Aladdin Flight Controller

Github : AladdinBensaid

Aladdin FC is an advanced STM32H7 autopilot designed by Ala bensaid.

Specifications :

Processor :

- Dual 32 bit ARM Cortex M7/M4 with double precision FPU (STM32H757)
- 480Mhz / 1 MB RAM / 2 MB Flash
- 8 bit IO MCU Co-Processor (Atmega328p)

Sensors :

- Barometer BMP388
- Magnetometer QMC5883L
- Accelerometer/Gyroscope LSM6DSOWTR

Power :

- USB input
- Operatory power 5V (dual power port)
- Dual voltage and current monitor inputs
- Adaptable with Pixhawk 4 power module PM07

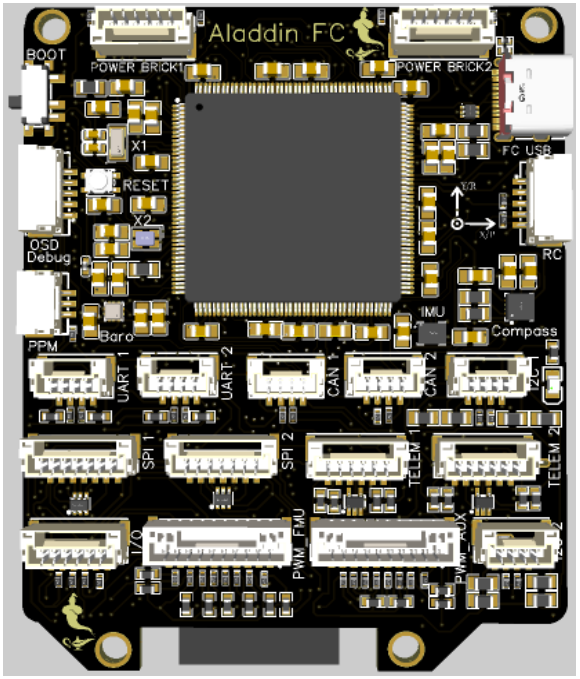
Interfaces :

- 8-12 PWM output (8 FMU + 4 IO MCU) support DMA
- 2x CAN Bus
- 2x I2C Port
- 2x SPI Port
- 4x UART Port
- PPM Port
- RC Port Support all RC protocols including (SBUS/DSM/IBUS/PPM) + RSSI input
- 2x ADC pin
- I/O (4x GPIO)
- STM32 debug (JTAG + SWD + 1x UART) + USB interface
- IO MCU debug (1x UART)
- ESP32 USB interface

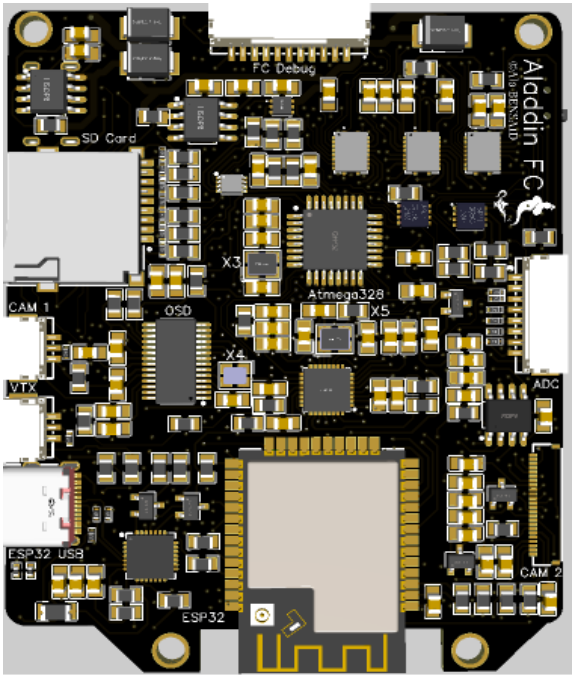
Others :

- Built in OSD
- SD Card (SDMMC protocol)
- ESP32 (8MB PSRAM) to support WiFi connectivity (live streaming / 4g,5g navigation …)
- Support Analog Camera (PAL/NTSC) + built in Analog to 8-bit video decoder
- Support OV2640 Camera
- Dimensions : 60.79mm x 76.71mm x 1.6mm
- JST GH connectors

Github Link for the project :
https://github.com/AladdinBensaid/Aladdin_Flight_Controller

