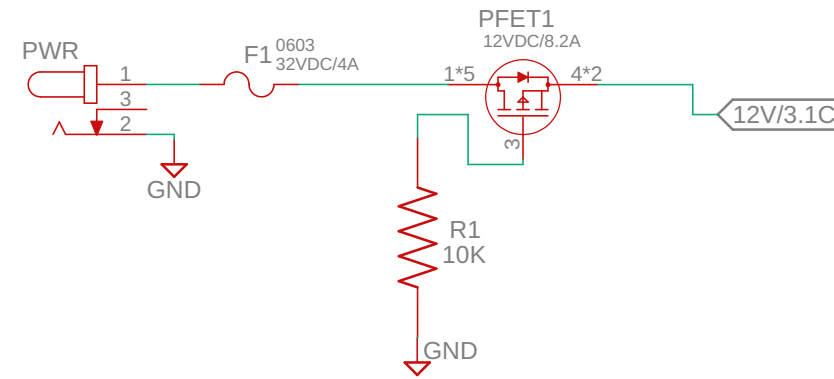
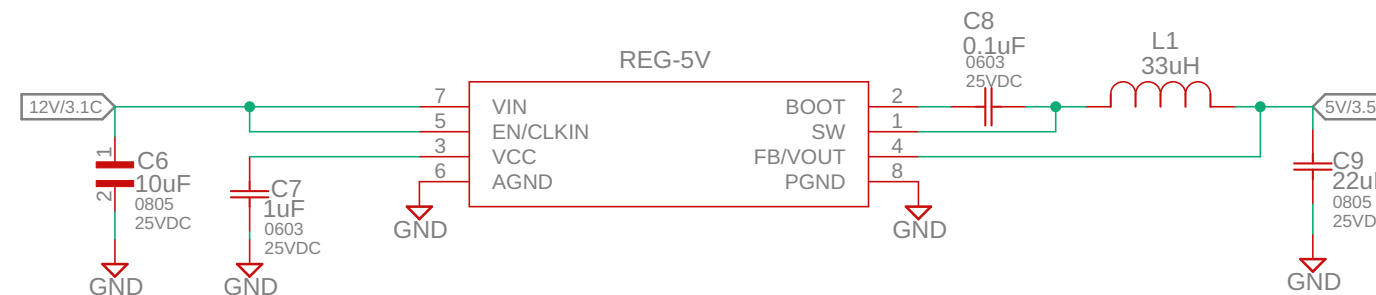


POWER SOURCE

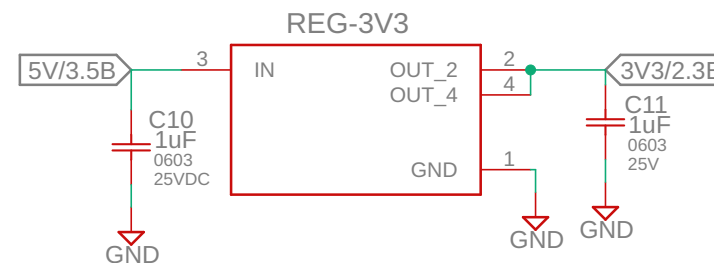


PMOSFET CONFIG
* DRAIN - PIN 1, 2, 5, 6, 7
* GATE - PIN 3
* SOURCE - PIN 4, 8

REGULATOR - 5V



REGULATOR - 3V3



NOTES:

Expect Temp rise for PFET1
* $I_{max} = 4A$; $R_{ds} = 19m\Omega$
* $V_{drop} = 4A * 19m\Omega = 70mV$
* $P_{loss} = 4A * 4A * 19m\Omega = 0.304W$
* $T_j \text{ range} = -55^\circ C - 150^\circ C$
* $R_{ja} = 270^\circ C/W$
* $Trise = R_{ja} * P_{loss} = 70.5^\circ C$
* $T_j = T_{atm} + Trise = 25^\circ C + 70.5^\circ C = 95.5^\circ C$

Expect Temp rise for REG-5V
* $T_j \text{ range} = -40^\circ C - 150^\circ C$
* $R_{ja} = 65^\circ C/W$
* $P_{loss} = 0.7W @ 1.5A$ (datasheet)
* $Trise = R_{ja} * P_{loss}$
* $T_j = T_{atm} + Trise = 25^\circ C + 48.75^\circ C = 73.75^\circ C$

Expect Temp rise for REG-3V3
* $T_j \text{ range} = -40^\circ C - 125^\circ C$
* $R_{ja} = 62.9^\circ C/W$
* $V_{drop} = 1.7V$
* $P_{loss} = 1.275W @ 0.75A$
* $Trise = R_{ja} * P_{loss} = 80.25^\circ C$
* $T_j = T_{atm} + Trise = 25^\circ C + 80.25^\circ C = 105.25^\circ C$

CAL POLY M.E.

