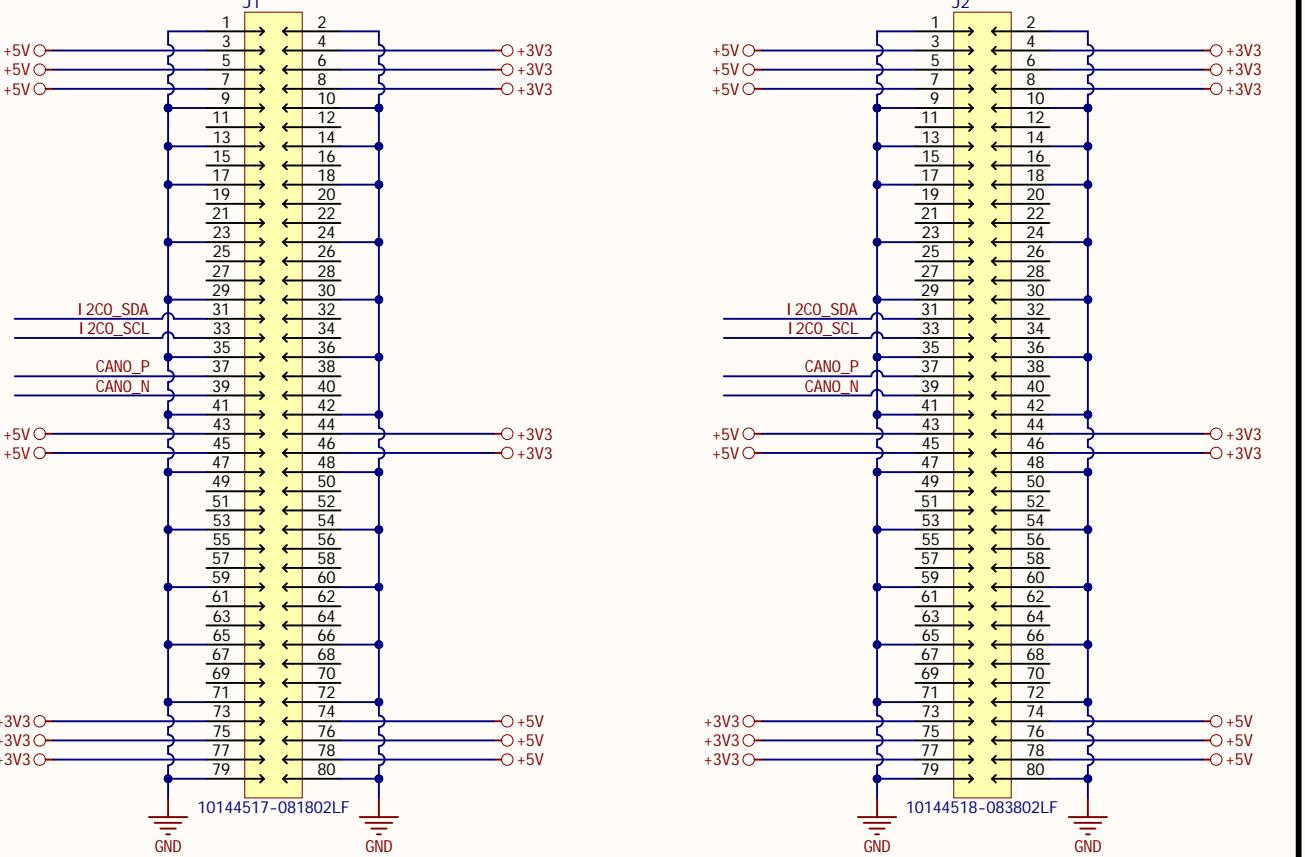
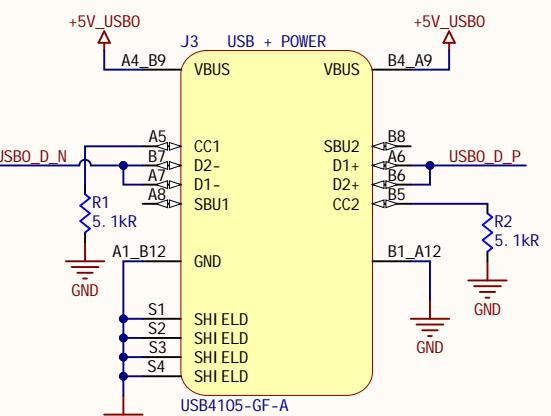


## BOARD CONNECTOR



## USB CONNECTORS



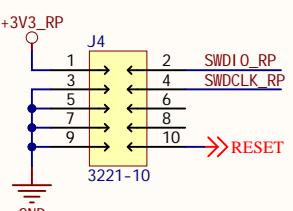
## NOTES:

- [1] CORESIGHT 2.0 STANDARD ALLOWS TRACECLK, TRDO - 4 TO ACT AS RTCK, SWO, nTRST, DBGRO, AND DBGACK.
- [2] SWD CAN ONLY BE USED FOR ONE MICROCONTROLLER UNLESS A SWD MULTIPLEXER IS EMPLOYED (SEE RESEARCH NOTES PG. 9 FOR DETAILS) OR MICROCONTROLLERS SUPPORT SWD 2.0 (SWD MULTIDROP).

