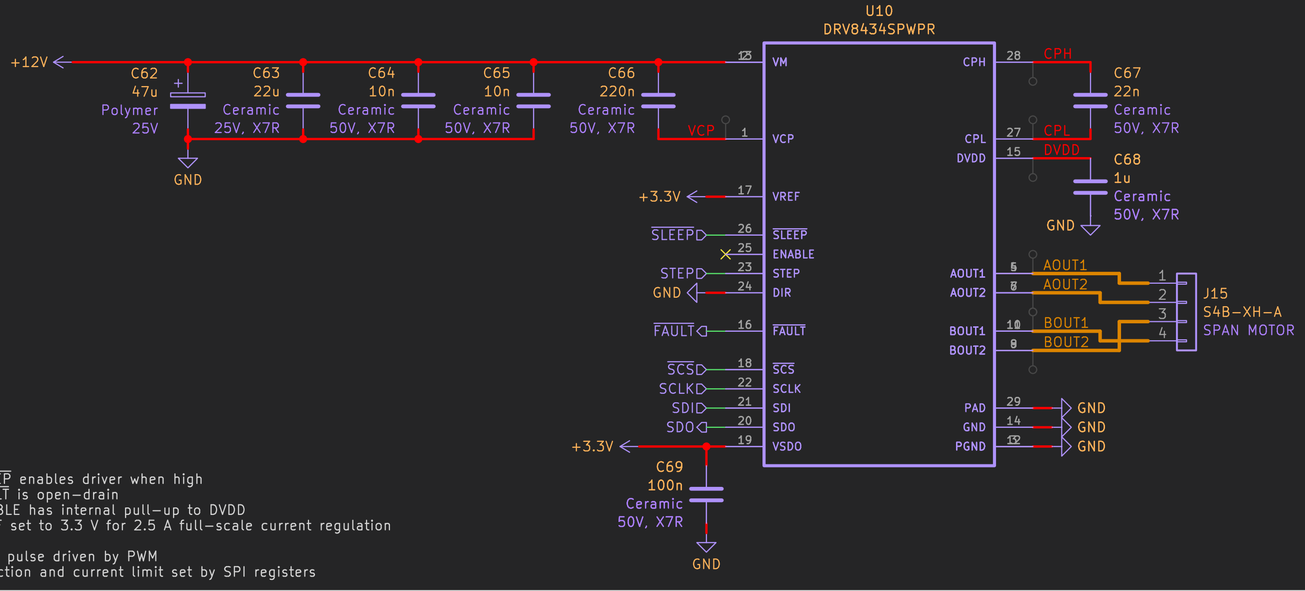
SLEEP enables driver when high
FAULT is open-drain
ENABLE has internal pull-up to DVDD
VREF set to 3.3 V for 2.5 A full-scale current regulation

Step pulse driven by PWM
Direction and current limit set by SPI registers

github.com/j9brown/bed-lift
Brown Studios LLC
Sheet: /span3/
File: span.kicad_sch
Title: Bed Lift Controller
Size: A4 Date: 2026-01 **Rev: v1.0**
KiCad E.D.A. 9.0.6 Id: 6/7

SPAN ACTUATOR MOTOR DRIVER

Designed for 12 V DC stepper motor load up to 1.8 A rms



U10
DRV8434SPWPR
+12V
C62
47u
Polymer
25V
C63
22u
Ceramic
25V, X7R
C64
10n
Ceramic
50V, X7R
C65
10n
Ceramic
50V, X7R
C66
220n
Ceramic
50V, X7R
GND
VCP
VM
VCP
+3.3V
VREF
SLEEP
ENABLE
STEP
DIR
GND
FAULT
SCS
SCLK
SDI
SDO
VSDO
+3.3V
C69
100n
Ceramic
50V, X7R
GND
CPH
CPL
DVDD
C67
22n
Ceramic
50V, X7R
C68
1u
Ceramic
50V, X7R
GND
AOUT1
AOUT2
BOUT1
BOUT2
J15
S4B-XH-A
SPAN MOTOR
PAD
GND
PGND
GND
GND
GND
1
2
3
4
28
27
15
17
26
25
23
24
16
18
22
21
20
19
29
14

SLEEP enables driver when high
FAULT is open-drain
ENABLE has internal pull-up to DVDD
VREF set to 3.3 V for 2.5 A full-scale current regulation

Step pulse driven by PWM
Direction and current limit set by SPI registers

github.com/j9brown/bed-lift
Brown Studios LLC
Sheet: /span4/
File: span.kicad_sch
Title: Bed Lift Controller
Size: A4 Date: 2026-01 **Rev: v1.0**
KiCad E.D.A. 9.0.6 Id: 7/7