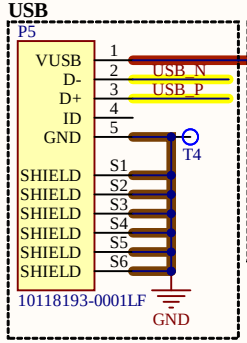
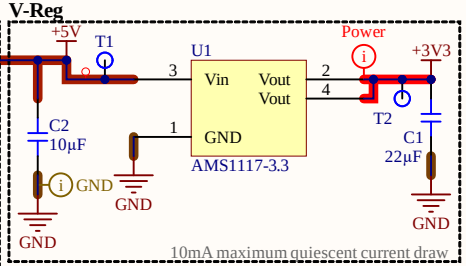
## Input

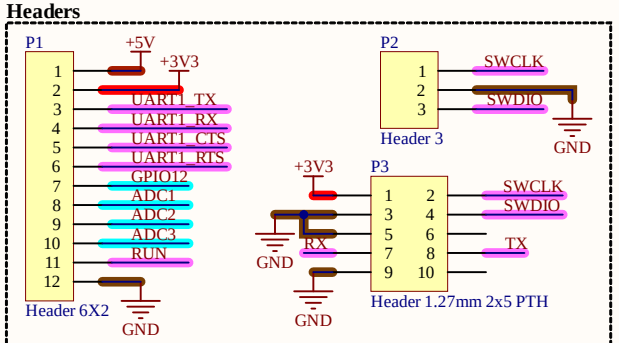
### USB



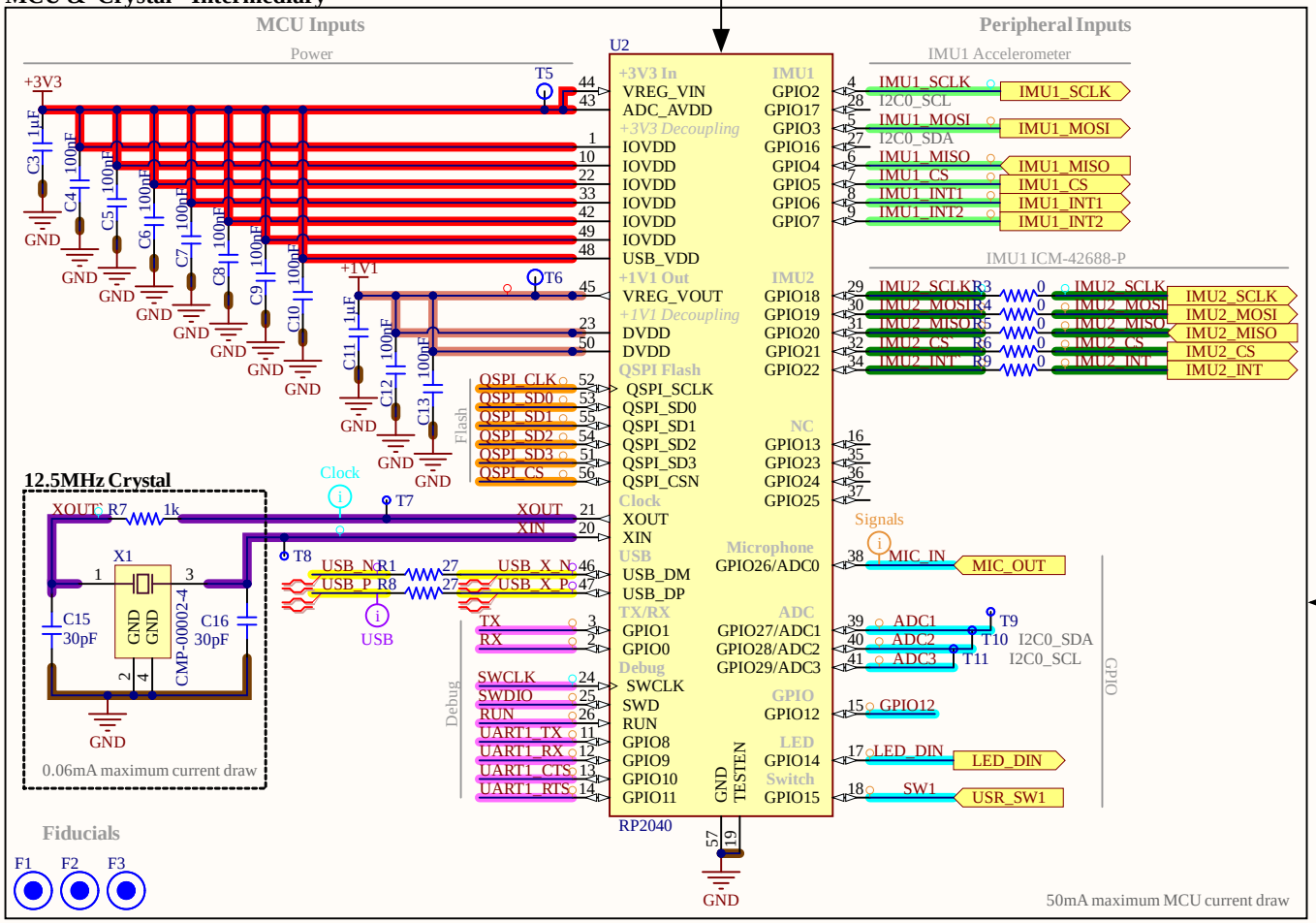

### V-Reg



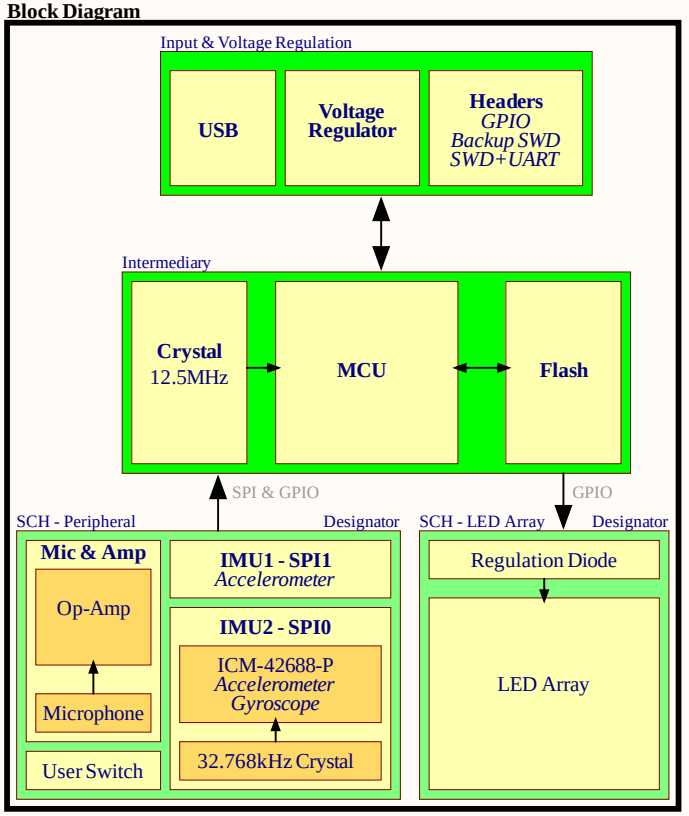

### Headers



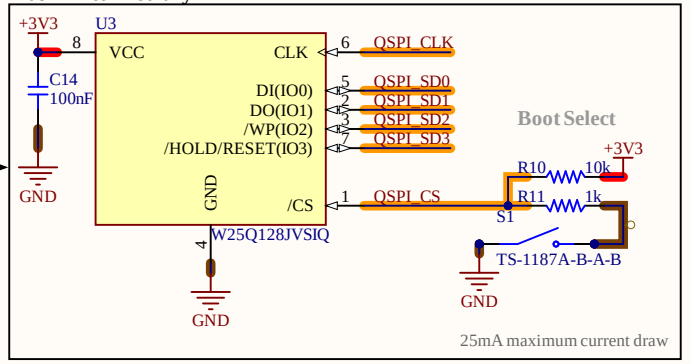

## MCU & Crystal - Intermediary




## Block Diagram



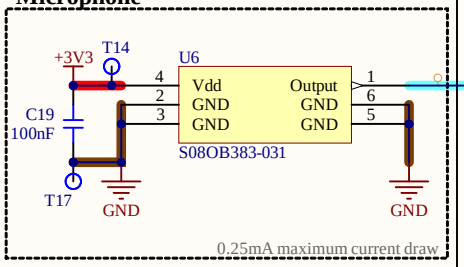