## NOTES:

- [1] <https://dubiouscreations.com/2021/04/06/designing-with-usb-c-lessons-learned/>
- [2] [https://www.pcbway.com/blog/PCB\\_Design\\_Tutorial/How\\_to\\_add\\_USB\\_C\\_to\\_your\\_projects.html](https://www.pcbway.com/blog/PCB_Design_Tutorial/How_to_add_USB_C_to_your_projects.html)
- [3] DO NOT FORGET TO SECURE THE MECHANICAL POLES BEFORE CONNECTING ANYTHING.

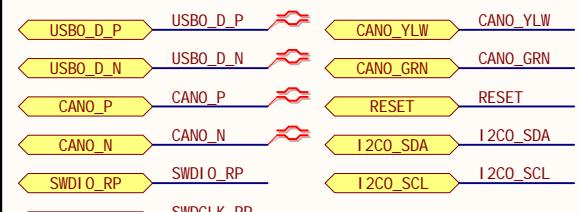
## SWD CONNECTOR



## NOTES:

- [1] THIS CONNECTOR IS THE MAIN INTENDED WAY TO DEBUG THE MAIN BOARD'S RP2040.
- [2] PIN 7 IS THE KEY. PIN 8 IS NO CONNECT.
- [3] NO SERIAL WIRE OUTPUT (SWO) ON THE RP2040. PIN 6 HAS BEEN LEFT DISCONNECTED.

## SCHEMATIC PORTS

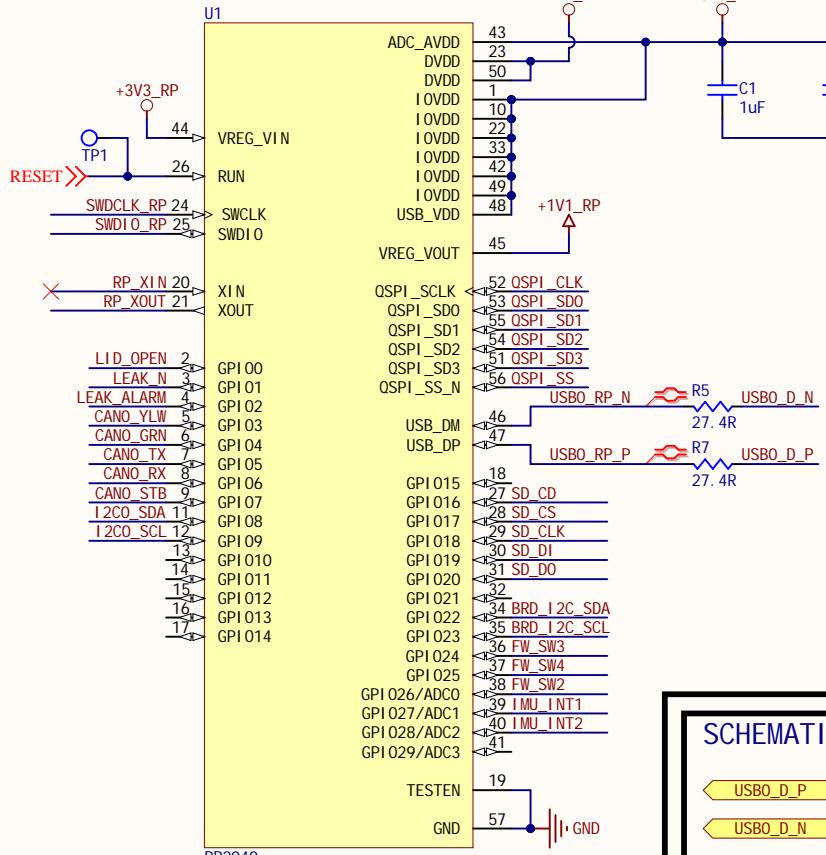


NOTES:

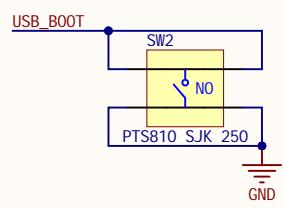
- [1] USB 2.0 TARGET IMPEDANCE IS 90 OHM. PCB TOOLKIT GAVE 91 OHMS FOR 11 MIL WIDE @ 10 MIL SPACING W/ CURRENT STACKUP.
- [2] <http://iamsimpler.com/COUPLED%20TRANSMISSION%20LINES%20AND%20Crosstalk.pdf>

