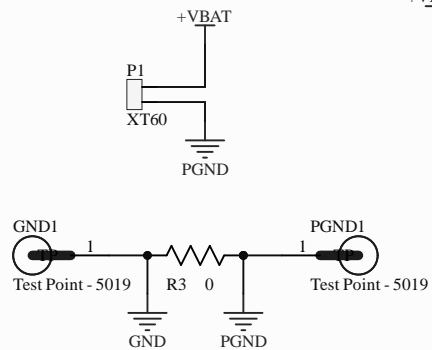


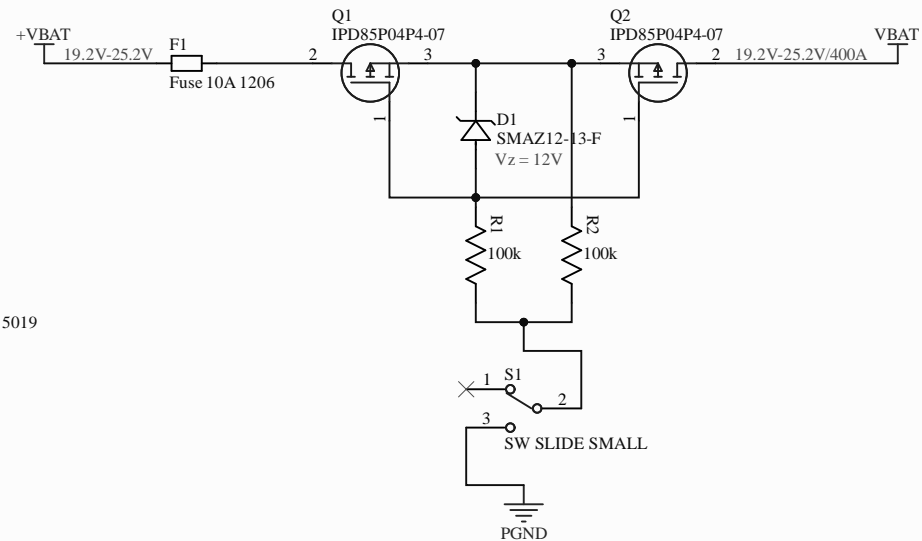
Title		
Size	Number	Revision
A4		
Date:	3/10/2024	Sheet of
File:	C:\Users\...\root.SchDoc	Drawn By:

Battery Connector

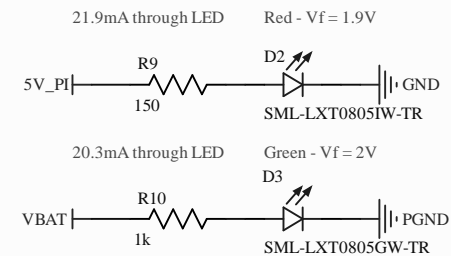
Input Power: 6S LiPo: 19.2V-25.2V



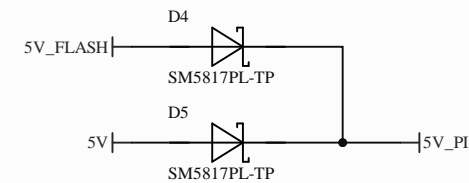
Reverse Polarity Protection



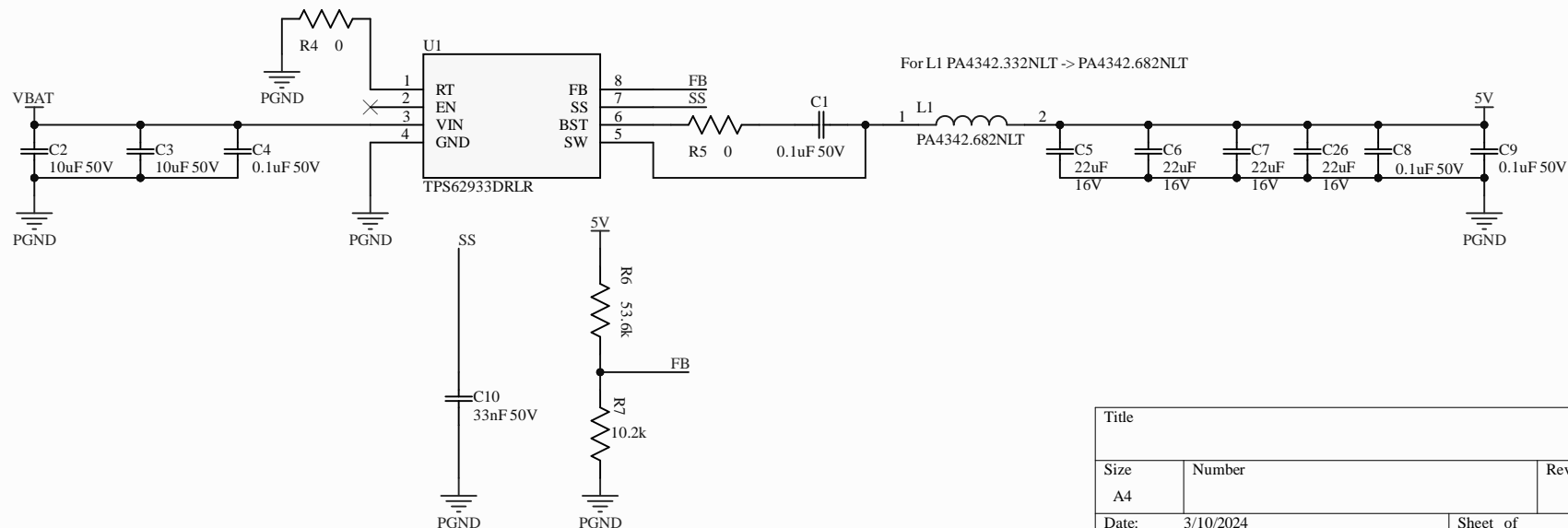
Power LEDs



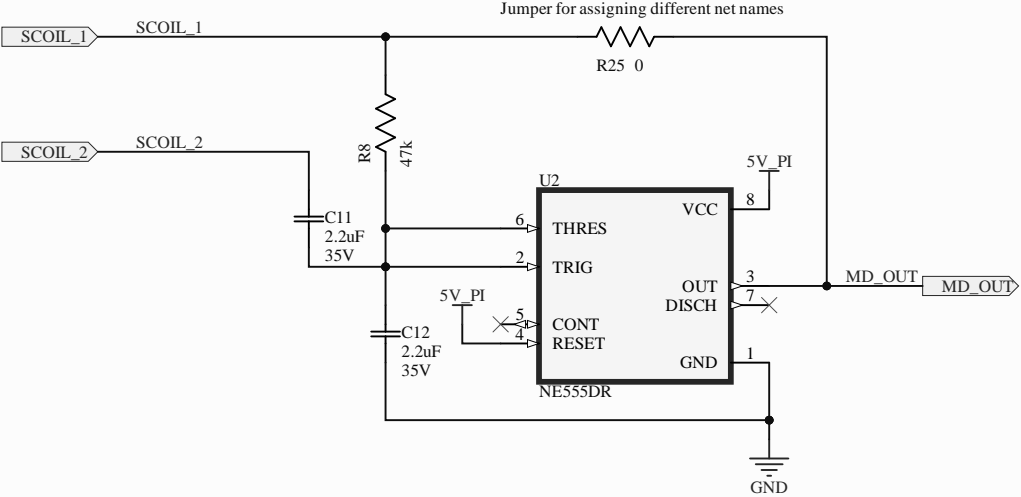
Power Schottkys



5V DC/DC Converter



Title		
Size	Number	Revision
A4		
Date:	3/10/2024	Sheet of
File:	C:\Users\...\power.SchDoc	Drawn By:



Title		
Size	Number	Revision
A4		
Date:	3/10/2024	Sheet of
File:	C:\Users\...\metal-detector.SchDoc	Drawn By:

[illegible]

Front Left Motor

Diagram showing the wiring for the Front Left Motor. The motor connector J1 is connected to the 5-pin header S5B-PH-K-S(LF)(SN). The header pins are connected to the motor pins as follows: DIR1 (pin 2) to FG1 (pin 3), FG1 (pin 3) to I_PWM1 (pin 4), and I_PWM1 (pin 4) to pin 5. The header pins are also connected to ground (GND) through resistors: R27 (10k) to pin 1 (+VBAT), R33 (10k) to pin 2 (DIR1), and R31 (10k) to pin 3 (FG1). The header pins are also connected to ground (GND) through resistors: R29 (10k) to pin 4 (I_PWM1), R35 (10k) to pin 5, and R37 (10k) to pin 6. The header pins are also connected to ground (GND) through resistors: R31 (10k) to pin 1 (+VBAT), R37 (10k) to pin 2 (DIR1), and R33 (10k) to pin 3 (FG1). The header pins are also connected to ground (GND) through resistors: R29 (10k) to pin 4 (I_PWM1), R35 (10k) to pin 5, and R37 (10k) to pin 6.