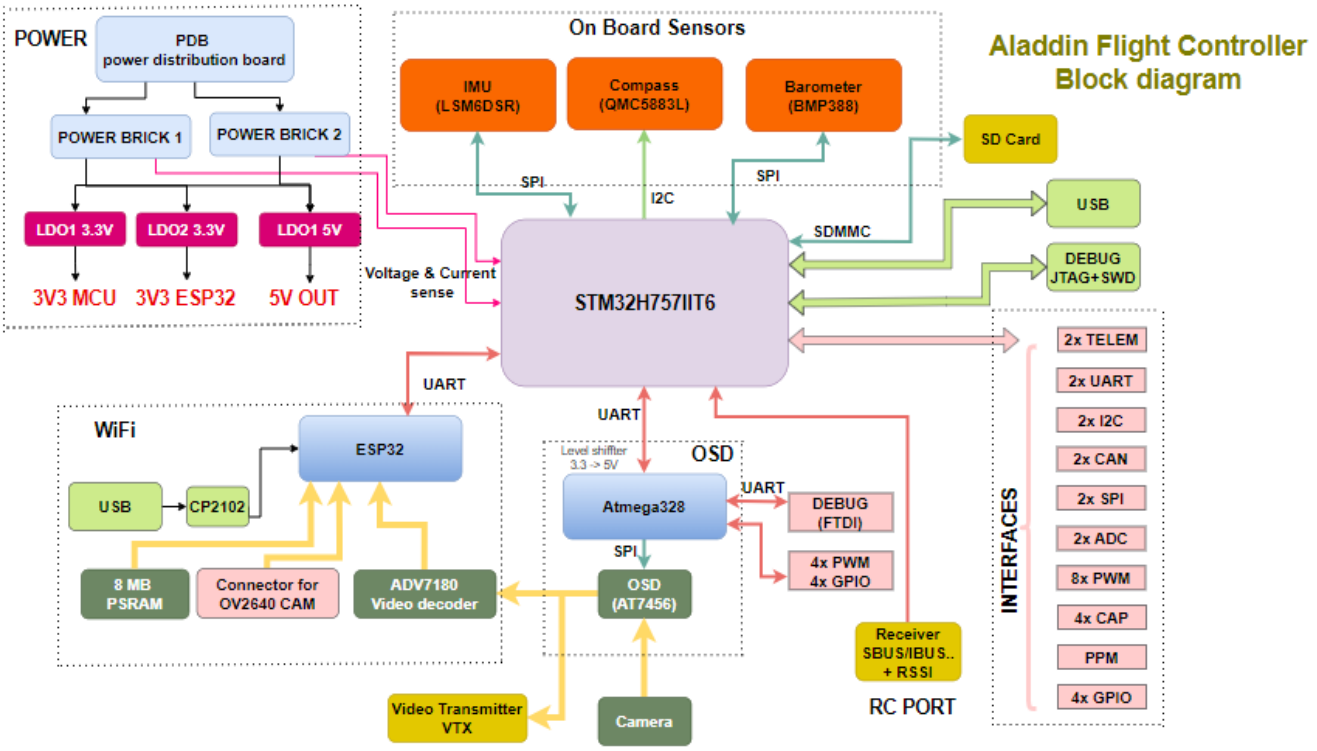


Top layer



Bottom layer

Aladdin FC Block Diagram



Connectors :

(Number of pin on board from left ->right / up -> down)

POWER BRICK 1

Pin	Signal	Volt
1	GND	GND
2	GND	GND
3	VOLTAGE1	+3V3
4	CURRENT1	+3V3
5	VCC1	+5V
6	VCC1	+5V

POWER BRICK 2

Pin	Signal	Volt
1	GND	GND
2	GND	GND
3	VOLTAGE2	+3V3
4	CURRENT2	+3V3
5	VCC2	+5V
6	VCC2	+5V

UART1 / UART2

Pin	Signal	Volt
1	VCC	+5V
2	TX	+3.3V
3	RX	+3.3V
4	GND	GND

TELEM 1 / TELEM 2

Pin	Signal	Volt
1	VCC	+5V
2	TX	+3V3
3	RX	+3V3
4	CTS	+3V3
5	RTS	+3V3
6	GND	GND

CAN 1/ CAN 2

Pin	Signal	Volt
1	VCC	+5V
2	CAN_H	+3.3V
3	CAN_L	+3.3V
4	GND	GND

I2C 1 / I2C 2

Pin	Signal	Volt
1	VCC	+5V
2	SCK	+3.3V
3	SDA	+3.3V
4	GND	GND

SPI 1 / SPI 2

Pin	Signal	Volt
1	VCC	+5V
2	SCK	+3V3
3	MOSI	+3V3
4	MISO	+3V3
5	CS1	+3V3
6	CS2	+3V3
7	GND	GND

PWM FMU

Pin	Signal	Volt
1	GND	GND
2	PWM8	+3V3
3	PWM7	+3V3
4	PWM6	+3V3
5	PWM5	+3V3
6	PWM4	+3V3
7	PWM3	+3V3
8	PWM2	+3V3
9	PWM1	+3V3
10	VCC	+5V

PWM AUX

Pin	Signal	Volt
1	VCC	+5V
2	IO4_AUX	+5V
3	IO3_AUX	+5V
4	IO2_AUX	+5V
5	IO1_AUX	+5V
6	PWM4_AUX	+5V
7	PWM3_AUX	+5V
8	PWM2_AUX	+5V
9	PWM1_AUX	+5V
10	GND	GND

I/O

Pin	Signal	Volt
1	VCC	+5V
2	IO1	+3V3
3	IO2	+3V3
4	IO3	+3V3
5	IO4	+3V3
6	GND	GND

RC

Pin	Signal	Volt
1	VCC	5V
2	VCC	+3.3V
3	SBUS/IBUS	+3.3V
4	RSSI	+3.3V
5	GND	GND

PPM

Pin	Signal	Volt
1	GND	GND
2	PPM	3V3
3	VCC	5V

CAM

Pin	Signal	Volt
1	VCC	+5V
2	CAM_IN	3V3
3	GND	GND

VTX

Pin	Signal	Volt
1	VCC	+5V
2	Video_OUT	3V3
3	GND	GND

ADC

Pin	Signal	Volt
1	VCC	+5V
2	CAP1	+3.3V
3	CAP2	+3.3V
4	CAP3	+3.3V
5	CAP4	+3.3V
6	ADC1	+3.3V
7	ADC2	+3.3V
8	GND	GND