Project/Vehicle: TGIS - System Status		Machine Intelligence Laboratory	
Author(s):	Revisor(s):		
-Yovany Molina	-*		
-Blake Sanders	-*		
-*	-*		
-*	-*		
		Git Repo: <a href="https://github.com/yomole/TaiGator">https://github.com/yomole/TaiGator</a>	
		Git Hash: 3111120c	
Date: 4/17/2024	Revision: V1	Size: A	File: Connectors.SchDoc
			Sheet 1 of 1

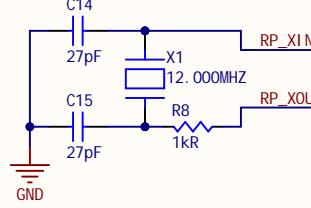
# MI CROCONTROLLER



## BOOTSEL



## OSCILLATOR



## SCHEMATIC PORTS

USBO_D_P	USBO_D_P	SWDIO_RP	SWDIO_RP	FW_SW2	FW_SW2
USBO_D_N	USBO_D_N	SWDCLK_RP	SWDCLK_RP	FW_SW4	FW_SW4
CANO_TX	CANO_RX	SD_CLK	SD_CLK	FW_SW3	FW_SW3
CANO_RX	CANO_TX	SD_DI	SD_DI	I MU_INT1	I MU_INT1
CANO_STB	CANO_STB	SD_DO	SD_DO	I MU_INT2	I MU_INT2
CANO_YLW	CANO_GRN	SD_CS	SD_CS	LID_OPEN	LID_OPEN
CANO_GRN	CANO_GRN	SD_CD	SD_CD	LEAK_N	LEAK_N
I2CO_SDA	I2CO_SDA	BRD_I2C_SCL	BRD_I2C_SCL	LEAK_ALARM	LEAK_ALARM
I2CO_SCL	I2CO_SCL	BRD_I2C_SDA	BRD_I2C_SDA		

**NOTES:**

- SEE RP2040 DATASHEET AND THE RP2040 HARDWARE DESIGN GUIDE FOR DETAILS.
- 1uF BULK DECOUPLING CAPS HAVE PRIORITY PLACEMENT.
- USE 10K RESISTOR FOR DNP IF CS IS NOT AT VCC ON STARTUP.
- RP2040 USES FLASH CS AS BOOTSEL.

[5] CANO COMMUNICATION RELIES ON "CANO2040" PIO IMPLEMENTATION (Kevin OConnor/cano2040 on GIT HUB).

Project/Vehicle: TGIS - System Status

Author(s):  
-Yovany Molina  
-Blake Sanders  
-\*

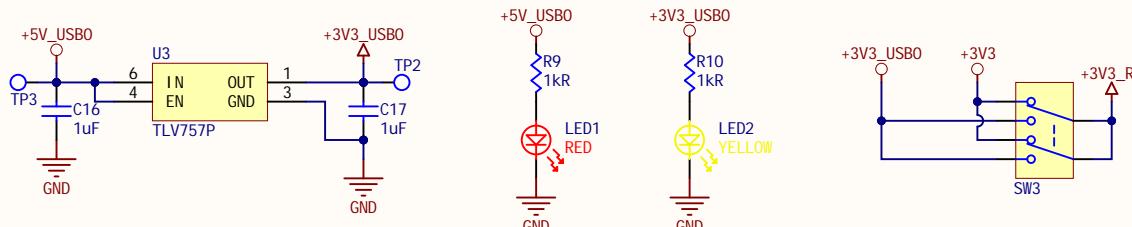
Revisor(s):  
-\*  
-\*  
-\*  
-\*

Machine Intelligence Laboratory  
1889 Museum Rd  
Room 3001  
Gainesville, FL, 32611  
Git Repo: <https://github.com/yomole/TailGator>  
Git Hash: 3111120c



Date: 4/17/2024 Revision: V1 Size: A File: Microcontroller.SchDoc

# RP2040 POWER



**NOTES:**  
 [1] POWER FOR THE RP2040 CAN COME FROM THE USB HOST OR THE TGIS 3V3 RAIL.

Project/Vehicle: TGIS - System Status

Author(s):

- Yovany Molina
- Blake Sanders
- \*
- \*

Revisor(s):