TITLE: PCBA_MAIN v96

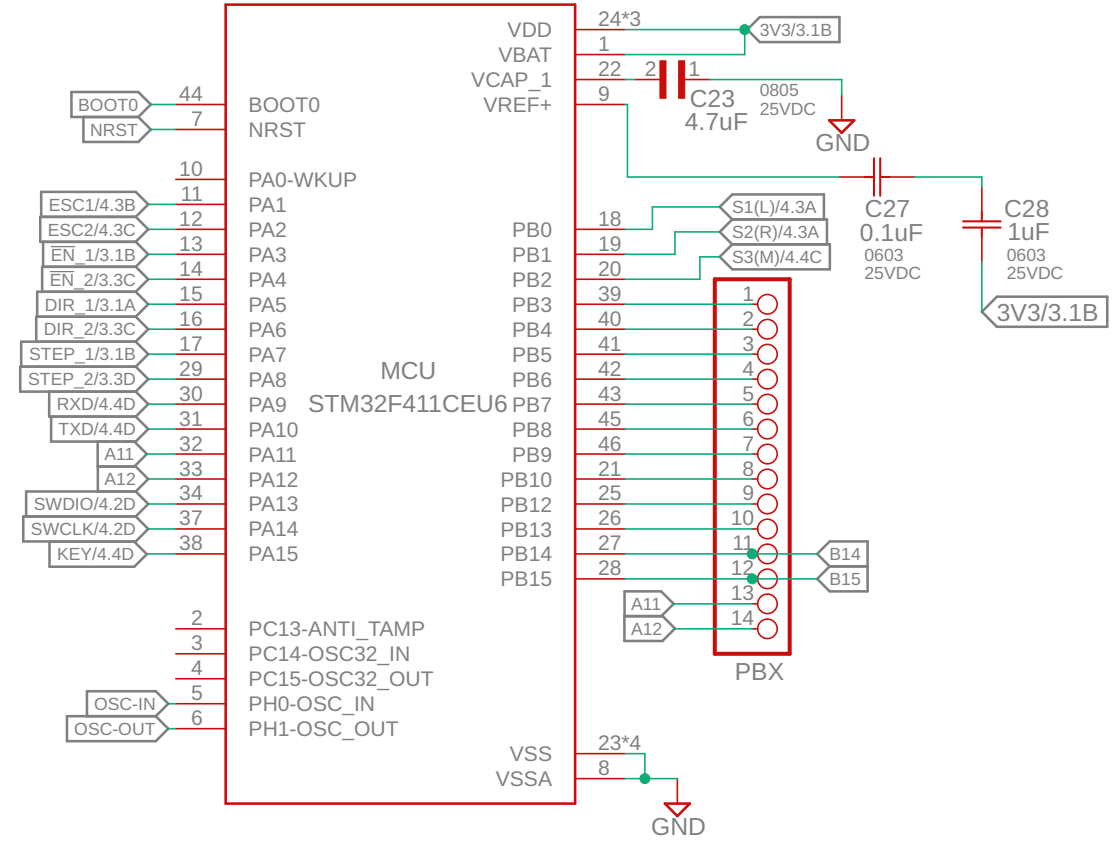
Drawn By: VINH VO, JOHNATHAN LAM

REV: REV1

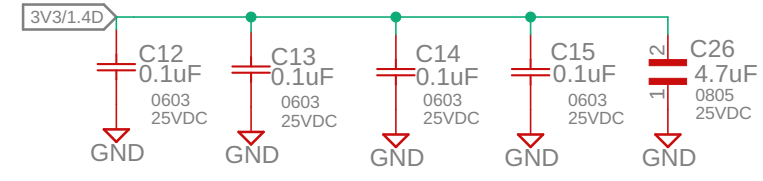
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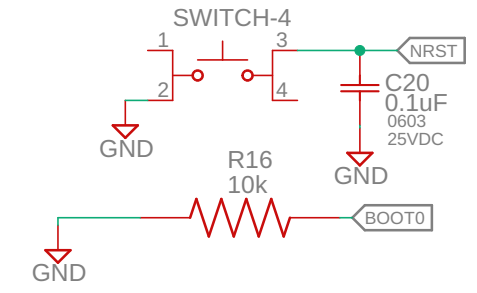
STM32F411CEU6