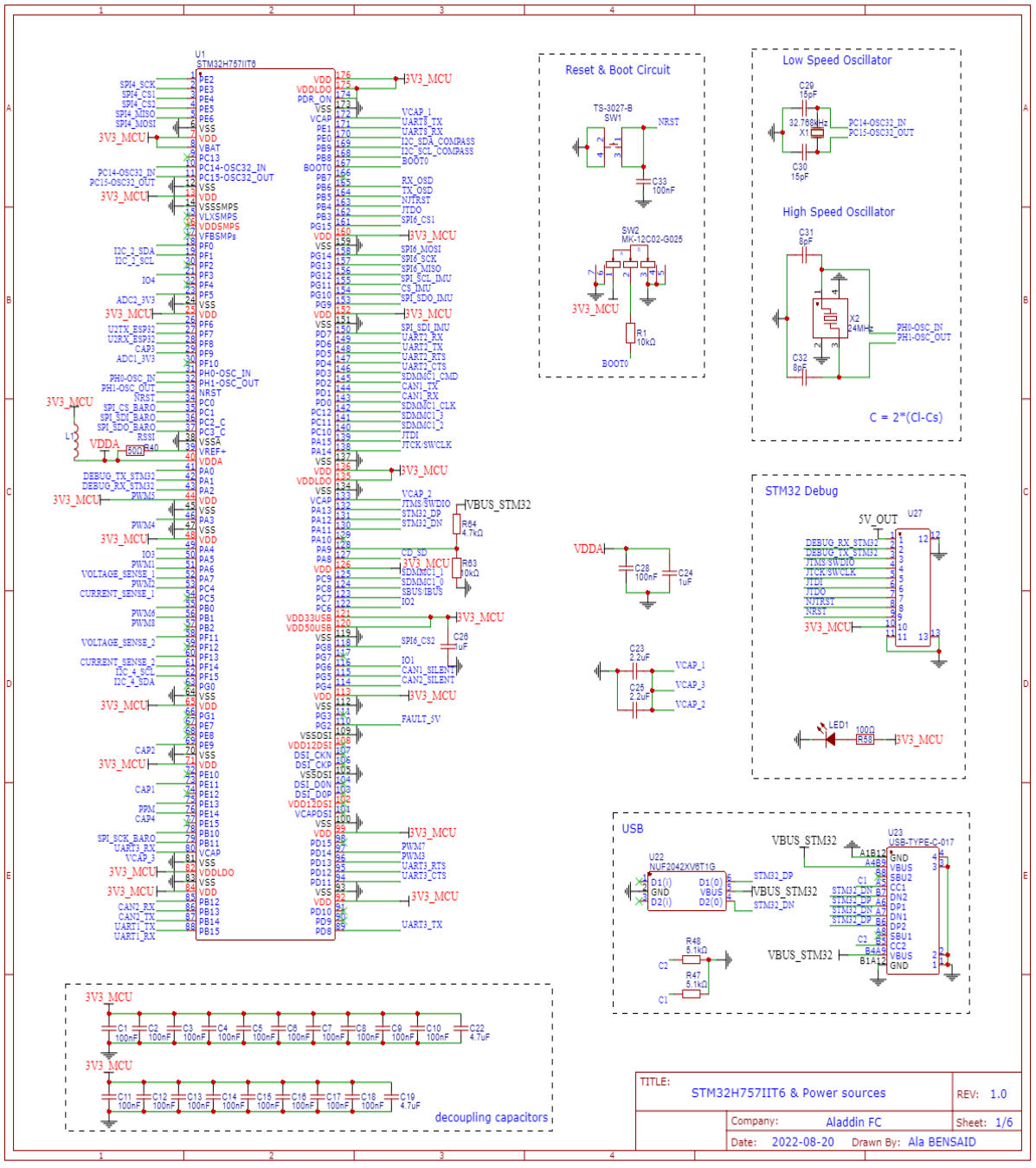
FC DEBUG

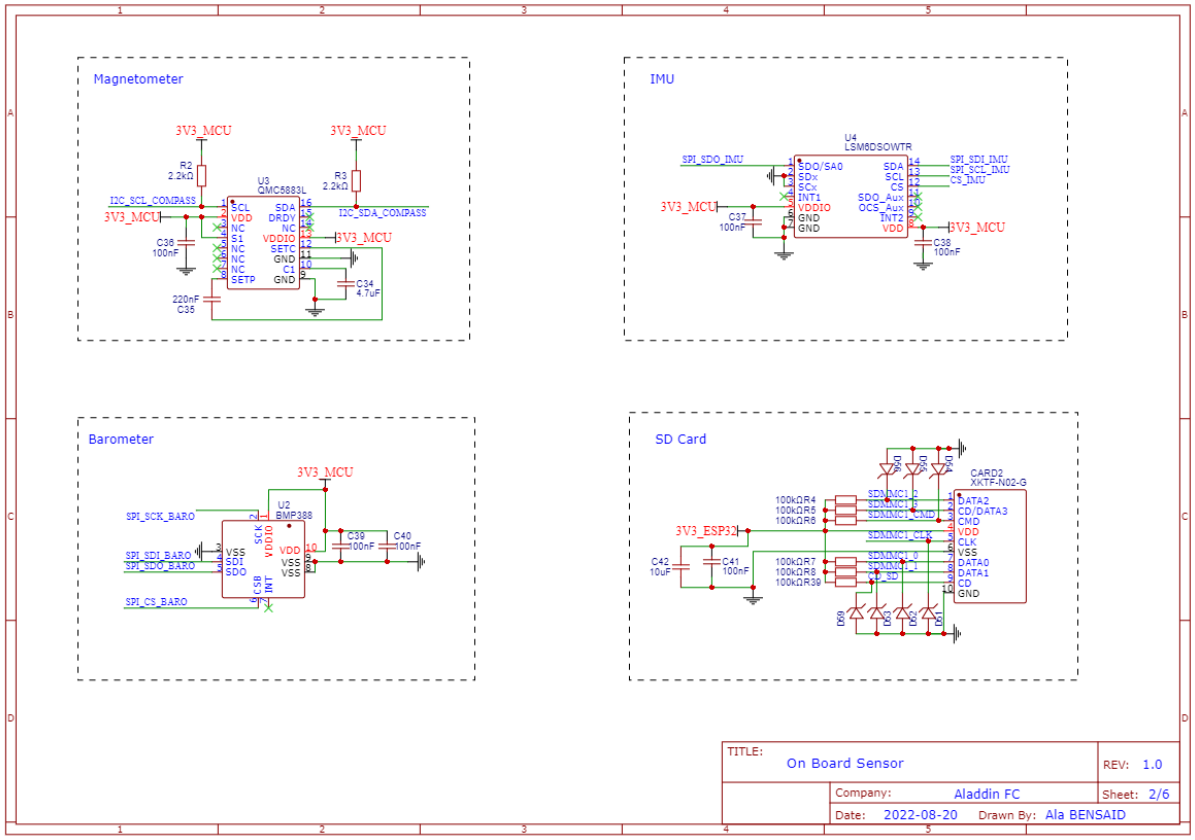
Pin	Signal	Volt
1	VCC	+5V
2	RX_STM32	+3.3V
3	TX_STM32	+3.3V
4	JTMS/SWDIO	+3.3V
5	JTCK/SWCLK	+3.3V
6	JTDI	+3.3V
7	JTDO	+3.3V
8	NJTRST	+3.3V
9	NRST	+3.3V
10	VCC	+3.3V
11	GND	GND