- \*
- \*
- \*
- \*

Machine Intelligence Laboratory

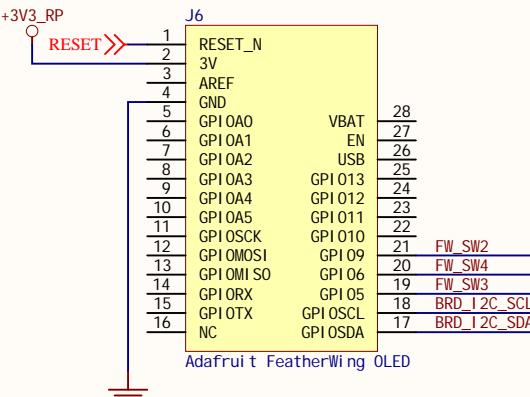
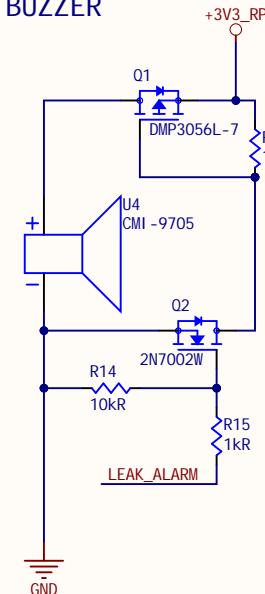
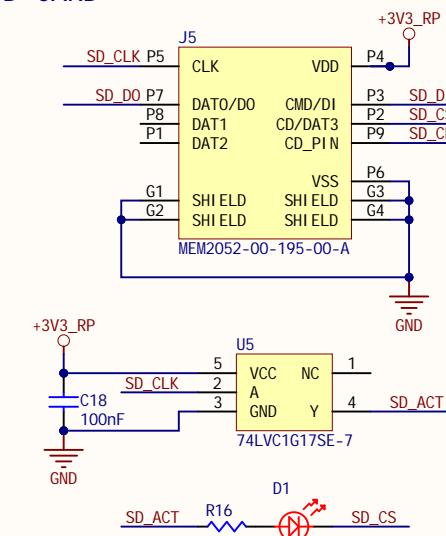
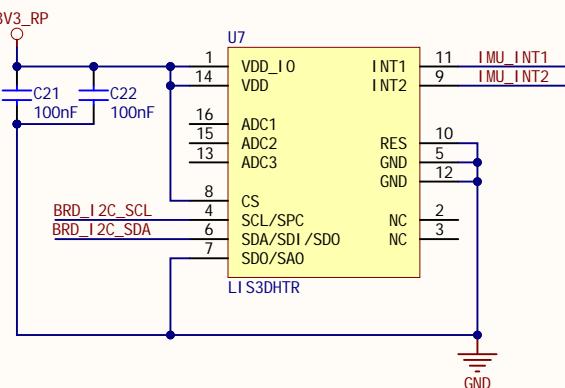
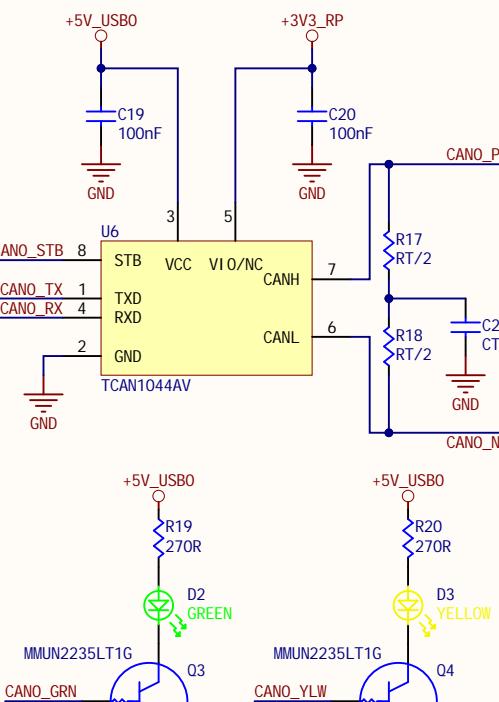
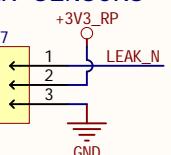
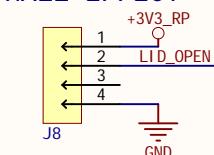
1889 Museum Rd  
Room 3001  
Gainesville, FL, 32611



Git Repo: <https://github.com/yomole/TailGator>  
Git Hash: 3111120c

Date: 4/17/2024 | Revision: V1 | Size: A | File: Power.SchDoc

Sheet 3 of 4

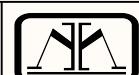
**OLED****I<sub>2</sub>C PULL UPS****BUZZER****SD CARD****I MU****CAN TRANSCEIVER + STATUS****LEAK SENSORS****HALL EFFECT****SCHEMATIC PORTS**