## Flash - Intermediary



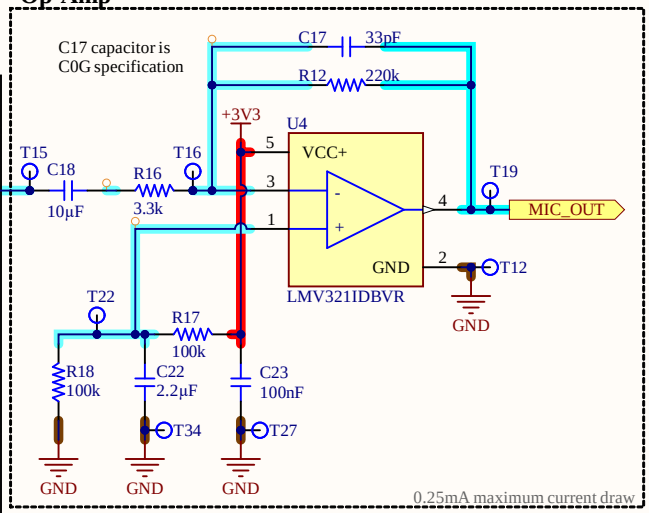

| | | |
|---|---|---|
| *AS1 SCH - Input & Intermediaries* | Drawn by: Jacob Finger, Liam McLaren | JAMES COOK UNIVERSITY AUSTRALIA |
| *Conx, Headers, MCU & Flash* | | |
| Sheet 1 of 3 | | |
| Date: 12/08/2024 Time: 4:32:11 PM | Revision: 1.2 | |
| File: SCH - Inputs and Intermediary.SchDoc | | |

