Nozzle0 +3.3V

24V to 40V,
up to 2A

U2 TMI8870B
VREF VM
IN1 OUT1
IN2 ISEN
GND OUT2

INA180-DNF
IN+ IN-
OUT
VS GND
U4

C2 100uF/63V
+VSW
100nF C4
PH0
N0+
N0-
R2 0.03R**
C6 1nF**DNF
+5V
C8 100nF-DNF
GND

Note: Nozzle 0 isn't monitored as
the ADC pin is being used to
measure the Motor Drive voltage.
Footprints are being placed just in
case though

Nozzle4 +3.3V

24V to 40V,
up to 2A

U1 TMI8870B
VREF VM
IN1 OUT1
IN2 ISEN
GND OUT2

INA180
IN+ IN-
OUT
VS GND
U3

C1 100uF/63V
+VSW
100nF C3
PH4
N4+
N4-
R1 0.03R**
C5 1nF**
+5V
C7 100nF
NR4

Cable to Printhead
TP1 DC_Connector TP2
N0+ 16   15 N0-
N1+ 14   13 N1-
N2+ 12   11 N2-
N3+ 10   9 N3-
N4+ 8   7 N4-
N5- 6   5 N5+
N6- 4   3 N6+
N7- 2   1 N7+
J1
TP3   TP4

Nozzle1 +3.3V

U6 TMI8870B
VREF VM
IN1 OUT1
IN2 ISEN
GND OUT2

INA180
IN+ IN-
OUT
VS GND
U8

C10 100uF/63V
+VSW
100nF C12
PH1
N1+
N1-
R4 0.03R**
C14 1nF**
+5V
C16 100nF
NR1

Nozzle5 +3.3V

U5 TMI8870B
VREF VM
IN1 OUT1
IN2 ISEN
GND OUT2

INA180
IN+ IN-
OUT
VS GND
U7

C9 100uF/63V
+VSW
100nF C11
PH5
N5+
N5-
R3 0.03R**
C13 1nF**
+5V
C15 100nF
NR5

To ESP32 Controller Board
Controller
1 2 PH0
3 4 PH1
5 6 PH2
7 8 PH3
+3.3V
9 10 PH4
11 12 PH5
13 14 PH6
15 16 PH7
17 18 SLCK
19 20 MISO
21 22 MOSI
23 24 CS
GND   J2

H1 M3
H2 M3
H3 M3
H4 M3

Nozzle2 +3.3V

U10 TMI8870B
VREF VM
IN1 OUT1
IN2 ISEN
GND OUT2

INA180
IN+ IN-
OUT
VS GND
U12

C18 100uF/63V
+VSW
100nF C20
PH2
N2+
N2-
R6 0.03R**
C22 1nF**
+5V
C24 100nF
NR2

Nozzle6 +3.3V

U9 TMI8870B
VREF VM
IN1 OUT1
IN2 ISEN
GND OUT2

INA180
IN+ IN-
OUT
VS GND
U11

C17 100uF/63V
+VSW
100nF C19
PH6
N6+
N6-
R5 0.03R**
C21 1nF**
+5V
C23 100nF
NR6

** this part value will need testing
Might need to be: 0.02, 0.03, 0.04 or 0.05 Ohms
Depends on final Filament Resistance

Motor Driver H-Bridge IC:
_____
AT8870 - 38V 3.6A, 29K STK, A$1.25/30
RZ7899 - 25V 6A 84K STK, A$0.51/30 (no sense resistor)
HV8548 - 28V 1.2A-2.4A, 5K STK, A$0.78/30
PT2470 - 36V 3.6A, 2.5K STK, A0.80/30
TMI8870B - 45V 3.6A, 3.5K STK, A$0.90/30 (up to 100KHz PWM = 10uSec pules)

Sheet: Power

File: Power.sch

Nozzle3 +3.3V

U14 TMI8870B
VREF VM
IN1 OUT1
IN2 ISEN
GND OUT2

INA180
IN+ IN-
OUT
VS GND
U16

C26 100uF/63V
+VSW
100nF C28
PH3
N3+
N3-
R8 0.03R**
C30 1nF**
+5V
C32 100nF
NR3

Nozzle7 +3.3V

U13 TMI8870B
VREF VM
IN1 OUT1
IN2 ISEN
GND OUT2

INA180
IN+ IN-
OUT
VS GND
U15

C25 100uF/63V
+VSW
100nF C27
PH7
N7+
N7-
R7 0.03R**
C29 1nF**
+5V
C31 100nF
NR7

Open Hardware
PRL
Sheet: /
File: Printhead-Driver.sch
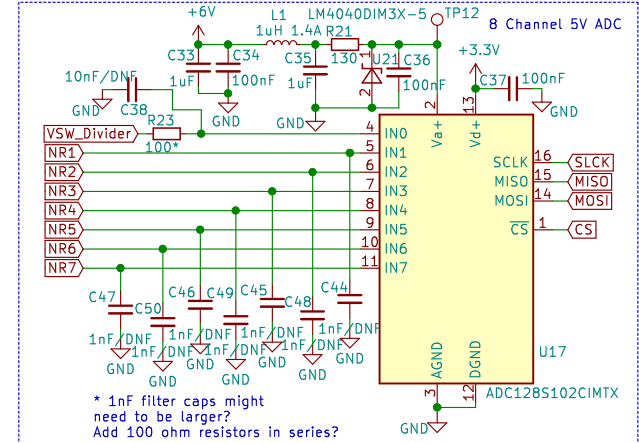Title: Open-PyroJet-Driver
Size: A4   Date: 2022-06-12   Rev: 0.7
KiCad E.D.A. kicad (5.1.12)-1   Id: 1/2