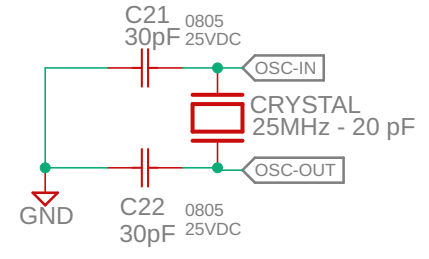
BYPASS CAPACITORS



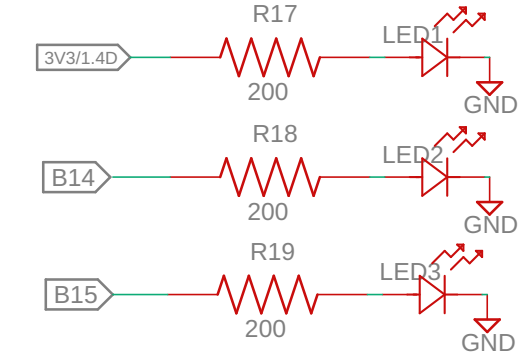
RESET CIRCUIT & BOOT0



OSCILLATOR



INDICATOR LED



NOTES:

- CRYSTAL AND CAPACITOR

 - * C21, C22 = 30 pF
 - * CL = 20 pF
 - * Cstray = 5 pF
 - * $CL = (C21 \cdot C22) / (C21 + C22) + Cstray$
 - * C21, C22 = 2 * CL - 2 * Cstray
- LED Notation

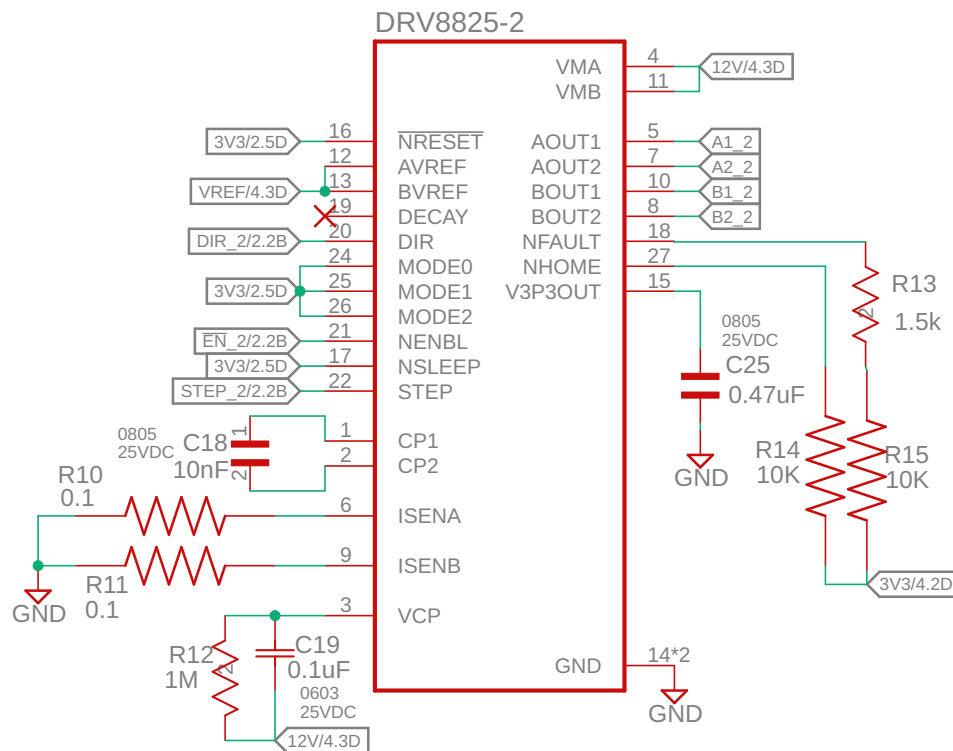
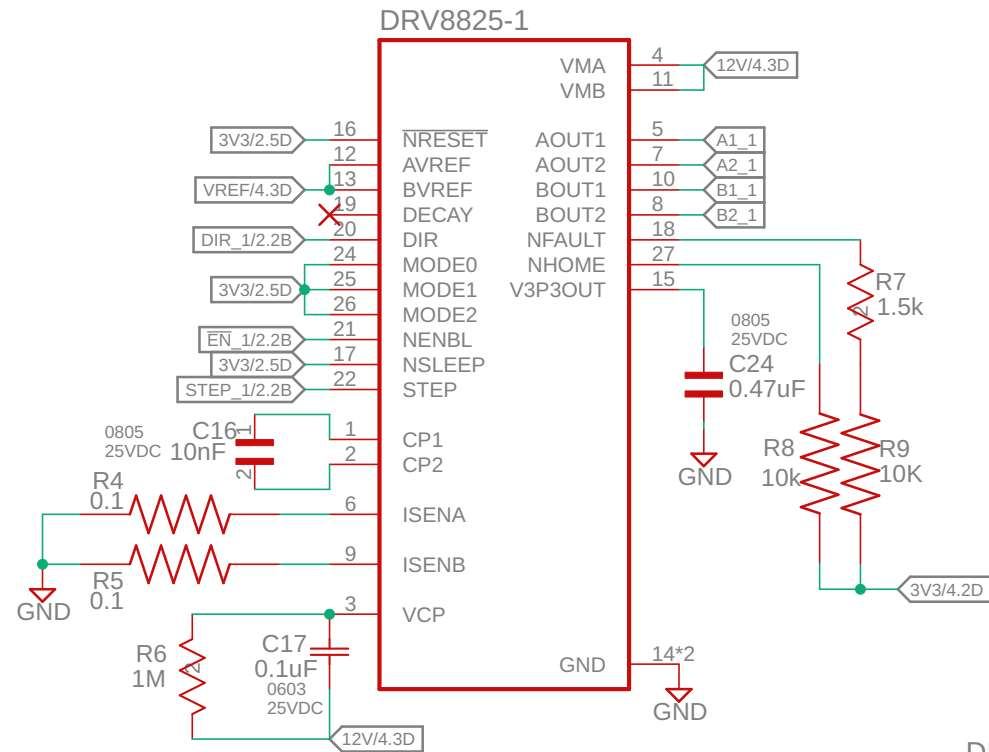
 - * LED1: MCU Ppwer
 - * LED2: Extra LED
 - * LED3: Extra LED
- Bypass Capacitors

