



SJSU

Robotics

**MicroMod-2222-C
Drive Controller Board**

Documentation

SJSU-IB2023

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Features

- USB Programming
- MicroMod Development Board
- SWD IDC Connector
- ESP-01
- CAN BUS
- I2C
- SPI RGB LED breakout
- Power Status LEDs
- Fuses
- TVS Diodes
- 3.3V, 5V, 12V Power
- USB C Breakout
- Relay for motor power
- Resettable CAN transceiver
- Switching blocks for logic pairs (CANBUS, UART, I2C)

Applications

Controller board for drive system. Designed with LPC4078 (same as SJSUDev2) in mind as the main microcontroller. Resettable CAN transceiver and motor relay in case of emergency lost connection to controls.

Circuit Board Overview

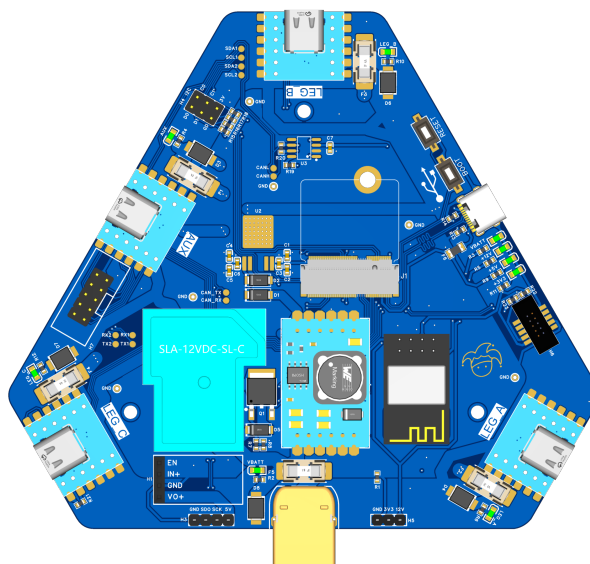


Figure 1: Top View

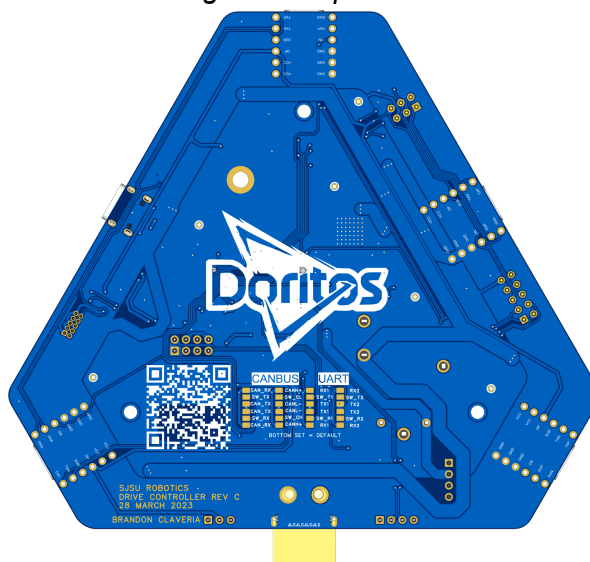


Figure 2: Bottom View