24V Boost to 25V-40V @ 4A Converter

L2 47uH/5A
D1 SS510
VR1 XL6019
C39 100uF/63V
C40 100uF/63V
C41 100nF/100V
R10 10K-DNF
R12 10K-DNF
RV1 100K
L3 1uH 4A
C42 100nF/100V
C43 1000uF/63V
+VSW
TP5
TP11
R9 100K
VSW_Divider
R11 10K

45V = 4.091V
40V = 3.636V
35V = 3.182V
30V = 2.727V
24V = 2.182V

188KHz PWM Freq

Start with the Pot, but later can add in fixed voltage resistors

VIN, EN, GND, SW, FB

8 Channel 5V ADC

+6V
L1 1uH 1.4A
LM4040DIM3X-5
R21 130
U21
TP12
+3.3V
C33 10nF/DNF
C38
C34 1uF
C35 100nF
C36 1uF
C37 100nF
R23 100*
VSW_Divider
NR1 IN0
NR2 IN1
NR3 IN2
NR4 IN3
IN4
NR5 IN5
NR6 IN6
NR7 IN7
Va+ Vd+
SCLK 16
MISO 15
MOSI 14
CS 1
SLCK
MISO
MOSI
CS
AGND 3
DGND 12
U17 ADC128S102CIMTX

C47 1nF/DNF
C50 1nF/DNF
C46 1nF/DNF
C49 1nF/DNF
C45 1nF/DNF
C48 1nF/DNF
C44 1nF/DNF

* 1nF filter caps might need to be larger? Add 100 ohm resistors in series?

24V to 6V Buck converter
Drives the ESP32 + Sensors

R13 R0.33
+24V
C57 100uF/63V
C58 22uF/35V
C59 100nF/3
MC34063AD U19
C60 470pF
TP10
Vin, Ipk, DC, SwC, TC, GND, SwE, Vfb
L5 220uH/2.1A
D2 SS34
R14 4.7K
TP7
C62 100nF 10V
C63 100nF 10V
C61 22uF
L6 1uH/1.4A
C64 100uF/63V
+6V
R15 1.0K
R22 150R

6.237V @1.2A
(when R15+R22 = 1200 Ohm)

100KHz PWM Freq

Vout = 1.25 * (1+(R15+R22)/R14)
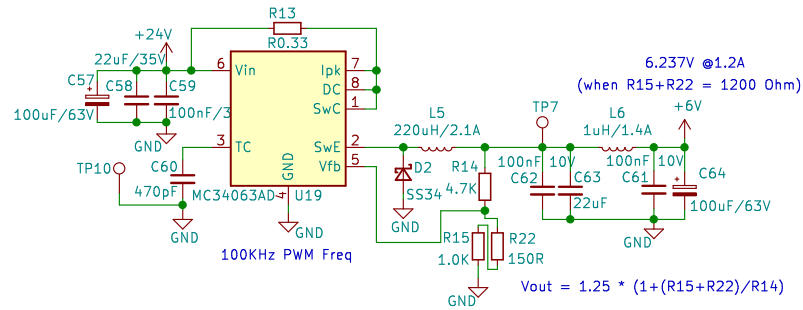
5V and 3.3V LDO Regulators

U18 HE6550MPR
+6V
C55 100nF
C56 10uF
VI, VO, GND
L4 1uH 1.4A
C53 100nF
C54 10uF
TP6 +5V @150mA
C51 100nF
C52 10uF

U20 XC6227C331MR
+6V
C67 1uF
C68 100nF
VIN, CE, VOUT, GND
TP8 +3.3V @700mA
C65 100nF
C66 10uF
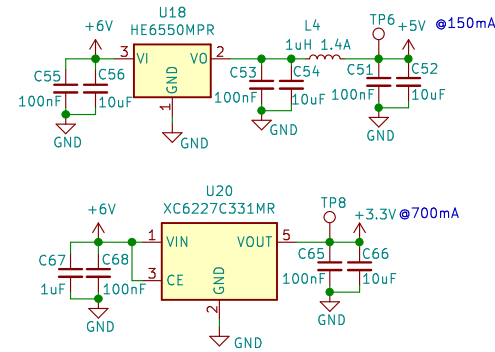
Switched 24V Power input + Reverse Polarity Protection

J3 24V Power In
TP9
F1 5A
Q1 RU30L30
Q2 RU30L30
D3 12V
R24 100k
R20 100k
+24V
OFF
ON
PWR SW C128955 SW1

Power Supply LEDs

+VSW
R17 62K
D5 Green

+24V
R16 27K
D4 Green

+5V
R18 4.7K
D6 Green

+3.3V
R19 2.7K
D7 Green
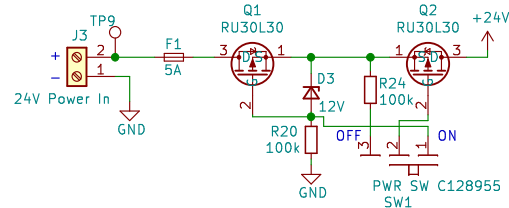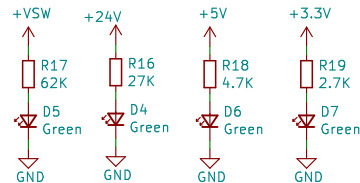
Open Hardware
PRL
Sheet: /Power/
File: Power.sch
Title: Open-PyroJet-Driver - Power
Size: A4
Date: 2022-06-12
KiCad E.D.A. kicad (5.1.12)-1
Rev: 0.7
Id: 2/2