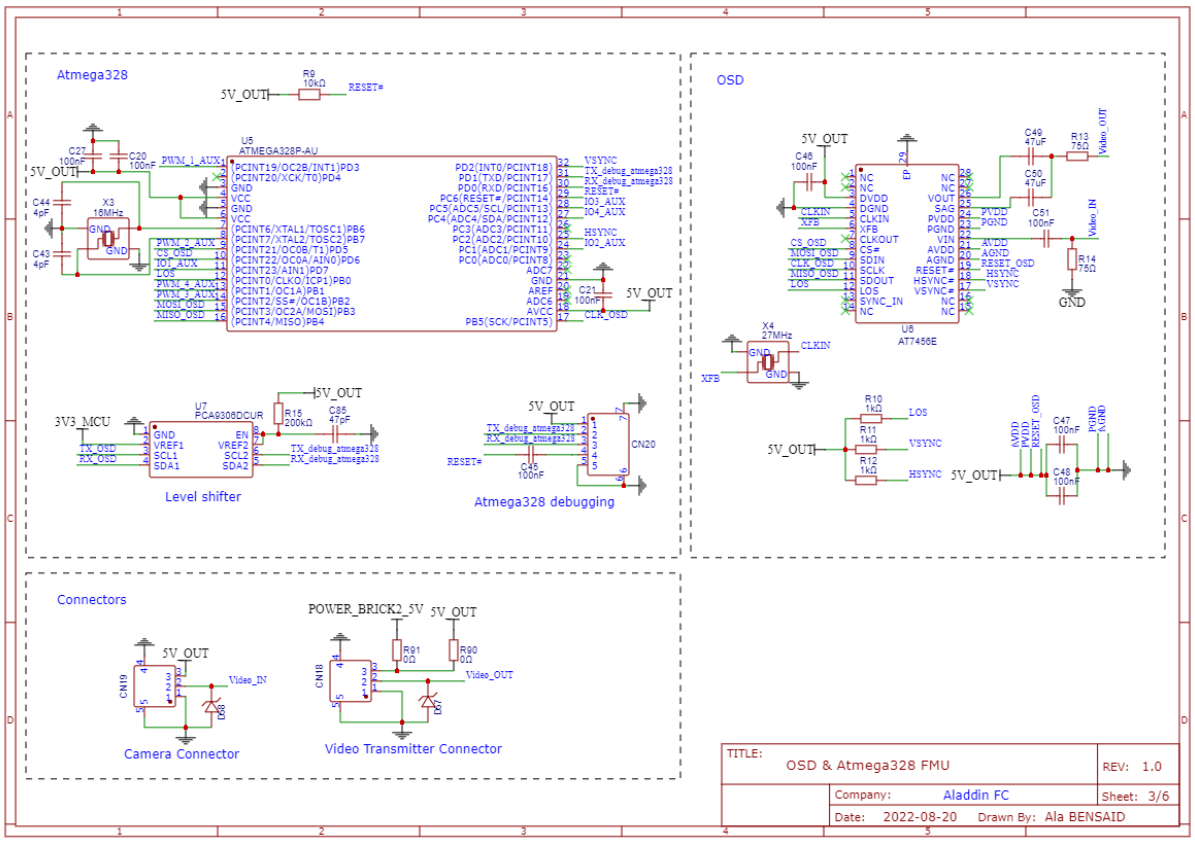
OSD DEBUG

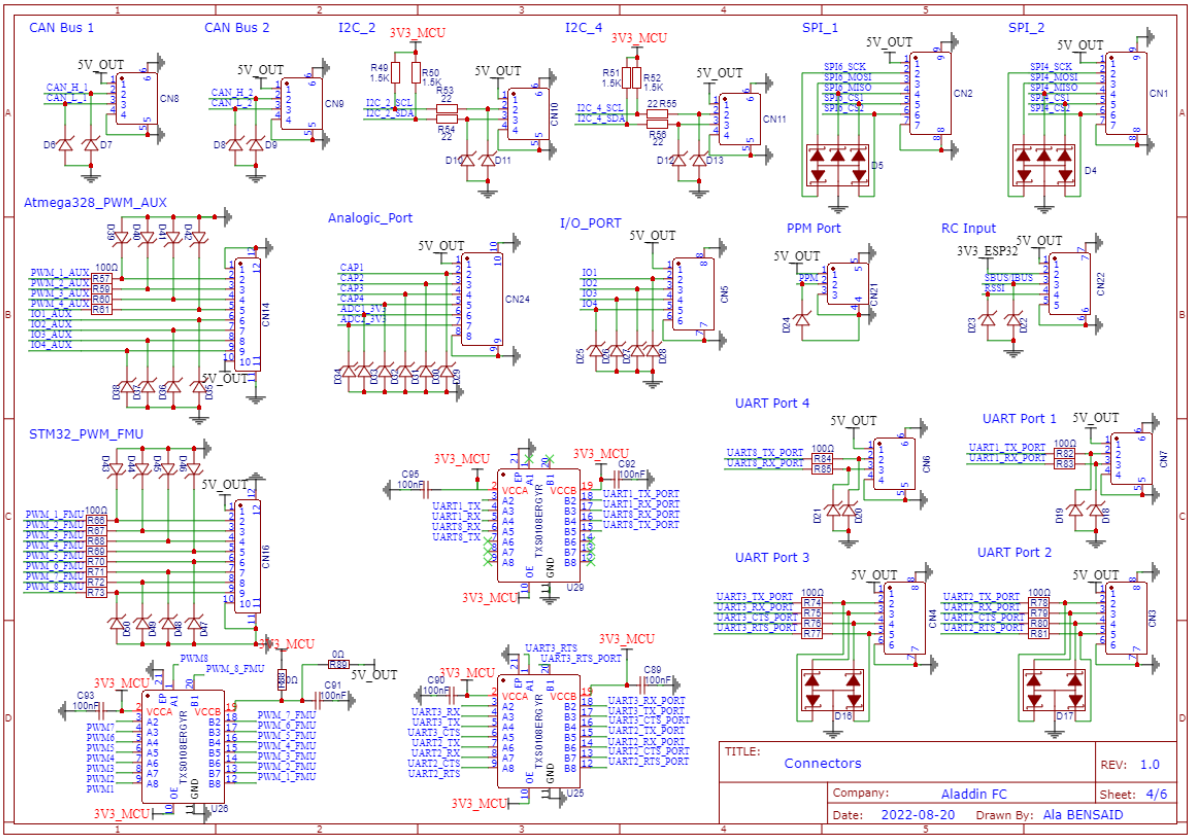
Pin	Signal	Volt