Front Right Motor

Diagram showing the wiring for the Front Right Motor. The motor connector J2 is connected to the 5-pin header S5B-PH-K-S(LF)(SN). The header pins are connected to the motor pins as follows: DIR2 (pin 2) to FG4 (pin 3), FG4 (pin 3) to I_PWM4 (pin 4), and I_PWM4 (pin 4) to pin 5. The header pins are also connected to ground (GND) through resistors: R28 (10k) to pin 1 (+VBAT), R34 (10k) to pin 2 (DIR2), and R30 (10k) to pin 3 (FG4). The header pins are also connected to ground (GND) through resistors: R30 (10k) to pin 4 (I_PWM4), R36 (10k) to pin 5, and R32 (10k) to pin 6. The header pins are also connected to ground (GND) through resistors: R32 (10k) to pin 1 (+VBAT), R38 (10k) to pin 2 (DIR2), and R34 (10k) to pin 3 (FG4). The header pins are also connected to ground (GND) through resistors: R28 (10k) to pin 4 (I_PWM4), R36 (10k) to pin 5, and R32 (10k) to pin 6.

Back Left Motor

Diagram showing the wiring for the Back Left Motor. The motor connector J8 is connected to the 5-pin header S5B-PH-K-S(LF)(SN). The header pins are connected to the motor pins as follows: DIR1 (pin 2) to FG3 (pin 3), FG3 (pin 3) to I_PWM3 (pin 4), and I_PWM3 (pin 4) to pin 5. The header pins are also connected to ground (GND) through resistors: R31 (10k) to pin 1 (+VBAT), R37 (10k) to pin 2 (DIR1), and R33 (10k) to pin 3 (FG3). The header pins are also connected to ground (GND) through resistors: R29 (10k) to pin 4 (I_PWM3), R35 (10k) to pin 5, and R37 (10k) to pin 6. The header pins are also connected to ground (GND) through resistors: R31 (10k) to pin 1 (+VBAT), R37 (10k) to pin 2 (DIR1), and R33 (10k) to pin 3 (FG3). The header pins are also connected to ground (GND) through resistors: R29 (10k) to pin 4 (I_PWM3), R35 (10k) to pin 5, and R37 (10k) to pin 6.

Back Right Motor

Diagram showing the wiring for the Back Right Motor. The motor connector J9 is connected to the 5-pin header S5B-PH-K-S(LF)(SN). The header pins are connected to the motor pins as follows: DIR2 (pin 2) to FG6 (pin 3), FG6 (pin 3) to I_PWM6 (pin 4), and I_PWM6 (pin 4) to pin 5. The header pins are also connected to ground (GND) through resistors: R32 (10k) to pin 1 (+VBAT), R38 (10k) to pin 2 (DIR2), and R34 (10k) to pin 3 (FG6). The header pins are also connected to ground (GND) through resistors: R30 (10k) to pin 4 (I_PWM6), R36 (10k) to pin 5, and R32 (10k) to pin 6. The header pins are also connected to ground (GND) through resistors: R32 (10k) to pin 1 (+VBAT), R38 (10k) to pin 2 (DIR2), and R34 (10k) to pin 3 (FG6). The header pins are also connected to ground (GND) through resistors: R30 (10k) to pin 4 (I_PWM6), R36 (10k) to pin 5, and R32 (10k) to pin 6.

△ DNP R24 for individual PWM, populate for grouped PWM

Left Side PWM

Right Side PWM

YC248-JR-070RL

△ Caution: For grouped PWMs, PWM1 and 4 feed back to the Pi so ensure to disable PWM2, 3, 5, and 6 pins

