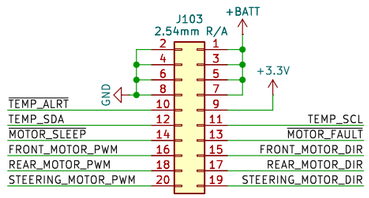
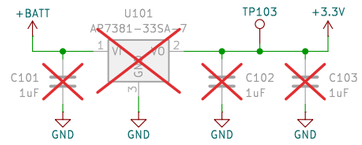
BATTERY CONNECTOR(s)

REPLACE WITH HIGH CURRENT RATED PART?

I/O CONNECTOR

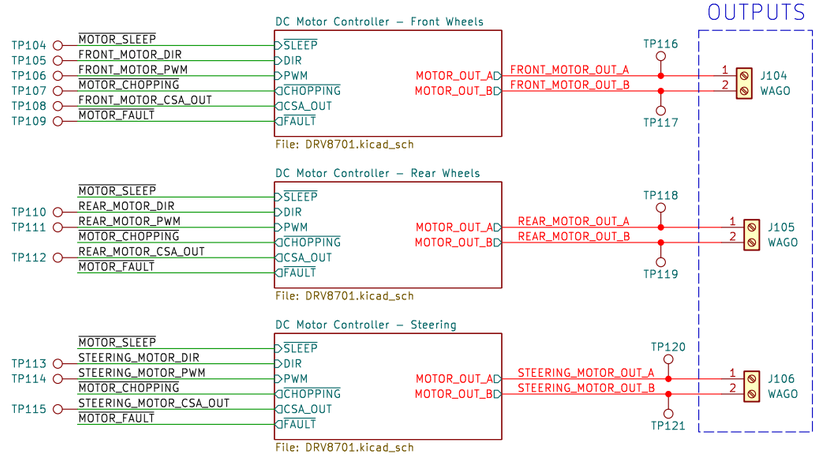


3.3V REGULATOR (OPTIONAL)

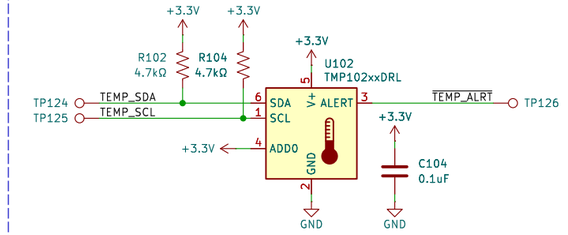


This regulator can be DNP if 3.3V is supplied externally.

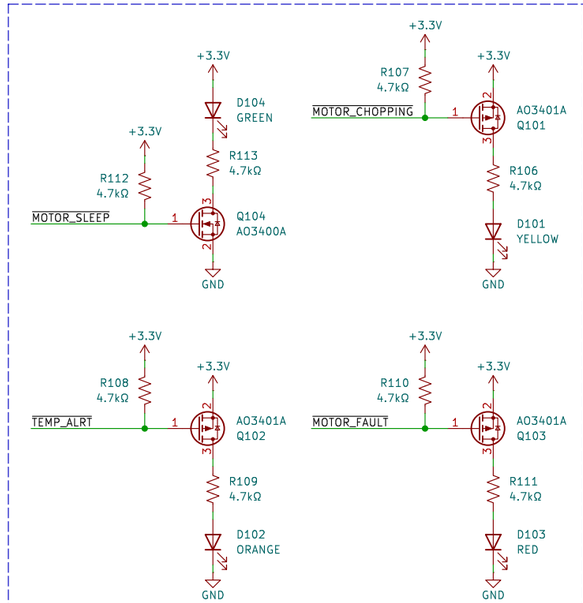
MOTOR OUTPUTS



TEMPERATURE SENSOR (OPTIONAL)

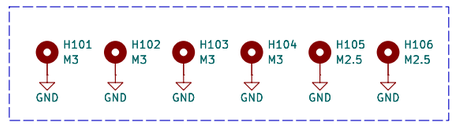


LED INDICATORS (OPTIONAL)

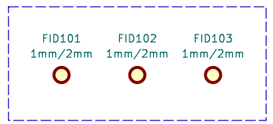


UPDATE SERIES RESISTOR VALUES!