1	GND	GND
2	RESET	+5V
3	RX	+5V
4	TX	+5V
5	VCC	+5V

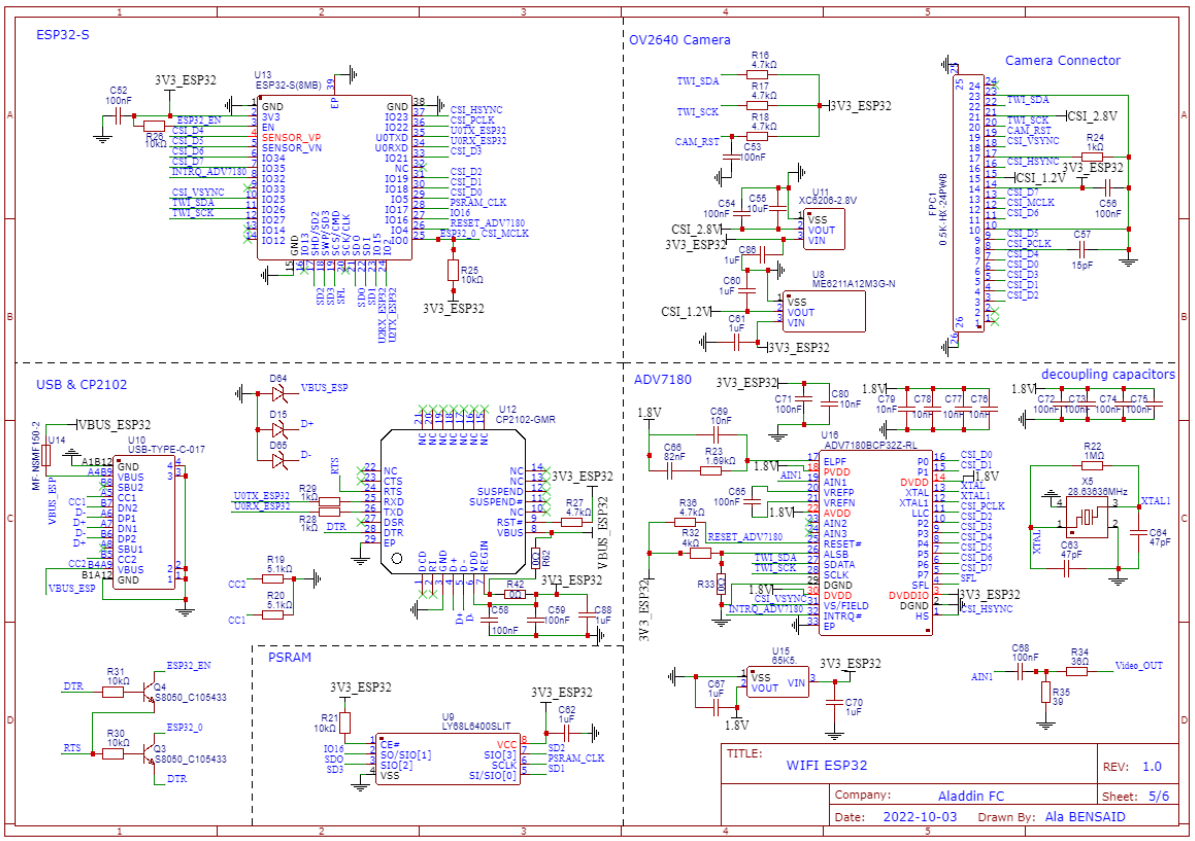
Aladdin FC schematics :