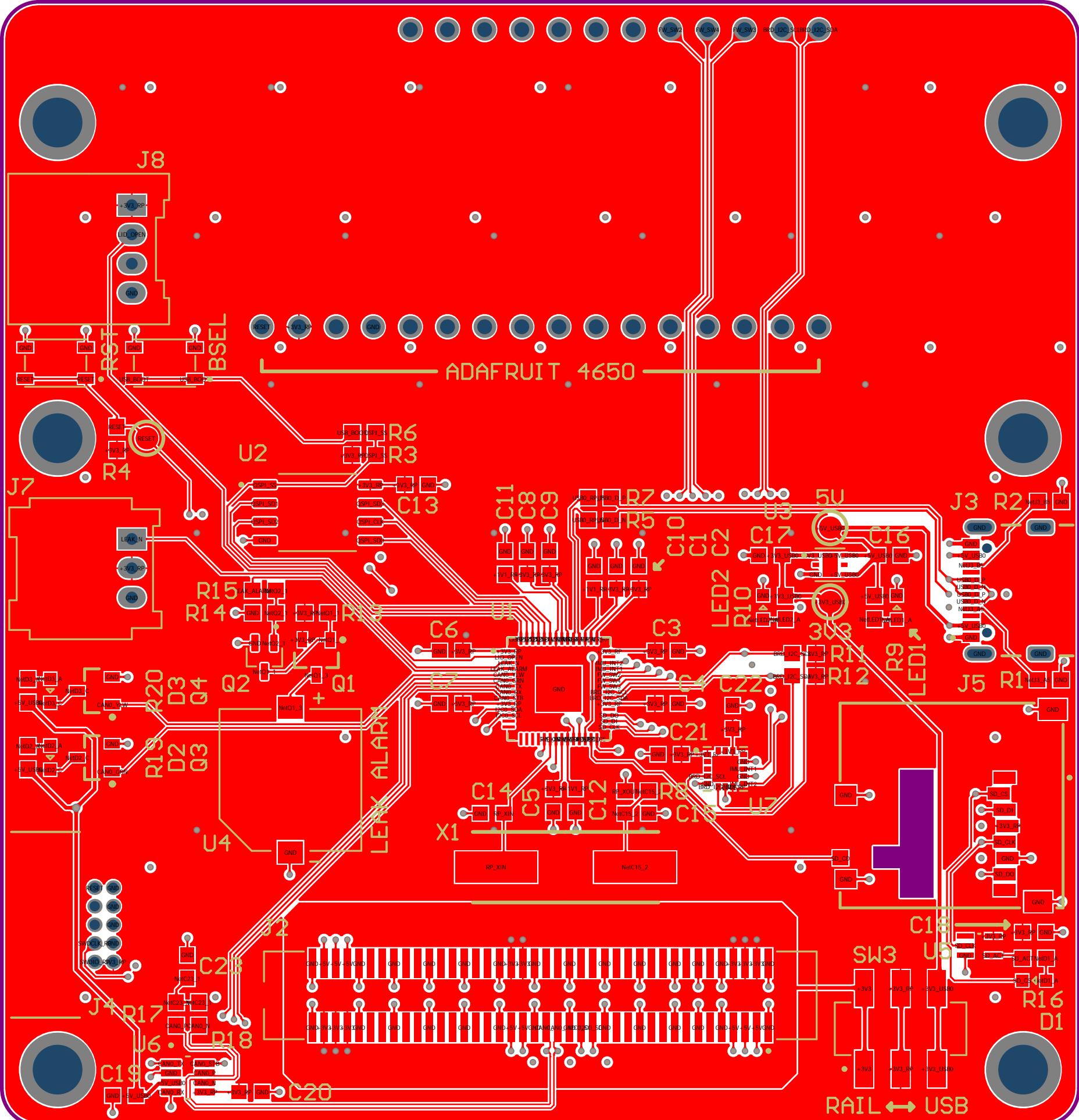
CANO_TX	CANO_TX	SD_CLK	SD_CLK
CANO_RX	CANO_RX	SD_DI	SD_DI
CANO_STB	CANO_STB	SD_DO	SD_DO
CANO_YLW	CANO_YLW	SD_CS	SD_CS
CANO_GRN	CANO_GRN	SD_CD	SD_CD
CANO_P	CANO_P	CANO_N	CANO_N
CANO_N	CANO_N	LID_OPEN	LID_OPEN
FW_SW2	FW_SW2	IMU_INT1	IMU_INT1
FW_SW4	FW_SW4	IMU_INT2	IMU_INT2
FW_SW3	FW_SW3	LEAK_N	LEAK_N
BRD_I2C_SCL	BRD_I2C_SCL	LEAK_ALARM	LEAK_ALARM
BRD_I2C_SDA	BRD_I2C_SDA		

^

- NOTES:  
 [1] OLED (ADAFRUIT ID 4650) REFERENCE: <https://learn.adafruit.com/assets/94578>  
 [2] BLUE ROBOTICS LEAK SENSOR BOARD: <https://bluerobotics.com/store/sensors-cameras/leak-sensor/sos-leak-sensor/> (KEEPING IT SEPARATE ALLOWS FOR OTHER BOARDS TO USE IT IN THE EVENT OF THIS BOARDS FAILURE).  
 [3] SD CARD SCHEMATIC MADE USING <https://learn.adafruit.com/assets/35635#>. ACTIVITY LIGHT PROVIDED FOR READ/WRITE.  
 [4] INDICATOR BUZZER WILL BE USED FOR FLOOD ALARM.