# User Input

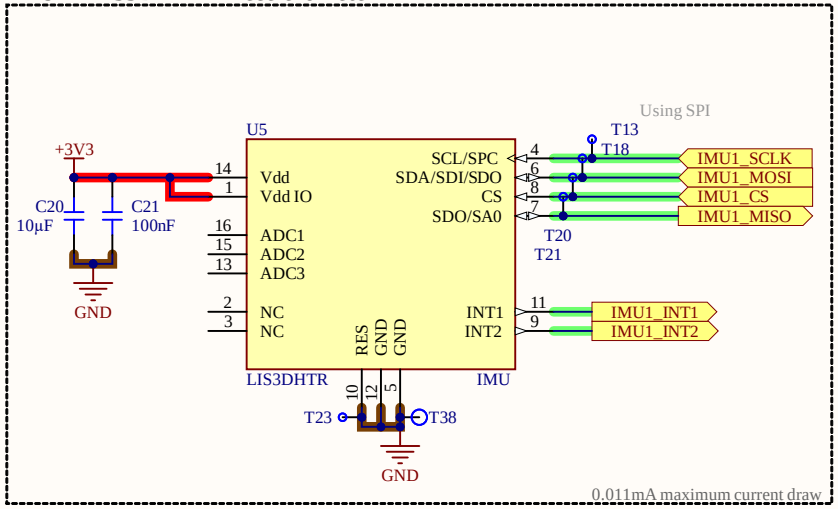
## Microphone



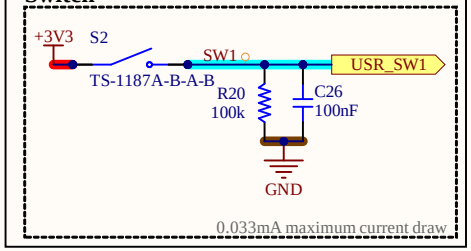

## Op-Amp




## IMU1 - LIS3DHTR - Accelerometer

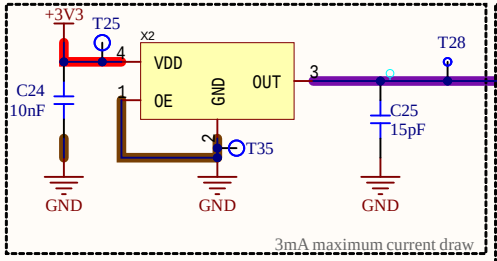



## Switch



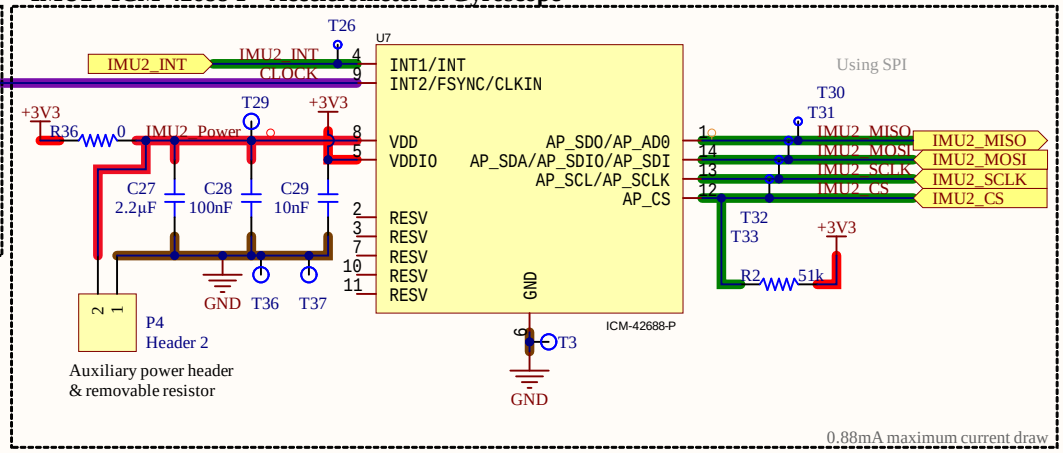

## Additional IMU2

### 32.768KHz RTC




Line Capacitance: 82.10345pF/m * 5.942mm = 0.488pf trace
15pf total load capacitance - 0.488pf line capacitance ~ 15pf load cap

### IMU2 - ICM-42688-P - Accelerometer & Gyroscope

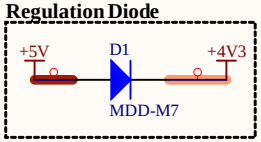



## System Current Draw

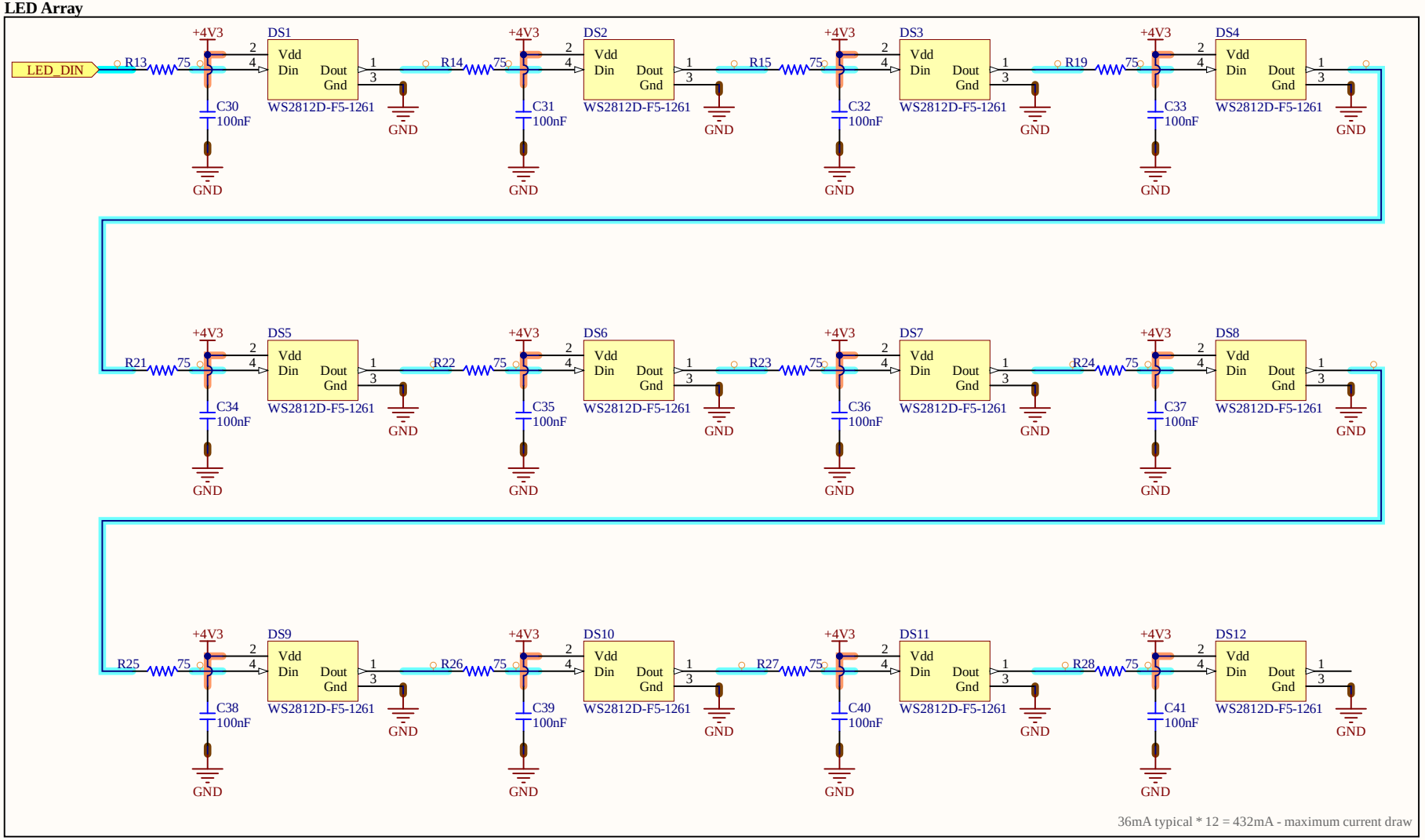
IMU1 - 11uA
IMU2 - 88uA
Flash - 25mA
MCU - 50mA
32kHz Crystal - 3mA
12.5MHz Crystal - 0.06mA
Op-Amp - 250uA
Microphone - 250uA
Voltage Regulator - 10mA
LED Array - 432mA
Switch - 33uA
---
521.4mA maximum current draw

| | | |
|---|---|---|
| *AS1 SCH - Peripherals* | Drawn by: | JAMES COOK UNIVERSITY AUSTRALIA |
| *Mic, Oscillator, IMUs & Switch* | Jacob Finger | |
| Sheet 2 of 3 | Liam McLaren | |
| Date: 12/08/2024 Time: 4:32:11 PM | Revision: 1.2 | |
| File: SCH - Peripheral.SchDoc | | |