Block Diagram

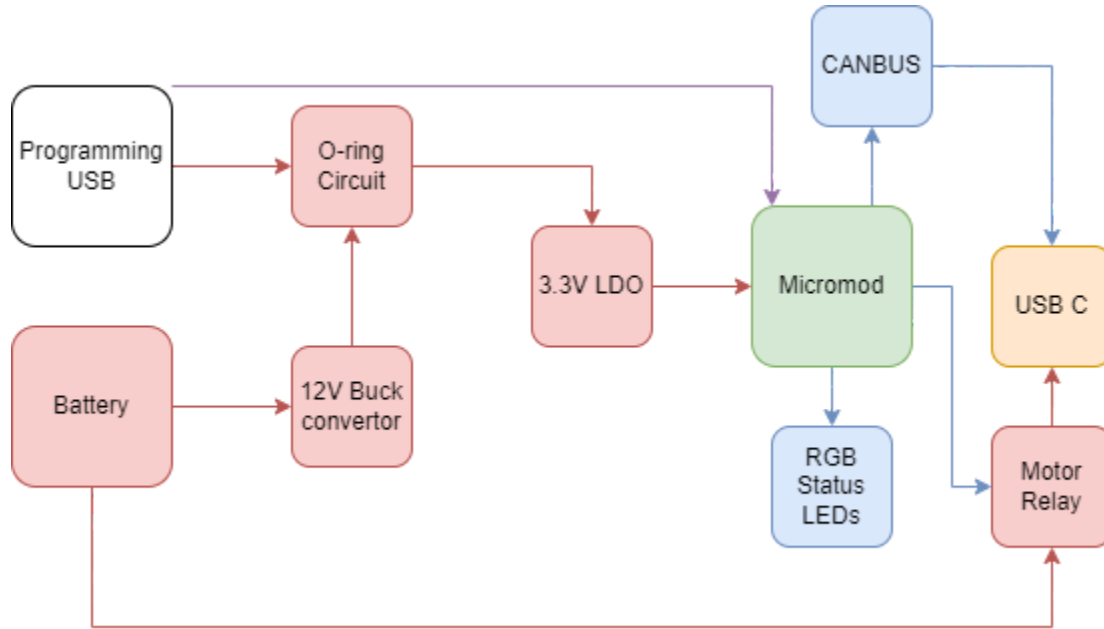


Figure 3: Circuitry Block Diagram

Drive Controller Board Typical Application

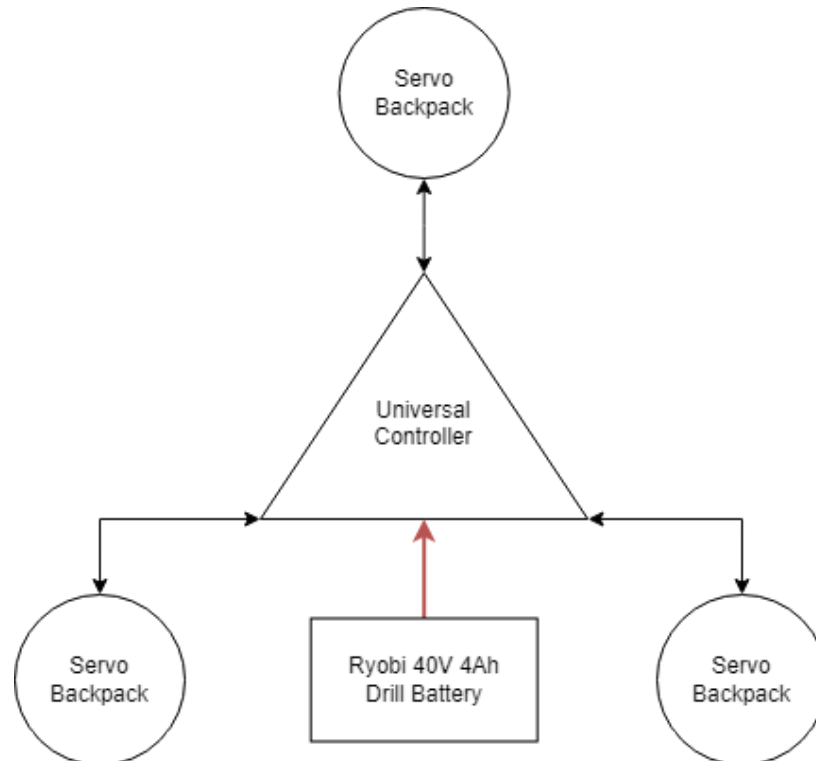


Figure 4: Normal wiring diagram for drive systems

USB Programming

USB C for programming the MicroMod is located next to the boot and reset switch. Denoted by the USB symbol, USB C mounted with castellations should not be connected to a computer. See figure 5 for location.

MicroMod M.2 Connector

Standard M.2 Connector for MicroMod processor boards. Separate boot and reset switches located next to the USB programming connector. See figure 6 for location.

SWD IDC Connector

SWD IDC connector meant for SWD programming and debugging. Uses a 2x5 1.27mm male header to interface with a SWD programming cable. See figure 7 for location.