Project/Vehicle: TGIS - System Status

Author(s):  
 -Yovany Molina  
 -Blake Sanders  
 -  
 -  
 -Revisor(s):  
 - \*  
 - \*  
 - \*  
 - \*Machine Intelligence Laboratory  
 1889 Museum Rd  
 Room 3001  
 Gai nesville, FL, 32611  
 Git Repo: <https://github.com/yomole/TailGator>  
 Git Hash: 3111120c



B0 I2C SDA SCL FW SW3 FW SW4 FW SW2

YOVANY MOLINA  
BLAKE SANDERS  
SPRING 2024  
TGIS STATUS V1

+3V3 RP

LID OPEN

GND

LID SENSE

COMMS STAT ACT LEAK SENSE

SWD

PWR DBG SYSTEM LOG

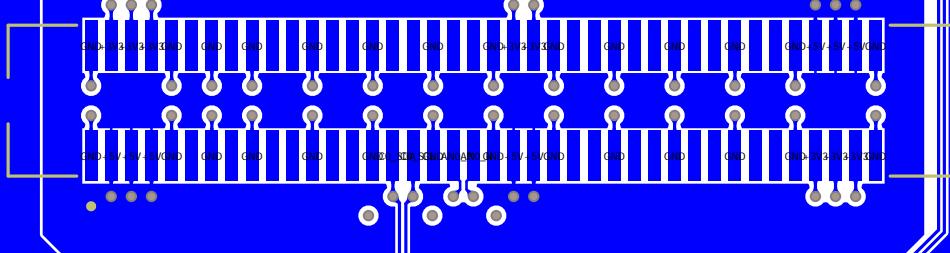
M3

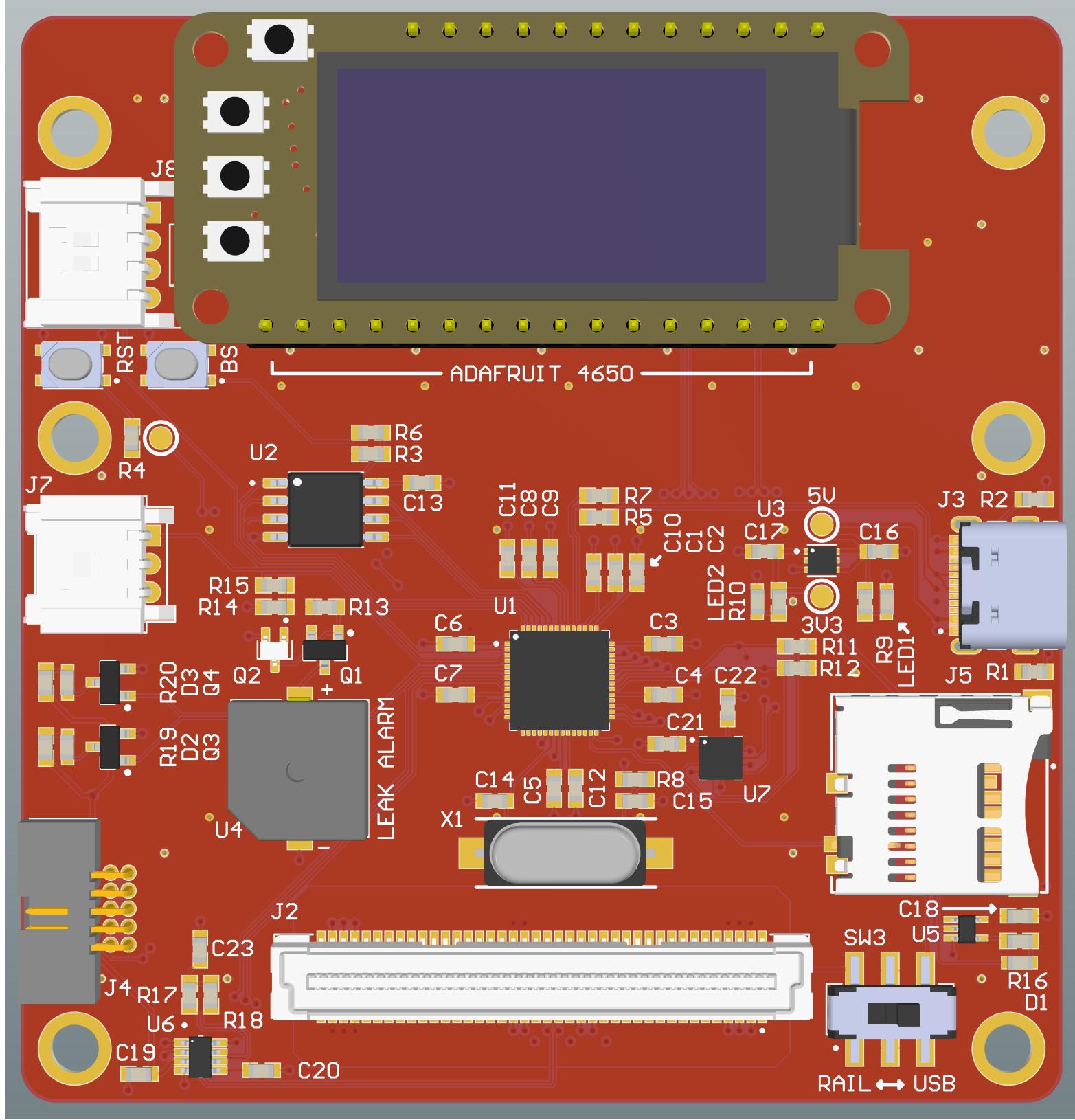
LEAK N

+3V3 RP

GND

J1







PWR  
DBG  
SYSTEM LOG

J1

LID SENSE  
COMMS  
STAT ACT  
LEAK SENSE  
SWD

M3

Comment	Description	Designator	Footprint	LibRef	Quantity	
1uF	Ceramic Capacitor, Multilayer, Cera	C1, C10, C16, C17	CAPCO603	CC0603KRX7R7BB105	4	
100nF	Ceramic Capacitor, Multilayer, Cera	C2, C3, C4, C5, C6, C7, C8, C9, C11, C12, C13, C18, C19, C20, C21, C22	CAPCO603	CC0603KRX7R7BB104	16	
27pF	Ceramic Capacitor, Multilayer, Cera	C14, C15	CAPCO603	CC0603JRNPO9BN27	2	
Cap		C23	CAPCO603	Cap	1	
RED	Single Color LED, Red, Water Clear	D1, LED	LED0603	150060RS/5000	2	
GREEN	Single Color LED, Bright Green, Wat	D2	LED0603	150060VS/5000	1	
YELLOW	Single Color LED, Yellow, Water Cle	D3, LED2	LED0603	150060VS/5000	2	
10144517-081802LF	CONN RCPT180POS SMD GOLD	J1		AMPHENOL_10144517-081802LF	1	
10144518-083802LF	CONN PLUG 3.80POS SMD GOLD	J2		AMPHENOL_10144518-083802LF	1	
USB4105-GF-A	USB-C (USB TYPE-C) USB2.0 Receptacle Connector 24(16+8 Dummy) Position Surface Mount, Right Angle, Through Hole	J8	GCT_USB4105-GF-A	USB4105-GF-A	1	
3221-10	Connector Header Surface Mount 10 position 0.050" (1.27mm)	J4		3220-10-0200-00	3221-10-0300-00	1
MEM2052-00-195-00-A	9 (6 + 1) Position Card Connector Secure Digital - microSD™ Surface Mount, Right Angle Gold	J5	GCT_MEM2052-00-195-00-A_REV_A	MEM2052-00-195-00-A	1	
Adafruit FeatherWing OLED	Adafruit FeatherWing OLED - 128x64 OLED Add-on for Feather - STEMMMA-QT / Qwiic	J6	ADAFRUIT_4650	ADAFRUIT_4650	1	