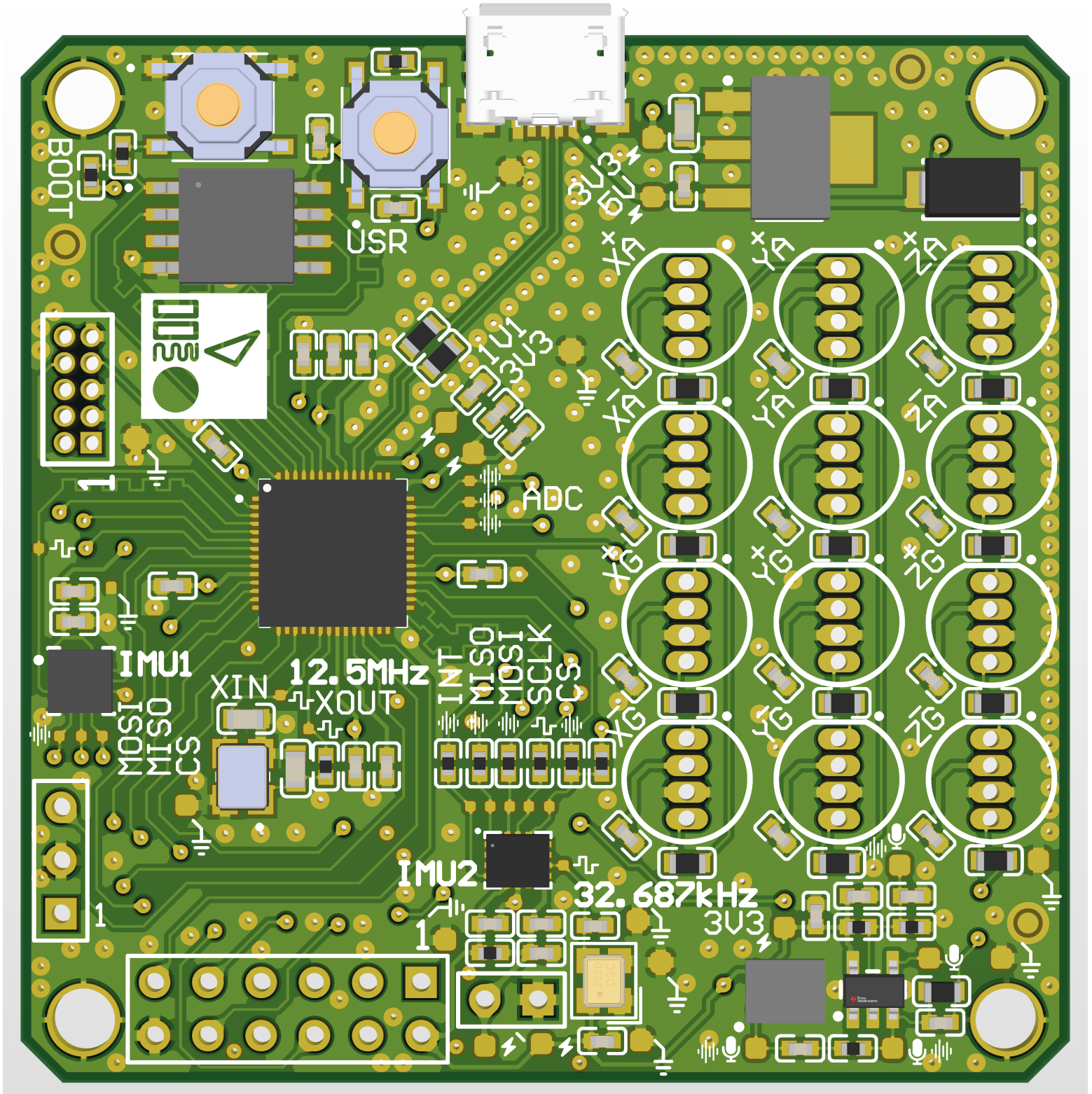
## Regulation Diode

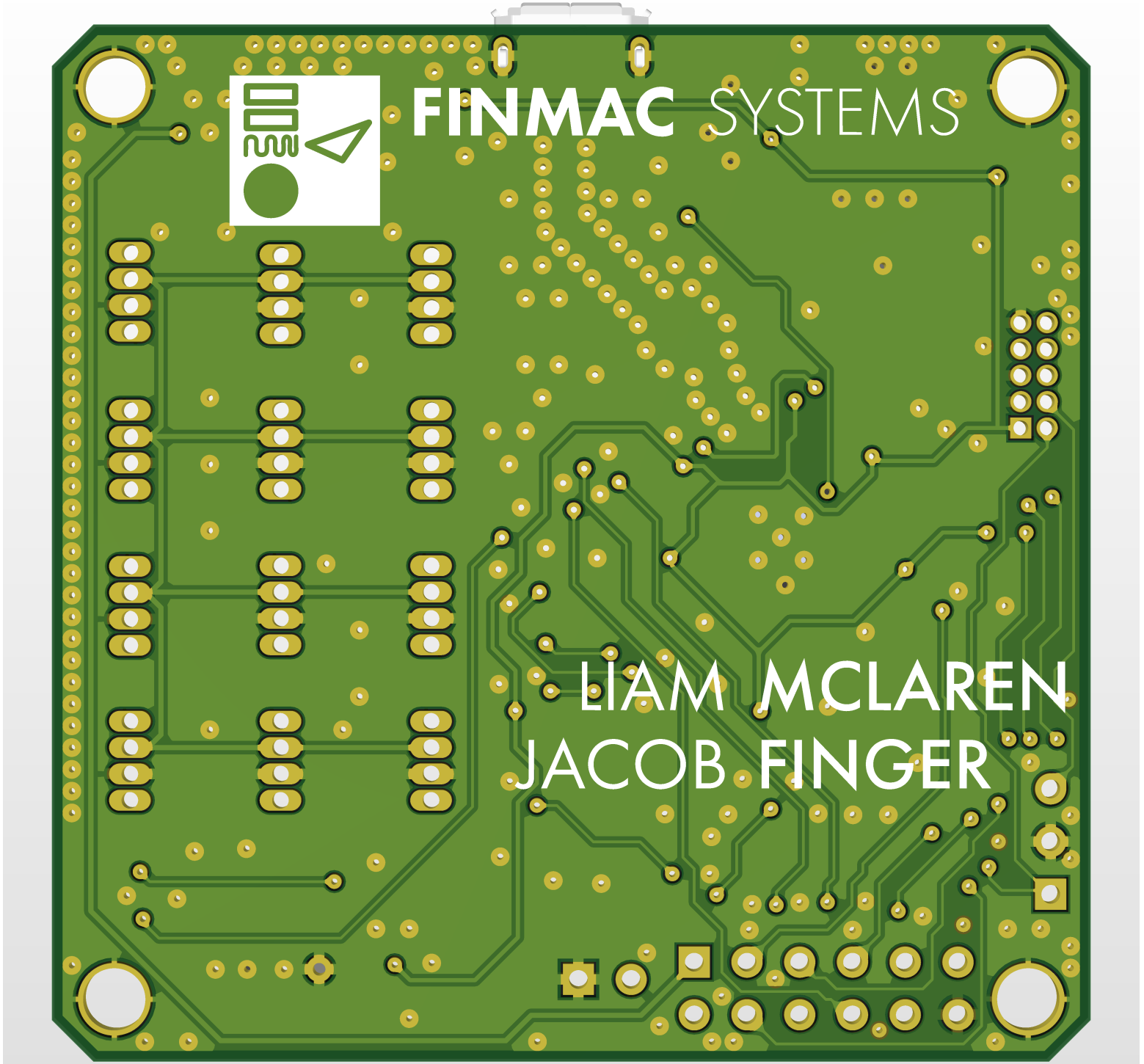


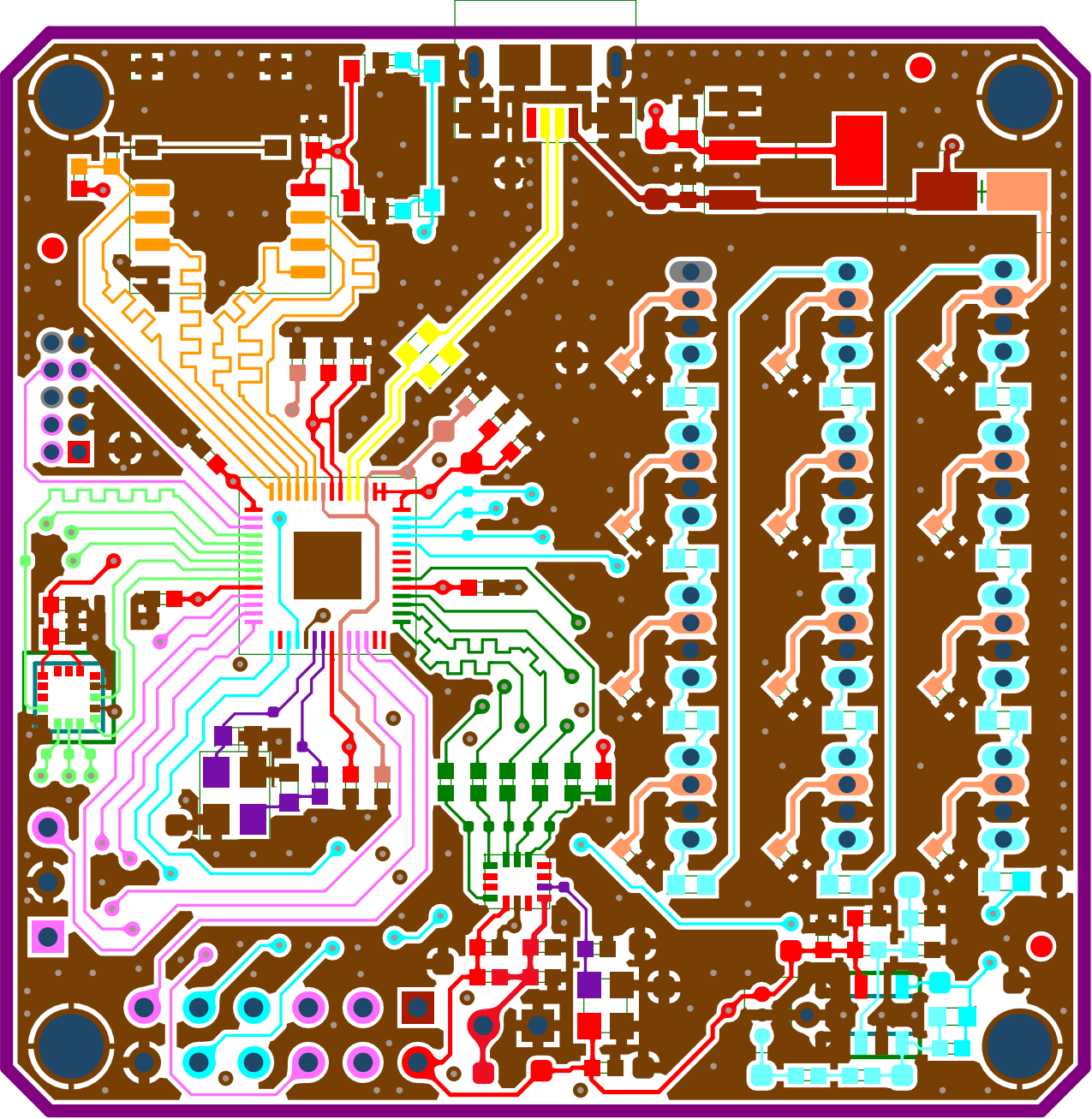

## LED Array