MOUNTING HOLES



FIDUCIALS



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Sheet: /
File: motor-controller-v3.kicad_sch

Title: Brushed DC Motor Driver

Size: USLedger	Date: 2025-10-21	**Rev: V3**
KiCad E.D.A. 9.0.5		Id: 1/4

DC MOTOR CONTROLLER

IC Notes:

The DRV8701 is a single H-bridge gate driver that uses four external N-channel MOSFETs targeted to drive a 12-V to 24-V bidirectional brushed DC motor.

VBAT Voltage Range: 6V to 45V (abs. max)
Motor Drive Current: up to 35 A continuous
Inputs compatible with 1.8, 3.3, and 5 V logic
PWM operation up to 100 kHz
CSA output prop. to motor current (20 mV/A)
Active current chopping at 50 A
Undervoltage shutdown
Short circuit protection

DRV8701 Datasheet

MOT6142G Datasheet

Bulk Capacitor Sizing for DC Motor Drivers

DESIGN NOTES

FET: MOT6142G (Qgd = 6.8 nC typ.)

FET Gate Rise Time $t_R = Q_{gd}/I_{DRIVE}$

To achieve 100ns < t_R < 300ns,
22.7mA < I_{DRIVE} < 68mA.

Connecting a 200kΩ resistor from IDRIVE pin to GND yields I_{DRIVE} = 25mA.

Choosing R_{SENSE} = 1mOhm

$I_{CHOP} = (V_{REF} - V_{OFFSET})/(Av*R_{SENSE})$

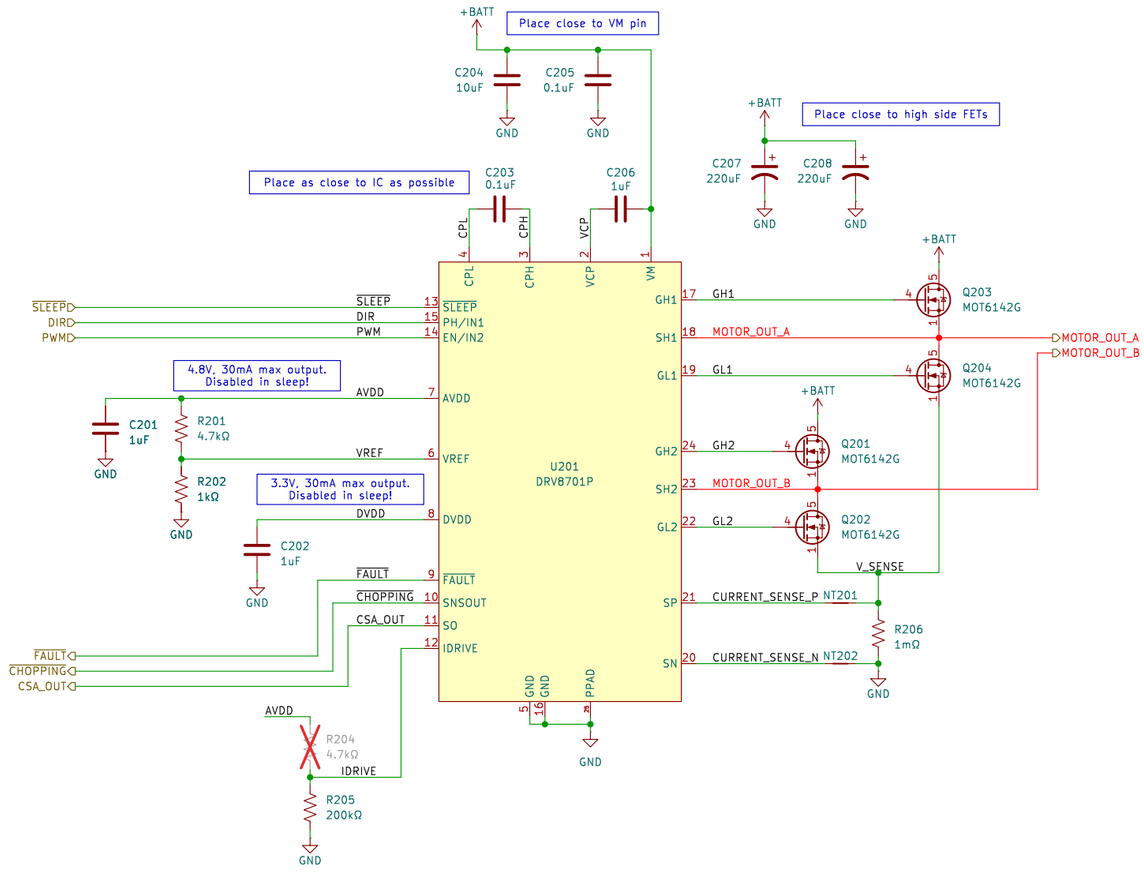
For I_{CHOP} = 40A,
V_{REF} must be set to 0.85V.
Use R_U = 4.7k, R_D = 1.0k (0.842V typ.)