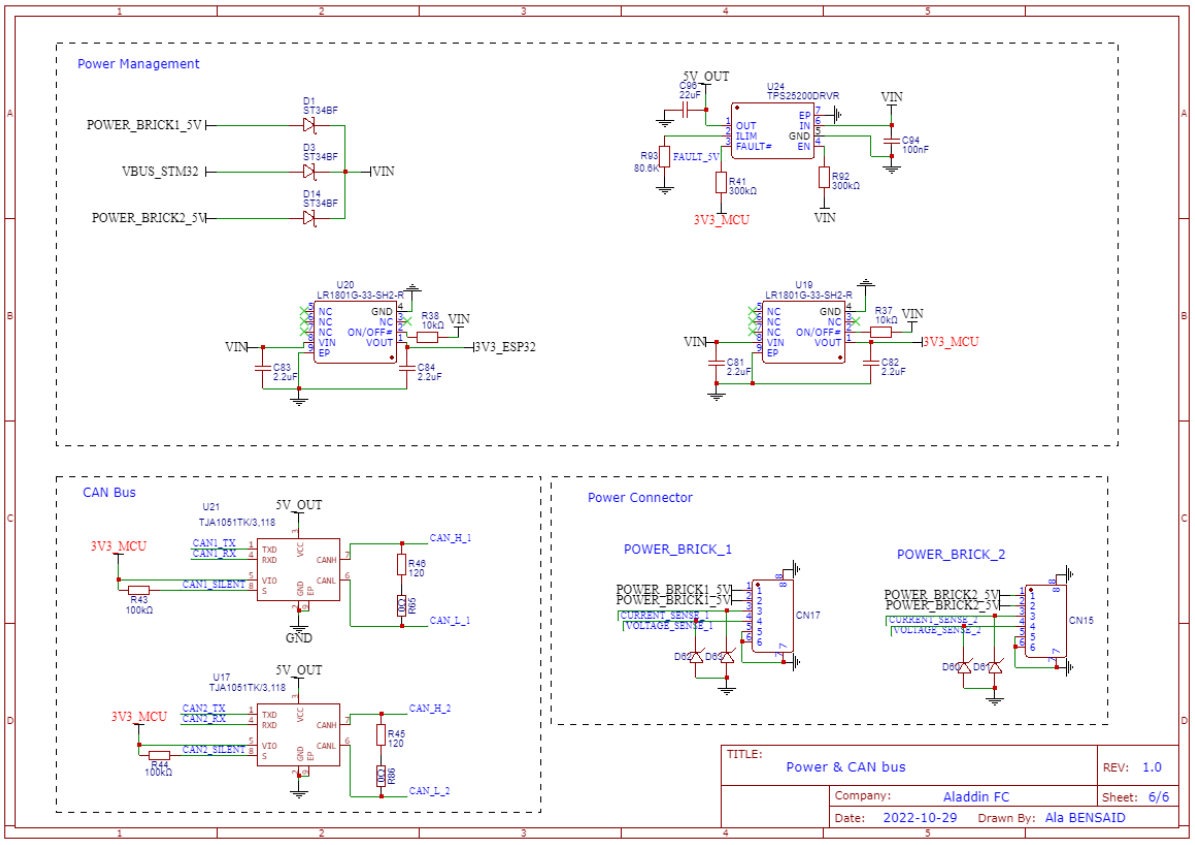



Magnetometer
3V3_MCU
3V3_MCU
R2
2.2kΩ
R3
2.2kΩ
U3
QMC5883L
I2C_SCL_COMPASS
3V3_MCU
SCL
VDD
NC
S1
NC
NC
NC
SETP
SDA
DRDY
NC
VDDIO
SETC
GND
C1
GND
I2C_SDA_COMPASS
3V3_MCU
C36
100nF
220nF
C35
C34
4.7uF
IMU
U4
LSM6DSOWTR
SPI_SDO_IMU
SDO/SA0
SDx
SCx
INT1
VDDIO
GND
GND
SDA
SCL
CS
SDO_Aux
OCS_Aux
INT2
VDD
SPI_SDI_IMU
SPI_SCL_IMU
CS_IMU
3V3_MCU
C37
100nF
3V3_MCU
C38
100nF
Barometer
3V3_MCU
U2
BMP388
SPI_SCK_BARO
SPI_SDI_BARO
SPI_SDO_BARO
SPI_CS_BARO
SCK
VDDIO
VSS
SDI
SDO
CSB
INT
VDD
VSS
VSS
C39
100nF
C40
100nF
SD Card
CARD2
XKTF-N02-G
3V3_ESP32
C42
10uF
C41
100nF
100kΩR4
100kΩR5
100kΩR6
100kΩR7
100kΩR8
100kΩR39
SDMMC1_D2
SDMMC1_D3
SDMMC1_CMD
SDMMC1_CLK
SDMMC1_D0
SDMMC1_D1
SDI
DATA2
CD/DATA3
CMD
VDD
CLK
VSS
DATA0
DATA1
CD
GND
D69
D68
D67
D66
TITLE:
On Board Sensor
REV: 1.0
Company: Aladdin FC
Sheet: 2/6
Date: 2022-08-20
Drawn By: Ala BENSAID