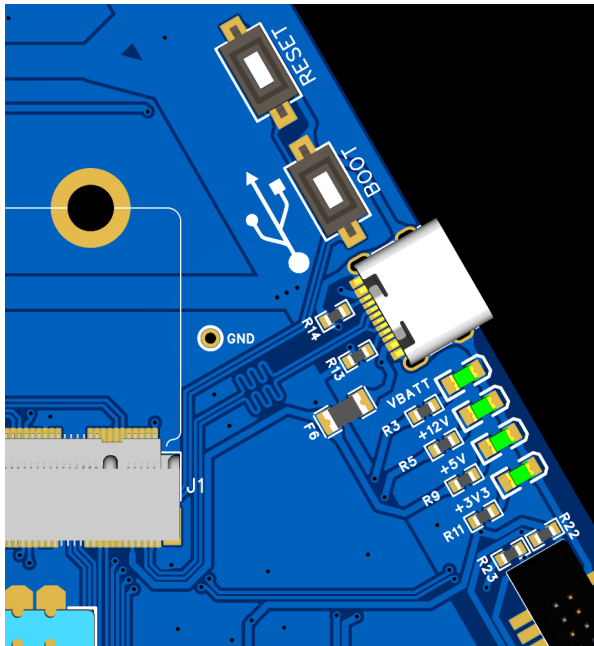


Figure 5: USB Programming

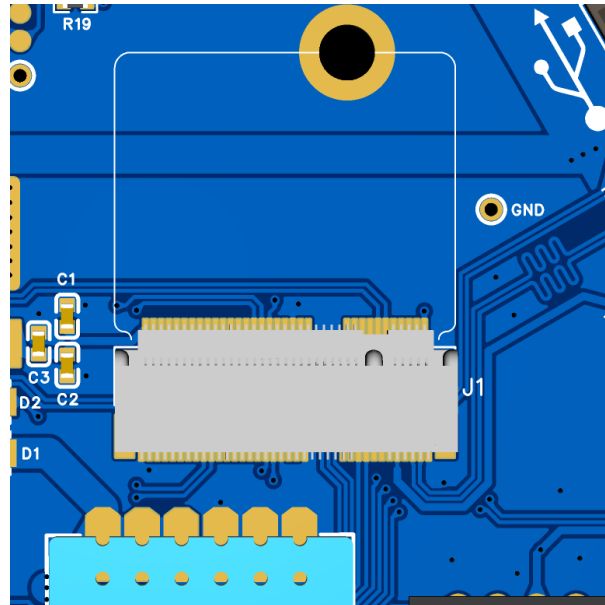


Figure 6: MicroMod Connector

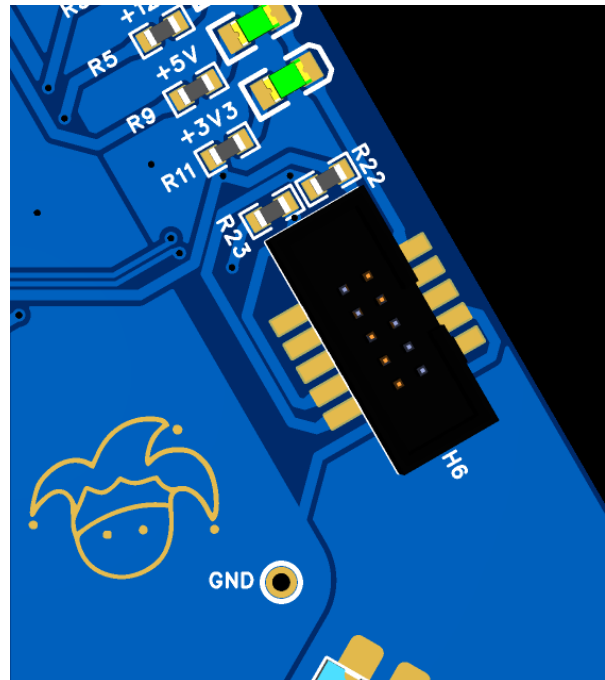


Figure 7: SWD Connector

ESP-01

ESP-01 wifi module for allowing the microcontroller to interface with a wifi network. Copper underneath the antenna is removed. See figure 8 for location.