$V_{CSA\_OUT} = R_{SENSE}*Av*I + V_{OFFSET}$
$V_{CSA\_OUT} = 0.020*I + 0.05$

Note: $f_{PWM} < I_{VCP} / 2*Q_{GD}$.
Do not allow f_{PWM} to exceed 400kHz!

DRV8701P (PWM) CONTROL INTERFACE

SLEEP	IN1	IN2	Description
0	X	X	Sleep; H-Bridge Disabled, High-Z
1	0	0	Coast; H-Bridge Disabled, High-Z
1	0	1	Reverse; Current SH2 -> SH1
1	1	0	Forward; Current SH1 -> SH2
1	1	1	Brake; Low-Side Slow Decay



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Learn Science and Math Club
Sheet: /DC Motor Controller – Front Wheels/
File: DRV8701.kicad_sch

Title: Brushed DC Motor Driver

Size: USLedger	Date: 2025-10-21	**Rev: V3**
KiCad E.D.A. 9.0.5		Id: 2/4

DC MOTOR CONTROLLER

IC Notes:

The DRV8701 is a single H-bridge gate driver that uses four external N-channel MOSFETs targeted to drive a 12-V to 24-V bidirectional brushed DC motor.

VBAT Voltage Range: 6V to 45V (abs. max)
Motor Drive Current: up to 35 A continuous
Inputs compatible with 1.8, 3.3, and 5 V logic
PWM operation up to 100 kHz
CSA output prop. to motor current (20 mV/A)
Active current chopping at 50 A
Undervoltage shutdown
Short circuit protection