Atmega328
5V_OUT
R9
10kΩ
RESET#
U5
ATMEGA328P-AU
C27
100nF
C20
100nF
PWM_1_AUX
5V_OUT
C44
4pF
C43
4pF
X3
16MHz
GND
GND
PWM_2_AUX
CS_OSD
TOT_AUX
TOS
PWM_4_AUX
PWM_3_AUX
MOSI_OSD
MISO_OSD
(PCINT19/OC2B/INT1)PD3
(PCINT20/XCK/T0)PD4
GND
VCC
GND
VCC
(PCINT6/XTAL1/TOSC1)PB6
(PCINT7/XTAL2/TOSC2)PB7
(PCINT21/OC0B/T1)PD5
(PCINT22/OC0A/AIN0)PD6
(PCINT23/AIN1)PD7
(PCINT0/CLKO/ICP1)PB0
(PCINT1/OC1A)PB1
(PCINT2/SS#/OC1B)PB2
(PCINT3/OC2A/MOSI)PB3
(PCINT4/MISO)PB4
PD2(INT0/PCINT18)
PD1(TXD/PCINT17)
PD0(RXD/PCINT16)
PC6(RESET#/PCINT14)
PC5(ADC5/SCL/PCINT13)
PC4(ADC4/SDA/PCINT12)
PC3(ADC3/PCINT11)
PC2(ADC2/PCINT10)
PC1(ADC1/PCINT9)
PC0(ADC0/PCINT8)
ADC7
GND
AREF
ADC6
AVCC
PB5(SCK/PCINT5)
VSYNC
TX_debug_atmega328
RX_debug_atmega328
RESET#
IO3_AUX
IO4_AUX
HSYNC
IO1_AUX
C21
100nF
5V_OUT
CLK_OSD
3V3_MCU
U7
PCA9306DCUR
TX_OSD
RX_OSD
GND
VREF1
SCL1
SDA1
EN
VREF2
SCL2
SDA2
R15
200kΩ
C85
47pF
5V_OUT
TX_debug_atmega328
RX_debug_atmega328
Level shifter
5V_OUT
TX_debug_atmega328
RX_debug_atmega328
RESET#
C45
100nF
CN20
Atmega328 debugging
OSD
5V_OUT
C46
100nF
NC
NC
DVDD
DGND
CLKIN
XFB
CS_OSD
MOSI_OSD
CLK_OSD
MISO_OSD
LOS
EP
NC
NC
VOUT
SAG
PVDD
PGND
VIN
AVDD
AGND
RESET#
HSYNC#
VSYNC#
NC
NC
SDOUT
SDIN
SCLK
CLKOUT
CS#
SYNC_IN
NC
C49
47uF
C50
47uF
C51
100nF
R13
75Ω
Video_OUT
Video_IN
R14
75Ω
GND
U6
AT7456E
X4
27MHz
CLKIN
XFB
GND
GND
R10
1kΩ
R11
1kΩ
R12
1kΩ
LOS
VSYNC
HSYNC
5V_OUT
AVDD
PVDD
RESET_OSD
C47
100nF
C48
100nF
DGND
AGND
5V_OUT
Connectors
5V_OUT
CN19
Video_IN
D68
Camera Connector
POWER_BRICK2_5V
5V_OUT
CN18
R91
0Ω
R90
0Ω
Video_OUT
D67
Video Transmitter Connector
TITLE:
OSD & Atmega328 FMU
REV: 1.0
Company: Aladdin FC
Sheet: 3/6
Date: 2022-08-20
Drawn By: Ala BENSAID


CAN Bus 1
CAN Bus 2
I2C_2
I2C_4
SPI_1
SPI_2
Atmega328_PWM_AUX
Analogic_Port
I/O_PORT
PPM Port
RC Input
STM32_PWM_FMU
UART Port 4
UART Port 1
UART Port 3
UART Port 2
Connectors
REV: 1.0
Company: Aladdin FC
Sheet: 4/6
Date: 2022-08-20
Drawn By: Ala BENSAID

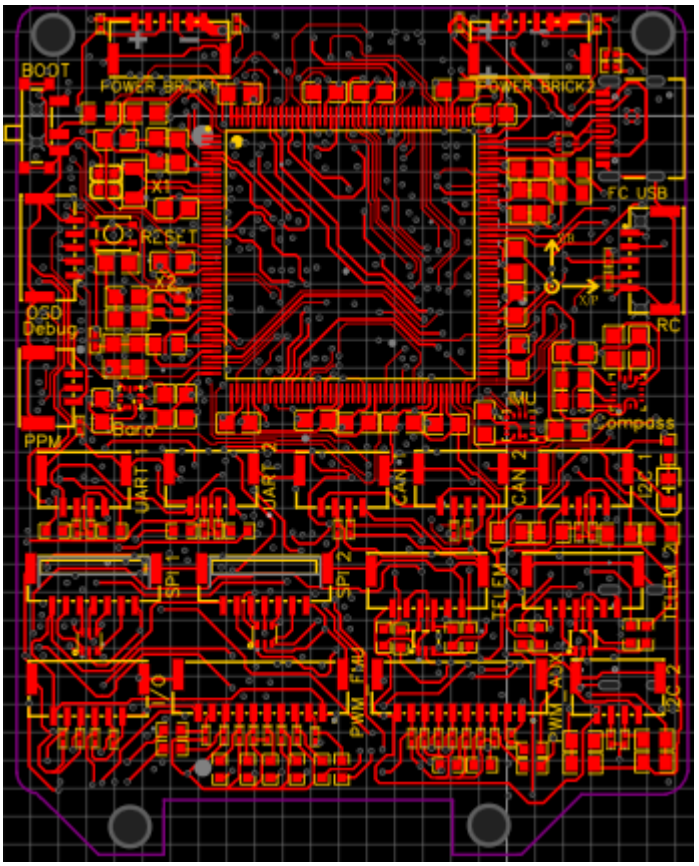

ESP32-S
OV2640 Camera
Camera Connector
USB & CP2102
ADV7180
decoupling capacitors
PSRAM
WIFI ESP32
REV: 1.0
Company: Aladdin FC
Sheet: 5/6
Date: 2022-10-03
Drawn By: Ala BENSAID