CAN BUS

CAN BUS IC is the SN65HVD230DR. The state of the transceiver is determined by I/O pin G3 being pulled up or down. (Down for normal use, Up for sleep). More information can be found at SEC 10.4.5 of the [SN65HVD230DR datasheet](#). See figure 9 for location.

I2C

I2C Channels have 2K2 pullup resistors. There is a header as well as test points for analyzing the digital signals. See figure 10 for location.

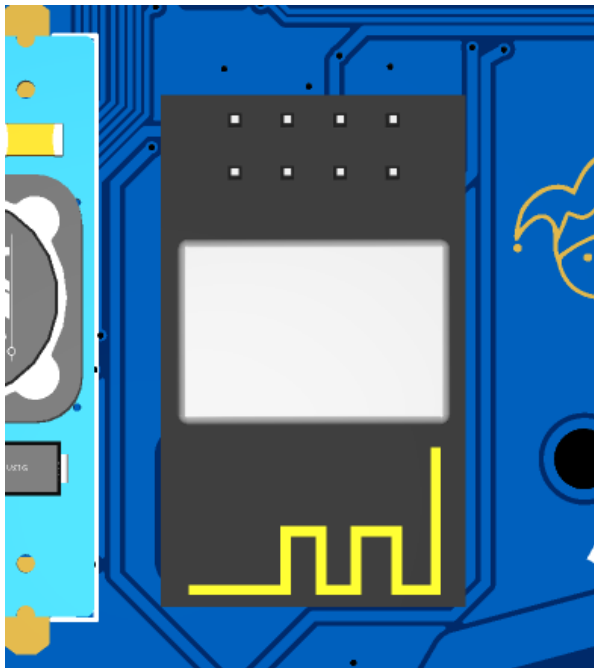


Figure 8: ESP-01

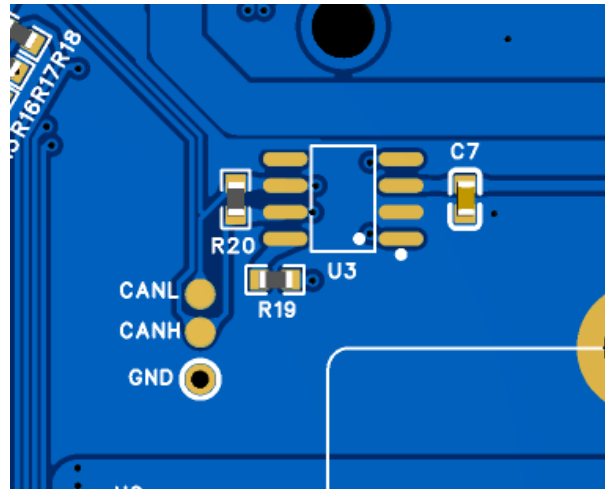
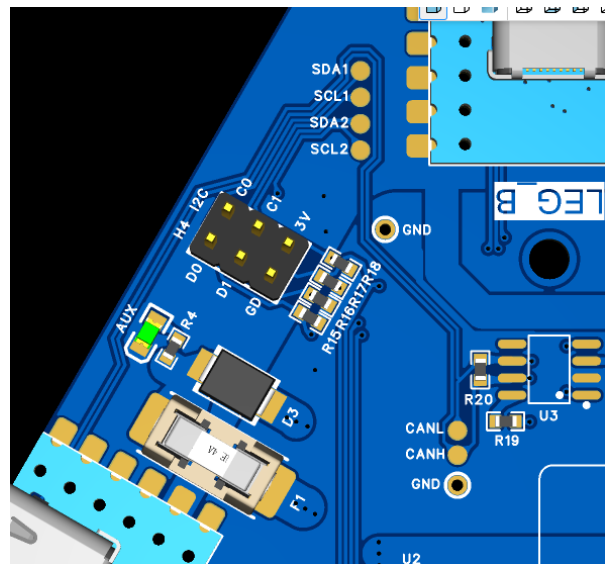


Figure 9: CAN BUS IC



SPI RGB Breakout

Breakout for SK9822 RGB LED strip.

Separate [5V buck converter](#) used to power the LEDs. Max rated current is 3A. See figure 11 for location.

Power Status LEDs / Fuse LEDs

LEDs located near the programming side of the board are used to indicate what power is currently connected to the board. See figure 12 for location.