DRV8701 Datasheet

MOT6142G Datasheet

Bulk Capacitor Sizing for DC Motor Drivers

DESIGN NOTES

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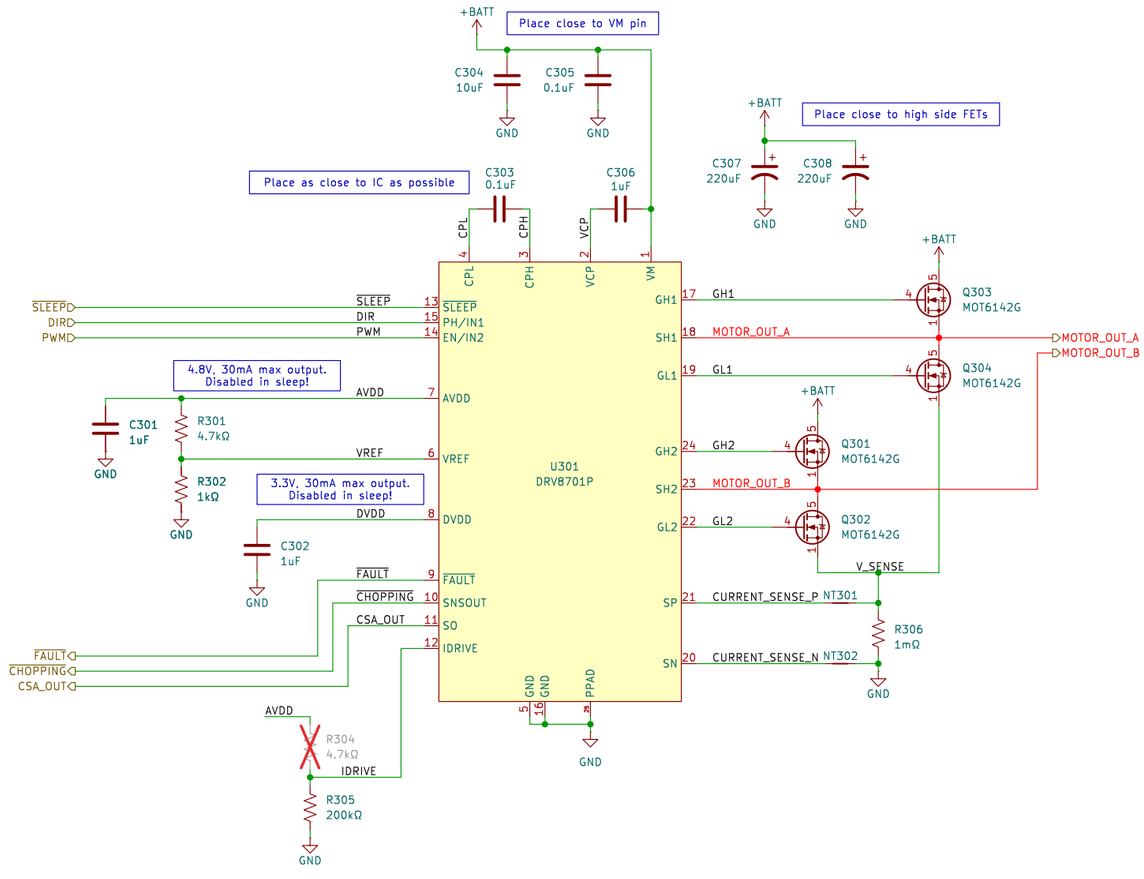
$V_{CSA\_OUT} = R_{SENSE}*Av*I + V_{OFFSET}$
$V_{CSA\_OUT} = 0.020*I + 0.05$

Note: $f_{PWM} < I_{VCP} / 2*Q_{GD}$.
Do not allow f_{PWM} to exceed 400kHz!

DRV8701P (PWM) CONTROL INTERFACE

SLEEP	IN1	IN2	Description
0	X	X	Sleep; H-Bridge Disabled, High-Z
1	0	0	Coast; H-Bridge Disabled, High-Z
1	0	1	Reverse; Current SH2 -> SH1
1	1	0	Forward; Current SH1 -> SH2
1	1	1	Brake; Low-Side Slow Decay



Geeks for Kids
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Sheet: /DC Motor Controller – Rear Wheels/
File: DRV8701.kicad_sch

Title: Brushed DC Motor Driver

Size: USLedger	Date: 2025-10-21	**Rev: V3**
KiCad E.D.A. 9.0.5		Id: 3/4

DC MOTOR CONTROLLER

IC Notes:

The DRV8701 is a single H-bridge gate driver that uses four external N-channel MOSFETs targeted to drive a 12-V to 24-V bidirectional brushed DC motor.

VBAT Voltage Range: 6V to 45V (abs. max)
Motor Drive Current: up to 35 A continuous
Inputs compatible with 1.8, 3.3, and 5 V logic
PWM operation up to 100 kHz
CSA output prop. to motor current (20 mV/A)
Active current chopping at 50 A
Undervoltage shutdown
Short circuit protection

DRV8701 Datasheet

MOT6142G Datasheet

Bulk Capacitor Sizing for DC Motor Drivers

DESIGN NOTES

FET: MOT6142G (Qgd = 6.8 nC typ.)