Power Management
POWER_BRICK1_5V
VBUS_STM32
POWER_BRICK2_5V
D1
ST34BF
D3
ST34BF
D14
ST34BF
VIN
5V_OUT
C98
22uF
U24
TPS26200DRVR
OUT
ILIM
FAULT#
EP
IN
GND
EN
VIN
C94
100nF
R93
80.6k
FAULT_5V
R41
300kΩ
R92
300kΩ
3V3_MCU
VIN
U20
LR1801G-33-SH2-R
NC
NC
NC
VIN
EP
GND
NC
ON/OFF#
VOUT
R38
10kΩ
VIN
3V3_ESP32
C83
2.2uF
C84
2.2uF
U19
LR1801G-33-SH2-R
R37
10kΩ
VIN
3V3_MCU
C81
2.2uF
C82
2.2uF
CAN Bus
U21
TJA1051TK/3,118
5V_OUT
3V3_MCU
CAN1_TX
CAN1_RX
CAN1_SILENT
TXD
RXD
VIO
S
VCC
CANH
CANL
GND
EP
R43
100kΩ
CAN_H_1
R46
120
R66
CAN_L_1
GND
U17
TJA1051TK/3,118
5V_OUT
3V3_MCU
CAN2_TX
CAN2_RX
CAN2_SILENT
R44
100kΩ
CAN_H_2
R45
120
R86
CAN_L_2
Power Connector
POWER_BRICK_1
POWER_BRICK1_5V
POWER_BRICK1_5V
CURRENT_SENSE_1
VOLTAGE_SENSE_1
CN17
D62
D63
POWER_BRICK_2
POWER_BRICK2_5V
POWER_BRICK2_5V
CURRENT_SENSE_2
VOLTAGE_SENSE_2
CN15
D60
D61
TITLE:
Power & CAN bus
REV: 1.0
Company: Aladdin FC
Sheet: 6/6
Date: 2022-10-29
Drawn By: Ala BENSAID

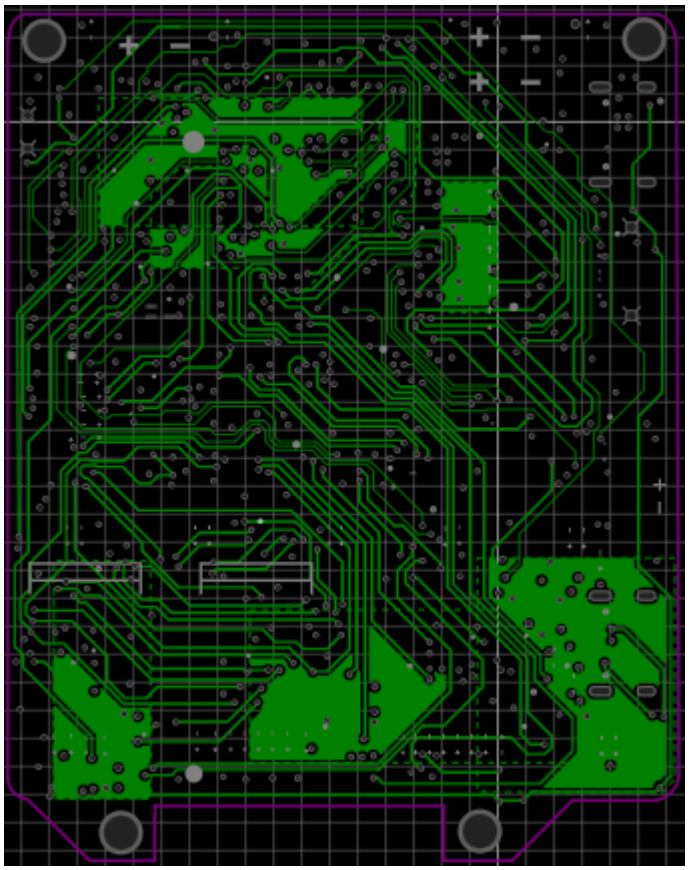
Aladdin FC is a 6 layers board with the following Stackup ;

1st layer (signals) + 2nd layer (GND Plane) + 3rd layer (signals + power) + 4th layer (signals) + 5th layer (GND plane) + 6th layer (signals)

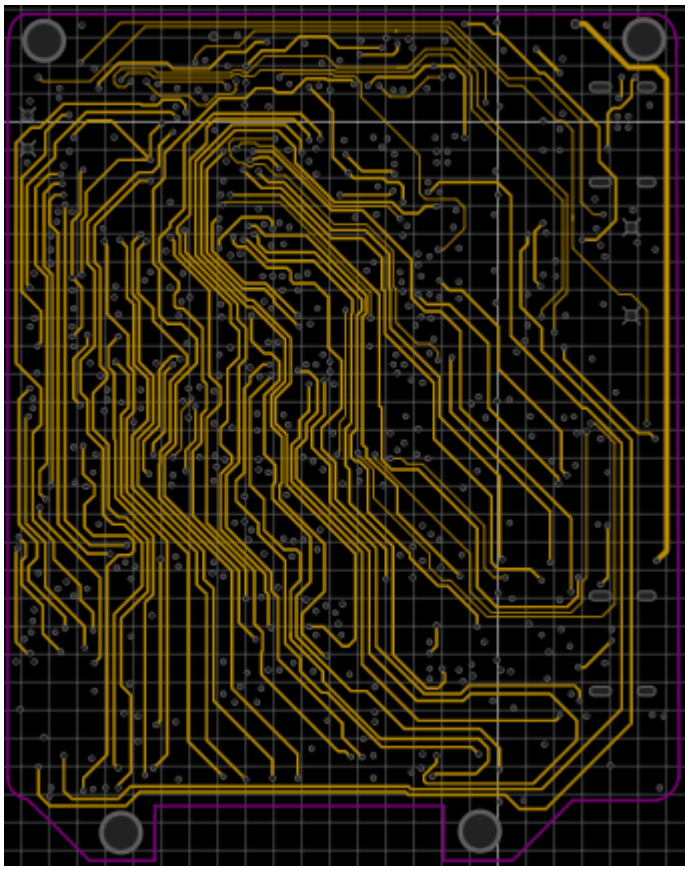
1st layer (Top layer) layout :



3rd layer layout



4th layer layout



6th layer (Bottom layer) layout :