0353630360	Header, Molex, 2mm Pitch Sherlock Header, Single Row, Right Angle 3 Circuits, Length 3.3mm	J7	MOLEX-HDR-1X3-SHERLOCK-RA	SHERLOCK-1x3-RA	1	
0353630460	Header, Molex, 2mm Pitch Sherlock Header, Single Row, Horizontal 4 Circuits, Length 3.3mm	J8	MOLEX-HDR-1X4-SHERLOCK-RA	SHERLOCK-1x4-RA	1	
DMP3056L-7	Power Field-Effect Transistor, 4.3A	Q1	SOT-23-3	DMP3056L-7	1	
2N7002W	Small Signal Field-Effect Transistor	Q2	SOT-323	2N7002W	1	
MMUN2235LT1G	Small Signal Bipolar Transistor, 0	Q3, Q4	SOT-23-3	MMUN2235LT1G	2	
5.1kR	Fixed Resistor, Metal Glaze/thick F	R1, R2	RES0603	RC0603FR-075K1L	2	
Ris		R3, R7, R16	RES0603	Res	3	
1kR	Fixed Resistor, Metal Glaze/thick F	R4, R5, R8, R9, R10, R11, R12, R15	RES0603	RC0603FR-071KL	8	
27.4R	Fixed Resistor, Metal Glaze/thick F	R5, R7	RES0603	RC0603FR-0727R4L	2	
10kR	Fixed Resistor, Metal Glaze/thick F	R13, R14	RES0603	RC0603FR-0710KL	2	
270R	Fixed Resistor, Metal Glaze/thick F	R16, R19, R20	RES0603	RC0603FR-07270RL	3	
PTS810SJK250	Tactile Switch SPST-NO Top Actuated Surface Mount	SW1, SW2	SW_PT810_SJM_250_SWTR_LFS	PTS810SJK250 SMTR LFS	2	
JS202011SCQN	Slide Switch DPDT Surface Mount	SW3	SW_JS202011SCQN	JS202011SCQN	1	
RP2040	ARM® Cortex®-M0+ Microcontroller IC 32-Bit Dual-Core 133MHz External Program Memory 56-QFN (7x7)	U1	QFN40P700X700X50-57N	SC0914(13)	1	
W25Q128JVSIQ	FLASH - NOR Memory IC 128Mbit SPI - Quad I/O, QFI, DTR133MHz 8-SOIC	U2	SOIC127P790X216-8N	W25Q128JVSIQ	1	
TLV757P	Linear Voltage Regulator IC Positive Fixed 1 Output 1A-6-WSON (2x2)	U3	VREG_TLV75733PDRV_R	TLV75733PDRV_R	1	
CMI-9705	Buzzers Indicator, Internally Driven Magnetic 3V/30mA 2.7khz@20dBm @3V, 10cm Surface Mount Solder Pads	U4	CUI_CMI-9705-0380-SMT-TR	CMI-9705-0380-SMT-TR	1	
74LVC1G17SE-7	Buffer, Non-Inverting1 Element 1 Bit per Element Push-Pull Output SOT-353	U5	SOT65P210X110-5N	74LVC1G17SE-7	1	
TCAN1044AV	1/1 Transceiver Half CANbus TSOI-23-8	U6	SOT65P280X110-8N	TCAN1044AVDDFRQ1	1	
LIS3DHTR	Accelerometer X/Y/Z Axis ±2g 4g 8g 16g 0.5Hz~625Hz 16-LGA (3x3)	U7	XDCR_LIS3DHTR	LIS3DHTR	1	
12.000MHz	12MHz±20ppm Crystal 18pF 50 Ohms HC-49/US	X1	ABLS_12.000MHZ	ABLS_12.000MHZ	1	