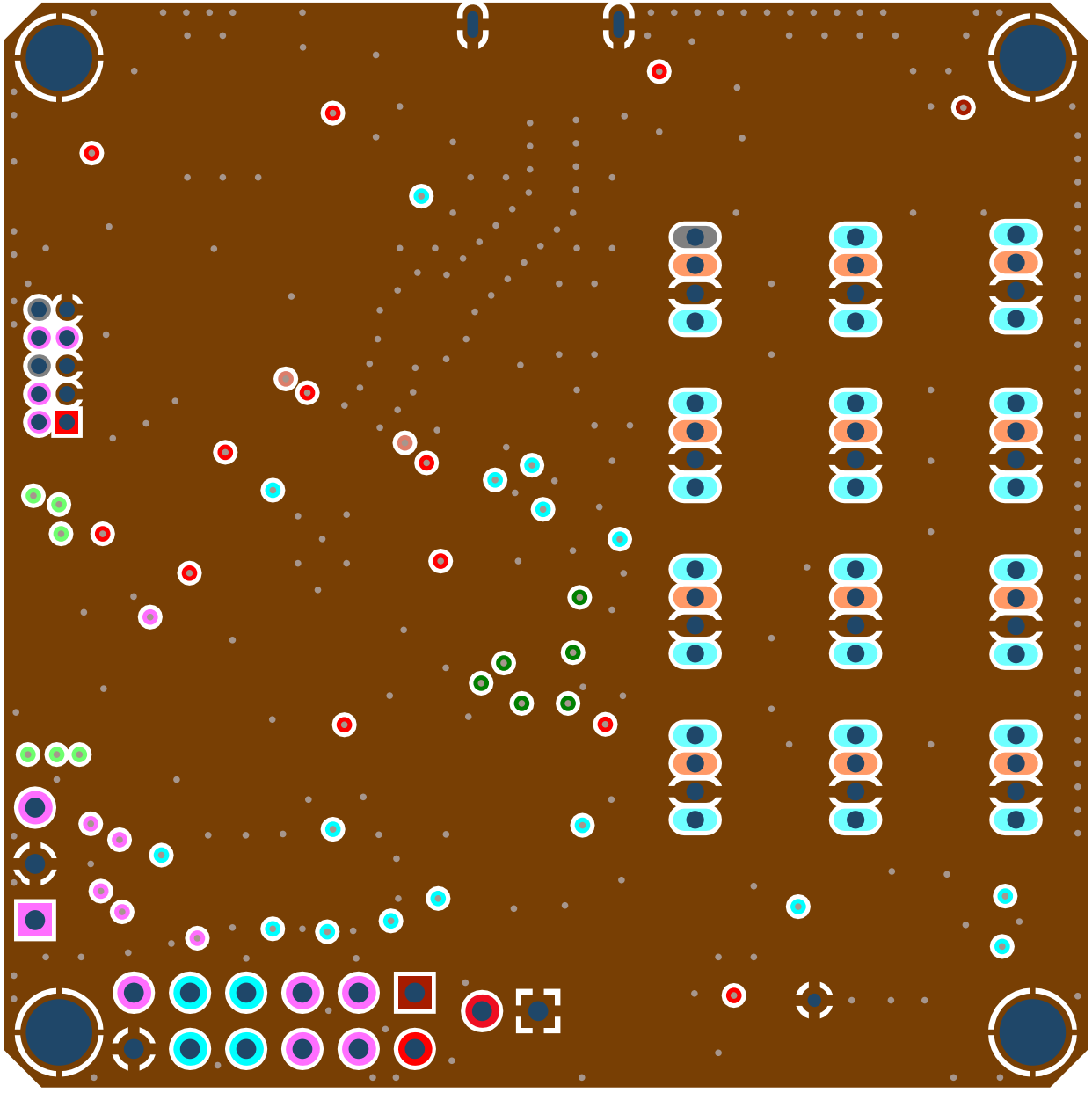


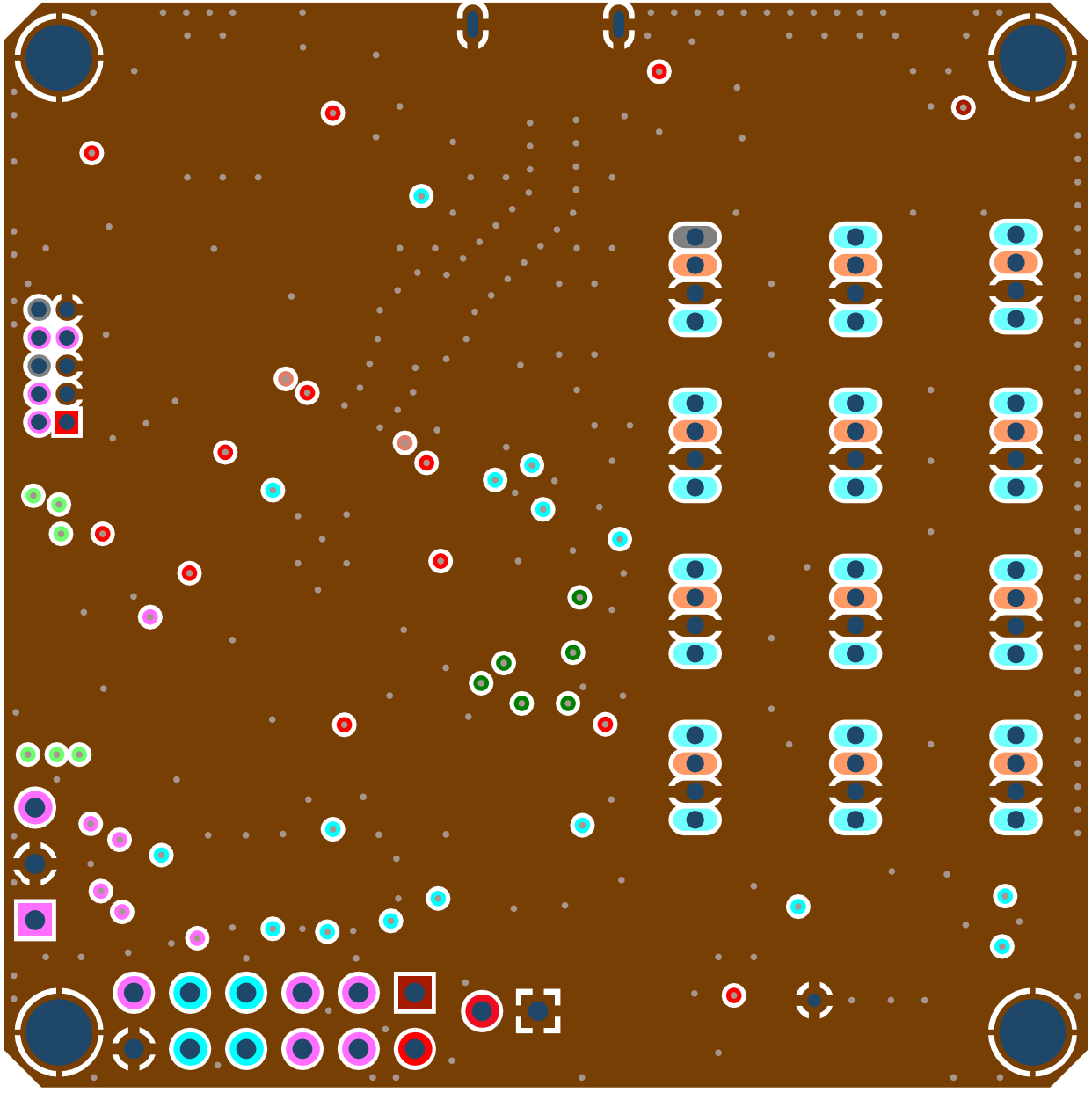

| | | |
|---|---|---|
| *AS1 SCH - LED Array*<br>*ARGB LED Array & Power Diode* | Drawn by:<br>Jacob Finger<br>Liam McLaren | JAMES COOK UNIVERSITY AUSTRALIA |
| Sheet 3 of 3 | | |
| Date: 12/08/2024 Time: 4:32:11 PM | Revision: 1.2 | |
| File: SCH - LED Array.SchDoc | | |