21.9mA through LED Red - Vf = 1.9V Q3 T2N7002BK,LM

5V_P1 R14 150 SML-LXT0805IW-TR D6 D_LED1 Q3 T2N7002BK,LM

21.9mA through LED Red - Vf = 1.9V Q4 T2N7002BK,LM

5V_P1 R16 150 SML-LXT0805IW-TR D7 D_LED2 Q4 T2N7002BK,LM

21.9mA through LED Red - Vf = 1.9V Q5 T2N7002BK,LM

5V_P1 R18 150 SML-LXT0805IW-TR D8 D_LED3 Q5 T2N7002BK,LM

21.9mA through LED Red - Vf = 1.9V Q6 T2N7002BK,LM



5V_P1 R20 150 SML-LXT0805IW-TR D9 D_LED4 Q6 T2N7002BK,LM

Pin connection diagram for CN HDR 40POS connector. The diagram shows a 40-pin connector with pins numbered 01 to 40. Pins 01, 03, 05, 07, 09, 11, 13, 15, 17, 19, 21, 23, 25, 27, 29, 31, 33, 35, 37, 39 are connected to various signals and ground. Pins 02, 04, 06, 08, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34, 36, 38, 40 are connected to various signals and ground. The signals include 3.3V, I2C_SDA, I2C_SCL, DIR1, DIR2, F_END, A_END, D_LED1, STEP, ST_DIR, SPWM, PWM6, 5V_PI, GND, D_LED2, PWM1, PWM2, PWM3, D_LED3, PWM4, PWM5, and D_LED4.

Signal	Pin	Signal	Pin
3.3V	01	02	02
I2C_SDA	03	04	04
I2C_SCL	05	06	06
DIR1	07	08	08
DIR2	09	10	10
F_END	11	12	12
A_END	13	14	14
D_LED1	15	16	16
	17	18	18
	19	20	20
	21	22	22
	23	24	24
	25	26	26
	27	28	28
STEP	29	30	30
ST_DIR	31	32	32
SPWM	33	34	34
PWM6	35	36	36
	37	38	38
	39	40	40

5V_PI
GND
D_LED2
GND
PWM1
PWM2
GND
PWM3
D_LED3
GND
PWM4
PWM5
D_LED4

CN HDR 40POS

APPROVALS		DATE	PROJECT					
ENG: *								
DSN: *								
CHK: *								
			PROJECT REVISION:		DOCUMENT REVISION:		DESIGN ITEM:	
					33e4a8abf823881385a8a65d463d3			
			TITLE					
			*					
REFERENCE DOCUMENTS								
BOM:								
ASSY DWG:			SIZE	CAGE CODE	DWG NO.			REV
FAB DWG:			B					
PCB DWG:			SCALE:	FILE NAME			SHEET	OF
				connectors.SchDoc			4	5

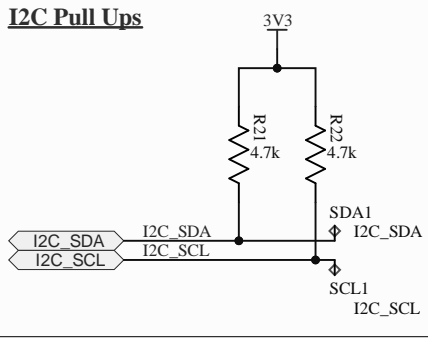
THIS DOCUMENT AND THE DATA DISCLOSED HEREIN OR HEREWITH IS THE PROPERTY OF ALTUM LIMITED AND MAY BE FREELY DISTRIBUTED IN WHOLE. NO RIGHTS ARE RESERVED OR EXPRESS OR IMPLIED WARANTEE GIVEN.

Note:
Strapping Pins:
GPIO0,GPIO2,GPIO5
GPIO15 (MTDO),GPIO12 (MTDI)
By pulling up or down these pins, you can enter different modes for the chip. After the reset button is released then the strapping pins work as normal pins. We have observed that pulling up IO2 and IO12 causes the chip not to be able to flash. However, pulling up or down the IO5 and IO15 does not cause flash errors. IO15 controls whether debugging logs are printed on U0TXD during booting, and IO5 in combo with IO15 controls Timing of SDIO Slave (we are not using SDIO, so it should be okay)

To ensure the power supply to the ESP32 chip during power-up, it is advised to add an RC delay circuit at the EN pin. The recommended setting for the RC delay circuit is usually $R = 10\text{ k}\Omega$ and $C = 1\text{ }\mu\text{F}$. However, specific parameters should be adjusted based on the power-up timing of the SiP and the power-up and reset sequence timing of the chip.