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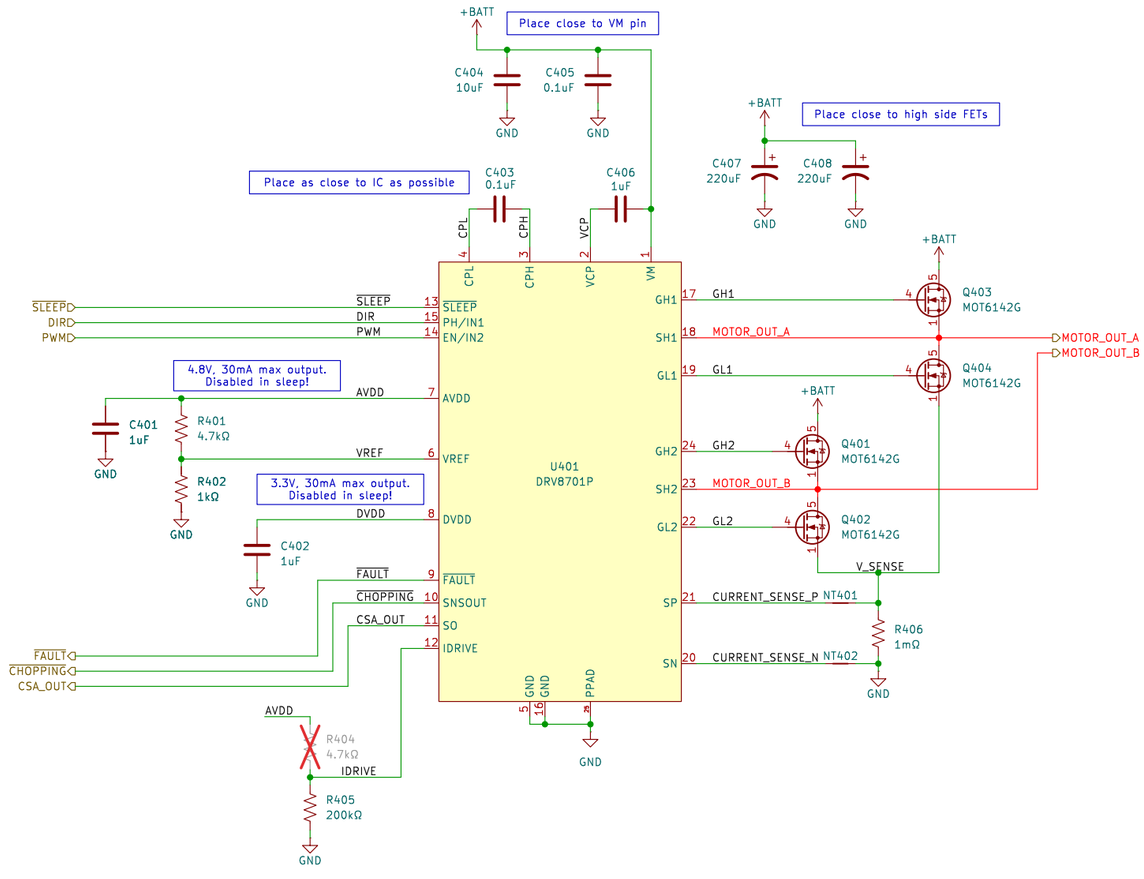
Use R_U = 4.7k, R_D = 1.0k (0.842V typ.)

$V_{CSA\_OUT} = R_{SENSE}*Av*I + V_{OFFSET}$
$V_{CSA\_OUT} = 0.020*I + 0.05$

Note: $f_{PWM} < I_{VCP} / 2*Q_{GD}$.
Do not allow f_{PWM} to exceed 400kHz!

DRV8701P (PWM) CONTROL INTERFACE

SLEEP	IN1	IN2	Description
0	X	X	Sleep; H-Bridge Disabled, High-Z
1	0	0	Coast; H-Bridge Disabled, High-Z
1	0	1	Reverse; Current SH2 -> SH1
1	1	0	Forward; Current SH1 -> SH2
1	1	1	Brake; Low-Side Slow Decay



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Sheet: /DC Motor Controller – Steering/
File: DRV8701.kicad_sch

Title: Brushed DC Motor Driver

Size: USLedger	Date: 2025-10-21	**Rev: V3**
KiCad E.D.A. 9.0.5		Id: 4/4