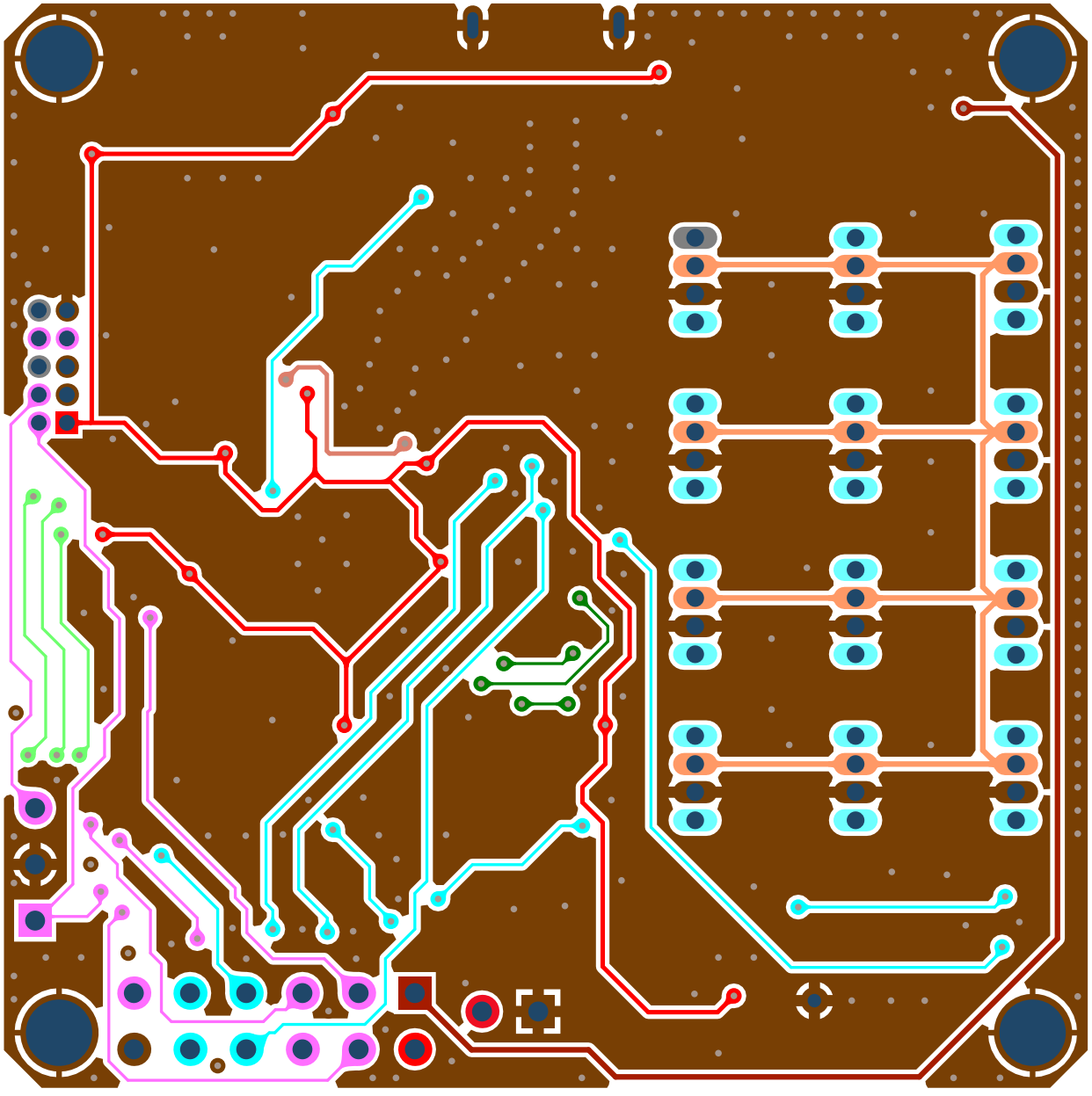

BOOT
USR
3V3
6V3
XA
YA
ZA
XG
YG
ZG
ADC
IMU1
MOSI
MISO
CS
XIN
12.5MHz
XOUT
INT
MISO
MOSI
SCLK
CS
IMU2
32.687kHz
3V3
1


FINMAC SYSTEMS
LIAM MCLAREN
JACOB FINGER









| Description | Designator | Footprint | JLCPCB Part Number | LCSC Part # | JLCPCB Part |
|---|---|---|---|---|---|
| Capacitor, Ceramic (MLCC), 22uF, ±20%, 6.3V, X5R, ±20%, SMD 0603 | C1 | CAP-0603 | C59461 | | |
| Capacitor, Ceramic (MLCC), 10uF, ±20%, 6.3V, X5R, ±20%, SMD 0402 | C2, C18, C20 | CAP-0402 | C15525 | | |
| Capacitor, Ceramic (MLCC), 1uF, ±10%, 25V, X5R, ±10%, SMD 0402 | C3, C11 | CAP-0402 | C52923 | | |
| Capacitor, Ceramic (MLCC), 100nF, ±10%, 50V, X7R, ±10%, SMD 0402 | C4, C5, C6, C7, C8, C9, C10, C12, C13, C14, C19, C21, C23, C28 | CAP-0402 | C307331 | | |
| Capacitor, Ceramic (MLCC), 30pF, ±5%, 50V, C0G, ±5%, SMD 0603 | C15, C16 | CAP-0603 | C1658 | | |
| Capacitor, Ceramic (MLCC), 33pF, ±5%, 50V, C0G, ±5%, SMD 0402 | C17 | CAP-0402 | C1562 | | |
| Capacitor, Ceramic (MLCC), 2.2uF, ±20%, 6.3V, X5R, ±20%, SMD 0402 | C22, C27 | CAP-0402 | C12530 | | |
| Capacitor, Ceramic (MLCC), 10nF, ±10%, 50V, X7R, ±10%, SMD 0402 | C24, C29 | CAP-0402 | C15195 | | |
| Capacitor, Ceramic (MLCC), 15pF, ±5%, 50V, C0G, ±5%, SMD 0402 | C25 | CAP-0402 | C1548 | | |
| Capacitor, Ceramic (MLCC), 100nF, ±10%, 16V, X7R, ±10%, SMD 0402 | C26, C30, C31, C32, C33, C34, C35, C36, C37, C38, C39, C40, C41 | CAP-0402 | C1525 | | |
| General purpose rectifier, 1.0 A, 1 kV, DO-214AC SMD | D1 | DIOM4227X24M | | | C95872 |
| USB - micro B USB 2.0 Receptacle Connector 5 Position Surface Mount, Right Angle; Through Hole | P5 | FCI_10118193-0001LF | | | C132562 |
| Resistor, 27Ω, ±1%, 100mW, 75V, ±200ppm/°C, -55°C~+155°C, SMD 0603 | R1, R8 | RES-0603 | C25190 | | |
| Resistor, 51kΩ, ±1%, 62.5mW, 50V, ±100ppm/°C, -55°C~+155°C, SMD 0402 | R2 | RES-0402 | C25794 | | |
| Resistor, 0Ω, ±1%, 62.5mW, 50V, ±800ppm/°C, -55°C~+155°C, SMD 0402 | R3, R4, R5, R6, R9, R36 | RES-0402 | C17168 | | |
| Resistor, 1kΩ, ±1%, 62.5mW, 50V, ±100ppm/°C, -55°C~+155°C, SMD 0402 | R7, R11 | RES-0402 | C11702 | | |
| Resistor, 10kΩ, ±1%, 62.5mW, 50V, ±100ppm/°C, -55°C~+155°C, SMD 0402 | R10 | RES-0402 | C25744 | | |
| Resistor, 220kΩ, ±1%, 100mW, 75V, ±100ppm/°C, -55°C~+155°C, SMD 0603 | R12 | RES-0603 | C22961 | | |
| Resistor, 75Ω, ±1%, 100mW, 75V, ±200ppm/°C, -55°C~+155°C, SMD 0603 | R13, R14, R15, R19, R21, R22, R23, R24, R25, R26, R27, R28 | RES-0603 | C4275 | | |
| Resistor, 3.3kΩ, ±1%, 62.5mW, 50V, ±100ppm/°C, -55°C~+155°C, SMD 0402 | R16 | RES-0402 | C25890 | | |