 - * C12 -> C15 as close as possible to the MCU's pwr pin

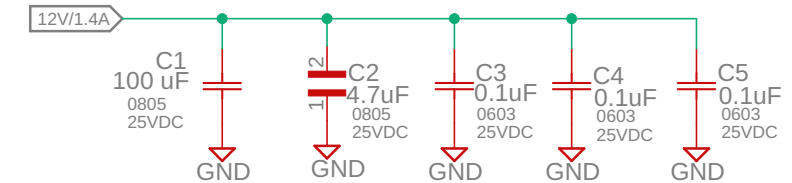
CAL POLY M.E.

TITLE: PCBA_MAIN v96	
Drawn By: VINH VO, JOHNATHAN LAM	REV: REV1
Date: 5/12/2024 11:52 PM	Sheet: 2/4

DRV8825

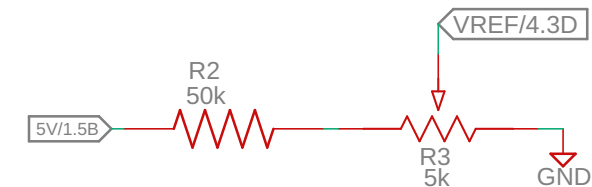


BYPASS CAPACITORS

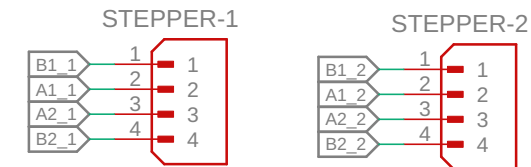


Bypass Capacitors
* Put C1, C2, C3, C4, C5 near Drv8825 pwr pin

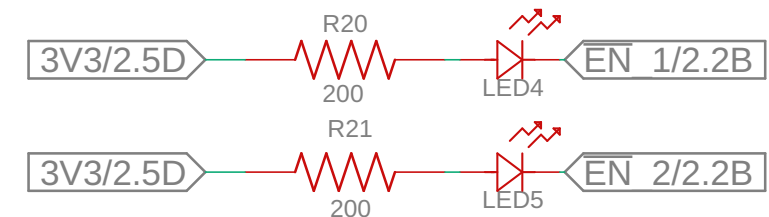
VREF



STEPPER CONNECTORS



INDICATOR LED



NOTES:

VREF Calculation:

- * $V_{in} = 5V$
- * $R_3 = 0 \text{ Ohm} - 5k \text{ Ohm}$
- * $V_{REFmin} = 0V$
- * $V_{REFmax} = V_{in} * R_3 / (R_3 + R_2)$
 $= 5V * (5k / 55k)$
 $= 0.45V$

Drv8825 Currents Limit

- * $V_{REF} = 0V - 0.45V$
- * $R_{sense} = R_4, R_5, R_{10}, R_{11}$
 $= 0.1 \text{ Ohm}$
- * $I_{max} = V_{REF} / (5 * R_{sense})$
 $= V_{REF} / (5 * 0.1)$
 $= 0A - 0.9A$

Expect Temp rise for Drv8825

- * $T_j \text{ range} = -40^\circ C - 150^\circ C$
- * $R_{ja} = 31.6^\circ C/W$
- * $V_{max} = 12V, I_{max} = 0.9A,$
- * $P_{max} = 10.8$
- * $Trise = 341.28^\circ C$
- * $T_j = T_{atm} + Trise$
 $= 25^\circ C + 341.28^\circ C$
 $= 366.28^\circ C \rightarrow \text{Fin Required}$

CAL POLY M.E.

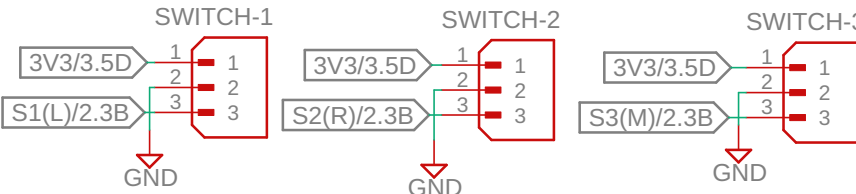
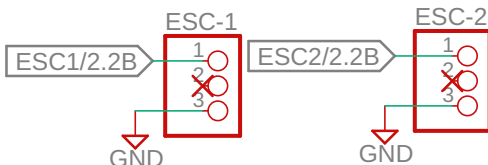
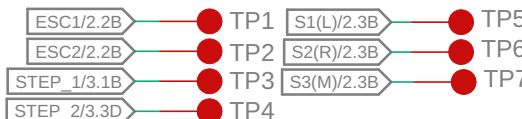
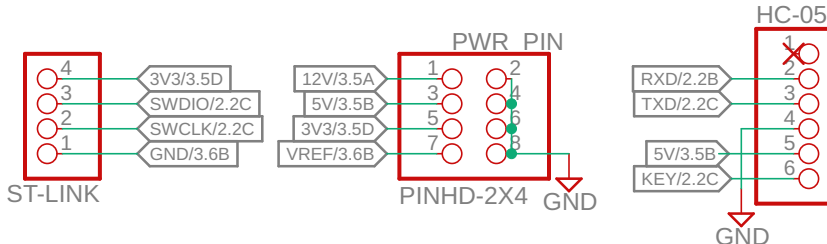
TITLE: PCBA_MAIN v96

Drawn By: VINH VO, JOHNATHAN LAM

REV: REV1

Date: 5/12/2024 11:52 PM

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	1	2	3	4	5	6
A	LIMIT SWITCH CONNECTORS					A
						
B	ESC PIN					B
						
C	TEST PADS					C
						
D	EXTRA PINS					D
						
E	<div>NOTES:</div> <div><div>Limit Switches * These are B3B-XH female connectors that are used to connect 3 limit switches (left, right, middle)</div><div>ESC Pin Header * This Pin Headers connect GND and PWM Pins from the MCU to external ESCs for running BLDC motors</div><div>External Pin & Test Pad * Includes some external and potential pin that can be used for debugging and testing purpose</div></div>					E
CAL POLY M.E.						
TITLE: PCBA_MAIN v96					REV: REV1	
Drawn By: VINH VO, JOHNATHAN LAM					Date: 5/12/2024 11:52 PM	
					Sheet: 4/4	