10k and 0.1uF gives 1ms time constant which satisfies the minimum delay required by the Power-Up Timing

I2C Pull Ups

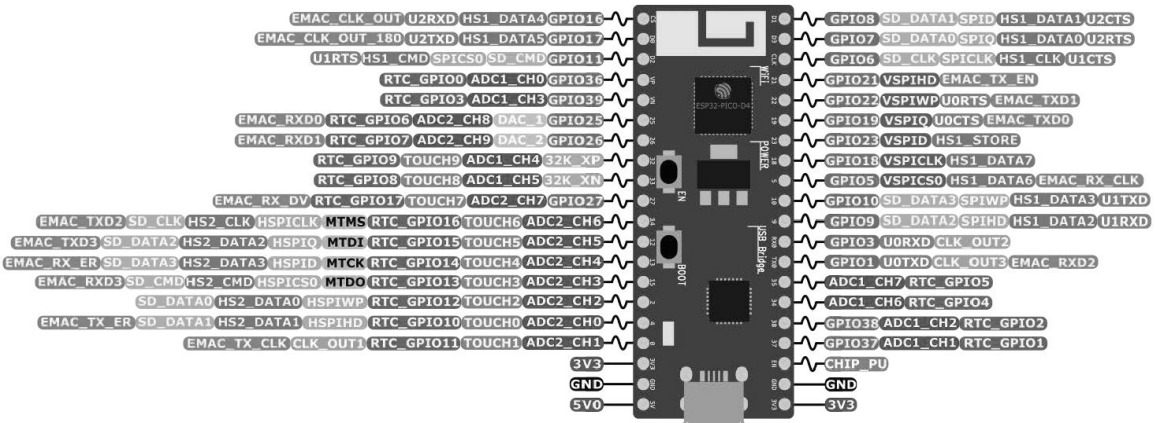
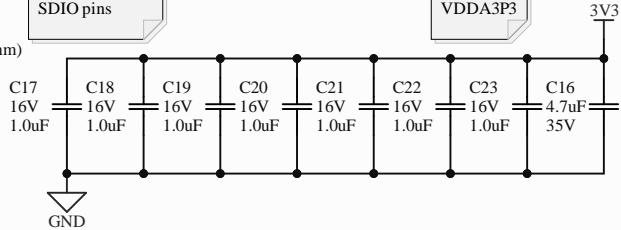


MCU DECOUPLING

MCU DECAPS
Ceramic capacitor (Low ESR, ESR<1ohm)

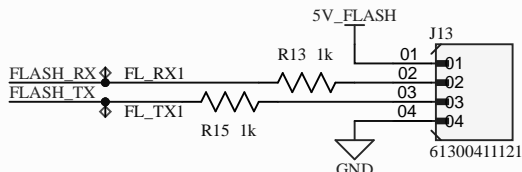
RTC, CPU, and
SDIO pins

VDDA /
VDDA3P3

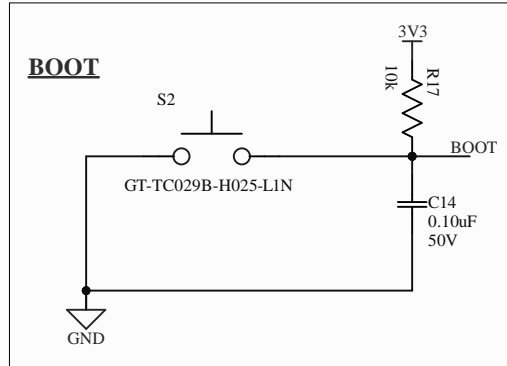


FLASHING

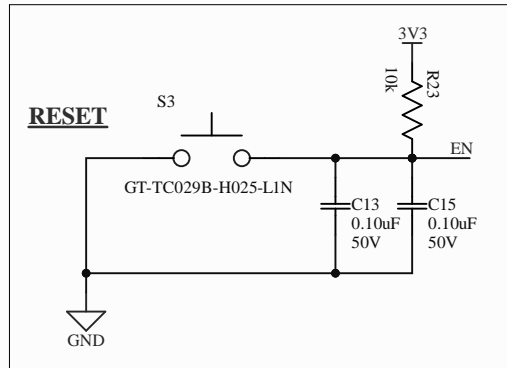
How to Flash:
1) plug in USB-UART adapter
2) Hold down BOOT button
3) Press EN button once
4) Once Device is detected in terminal, Release BOOT button



BOOT



RESET



APPROVALS	DATE	PROJECT	REVISION	DESCRIPTION	DATE	APPROVED
ENG: *						
DSN: *						
CHK: *						
REFERENCE DOCUMENTS		*				
BOM:						
ASSY DWG:		SIZE	CAGE CODE	DWG NO.	REV	
FAB DWG:		B				
PCB DWG:		SCALE:	FILE NAME	MCU.SchDoc	SHEET	5 OF 5