| Resistor, 100kΩ, ±1%, 62.5mW, 50V, ±100ppm/°C, -55°C~+155°C, SMD 0402 | R17, R18, R20 | RES-0402 | C25741 | | |
| SPST 50mA @12VDC Top Actuated Round Button 160gf SMD Tactile Switches RoHS | S1, S2 | SW_TS-1187A-B-A-B | | | C318884 |
| 3.3V 1A LOW DROPOUT VOLTAGE REGULATOR SOT-223 | U1 | SOT230P700X180-4N | | | C6186 |
| ARM Cortex-M0+ MCU 32-Bit Microcontroller for Raspberry Pi Pico | U2 | QFN40P700X700X90-57N | | | C2040 |
| FLASH - NOR Memory IC 128Mb (16M x 8) SPI - Quad I/O, QPI, DTR 133 MHz 8-SOIC | U3 | SOIC127P790X216-8N | | | C97521 |
| General Purpose Amplifier 1 Circuit Rail-to-Rail SOT-23-5 | U4 | FP-DBV0005A-MFG | | | C7972 |
| ACCEL 2-16G I2C/SPI 16LGA | U5 | FP-LGA-16-7983231-MFG | | | C15134 |
| MEMS Microphone SMD 3.76x3x1.1mm | U6 | Goertek_S08OB381-026 | | | C233789 |
| ICM-42688-P LGA-14(2.5x3) Attitude Sensor/Gyroscope | U7 | LGA-14_L3.0-W2.5-P0.50-TL | | C1850418 | |
| 12MHz SMD Crystal Resonator 20pF ±10ppm ±30ppm -40°C~+85°C SMD3225-4P Crystals ROHS Yangxing Tech | X1 | X322512MSB4SI-Footprint-1 | | | C9002 |
| HSO221S RTC - 3.3V 3mA ±30ppm 32.768kHz SMD2520-4P Oscillators ROHS | X2 | OSC-SMD_4P-L2.5-W2.0-BL | | C253914 | |

# Design Rules Verification Report

Filename : C:\Users\Public\Documents\Altium\Assignment 1\PCB - Assignment 1.PcbDoc

Warnings 0
Rule Violations 0

| Warnings | |
|---|---|
| Total | 0 |

| Rule Violations | |
|---|---|
| Clearance Constraint (Gap=0.2mm) (All),(All) | 0 |
| Clearance Constraint (Gap=0.203mm) (OnLayer('Top Layer')),(All) | 0 |
| Clearance Constraint (Gap=0.203mm) (OnLayer('Bottom Layer')),(All) | 0 |
| Short-Circuit Constraint (Allowed=No) (All),(All) | 0 |
| Un-Routed Net Constraint ( (All) ) | 0 |
| Modified Polygon (Allow modified: No), (Allow shelved: No) | 0 |
| Width Constraint (Min=0.089mm) (Max=2.54mm) (Preferred=0.381mm) (All) | 0 |
| Routing Topology Rule(Topology=Shortest) (All) | 0 |
| Power Plane Connect Rule(Relief Connect )(Expansion=0.508mm) (Conductor Width=0.254mm) (Air Gap=0.254mm) | 0 |
| Minimum Annular Ring (Minimum=0.076mm) (All) | 0 |
| Hole Size Constraint (Min=0.2mm) (Max=6.3mm) (All) | 0 |
| Hole To Hole Clearance (Gap=0.254mm) (All),(All) | 0 |
| Minimum Solder Mask Sliver (Gap=0.1mm) (All),(All) | 0 |
| Silk To Solder Mask (Clearance=0.1mm) (IsPad),(All) | 0 |
| Silk to Silk (Clearance=0.1mm) (All),(All) | 0 |
| Net Antennae (Tolerance=0mm) (All) | 0 |
| Board Clearance Constraint (Gap=0mm) (All) | 0 |
| Height Constraint (Min=0mm) (Max=25.4mm) (Prefered=12.7mm) (All) | 0 |
| Total | 0 |