## Electrical Rules Check Report

Class	Document	Message
		Successful Compile for T GIS System Status.PnjPcb

## Design Rules Verification Report

Filename : C:\Users\molyo\OneDrive\Desktop\MIL\TailGator\PCB\TailGator Interconnect System\TGIS System Status\SystemStatus.PcbDoc

Warnings 0  
Rule Violations 4

Warnings	
Total	0

Rule Violations	
Clearance Constraint (Gap=0.102mm) (All),(All)	4
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=0.102mm) (Max=1816.048mm) (Preferred=0.102mm) (All)	0
Power Plane Connect Rule(Relief Connect)(Expansion=0.3mm) (Conductor Width=0.102mm) (Air Gap=0.102mm)	0
Power Plane Connect Rule(Direct 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=0.25mm) (All),(All)	0
Minimum Solder Mask Sliver (Gap=0mm) (All),(All)	0
Silk To Solder Mask (Clearance=0.102mm) (IsPad),(All)	0
Silk to Silk (Clearance=0mm) (All),(All)	0
Net Antennae (Tolerance=0mm) (All)	0
Board Clearance Constraint (Gap=0mm) (All)	0
Matched Lengths(Tolerance=0.254mm) (InNetClass('USB0_RP'))	0
Matched Lengths(Tolerance=0.254mm) (InNetClass('USB0_D'))	0
Matched Lengths(Tolerance=0.127mm) (InNetClass('CAN0'))	0
Height Constraint (Min=0mm) (Max=1816.048mm) (Preferred=12.7mm) (All)	0
Total	4

Clearance Constraint (Gap=0.102mm) (All),(All)
Clearance Constraint: (0.175mm < 0.25mm) Between Hole of Pad J3-(63.559mm,29.88mm) on Multi-Layer And Pad J3-A1_B12(62.484mm,29.57mm) on
Clearance Constraint: (0.21mm < 0.25mm) Between Hole of Pad J3-(63.559mm,29.88mm) on Multi-Layer And Pad J3-A4_B9(62.484mm,30.37mm) on
Clearance Constraint: (0.175mm < 0.25mm) Between Hole of Pad J3-(63.559mm,35.66mm) on Multi-Layer And Pad J3-B1_A12(62.484mm,35.97mm) on
Clearance Constraint: (0.21mm < 0.25mm) Between Hole of Pad J3-(63.559mm,35.66mm) on Multi-Layer And Pad J3-B4_A9(62.484mm,35.17mm) on