Fuses / TVS Diodes

Input into the power connector, and output going out of USB for drive. Default 5A SMD littlefuses are found in fuse holders. Specific fuses are MFR#: 04510XX.MRL (XX is the current rating). LEDs are placed near the fuse to indicate their state. TVS diodes are also placed near the input and output sources to protect against back-emf. The specific TVS diode is SMBJ45CA 45V. See figure 13 for location on LEG B connector.

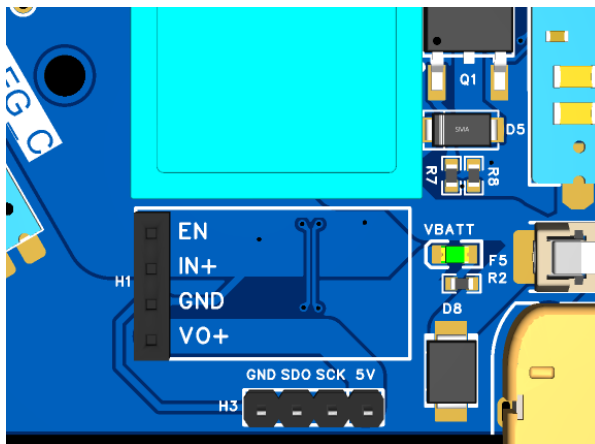


Figure 11: RGB Breakout

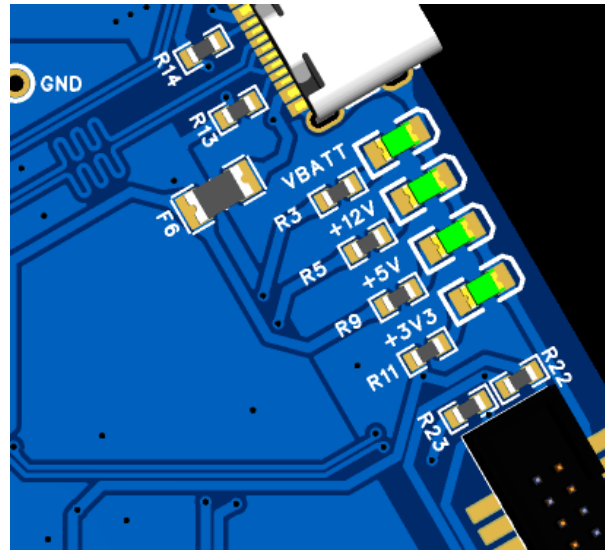


Figure 12: Power Status LEDs

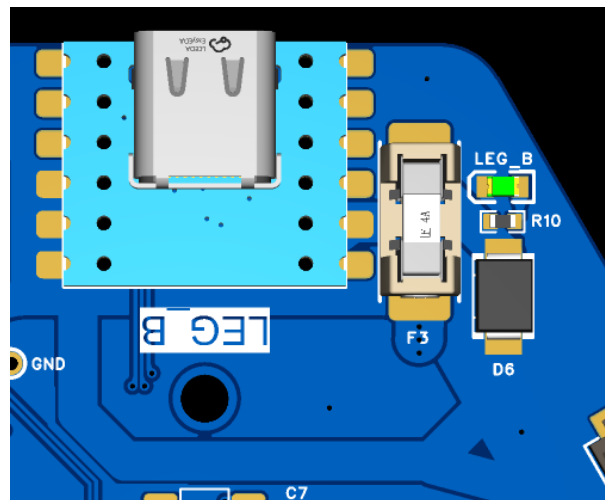


Figure 13: Fuses / TVS Diodes

OR-ing Circuit / 3.3V LDO

A 3.3V LDO is used to power the MicroMod processor. An OR-ing circuit utilizing MSK340A schottky diodes allows for simultaneous power from USB programming and 12V from the buck converter. See figure 14 for location.

12V Buck Converter

SJSU Robotics buck converter used to lower 40V from the battery to 12V. *Smoothing capacitor recommended for the output voltage* See figure 15 for location.

Debug Connector

2x5 2.54mm IDC Connector used to connect a logic analyzer easily to the MicroMod. Pin connections can be found in figure 16.

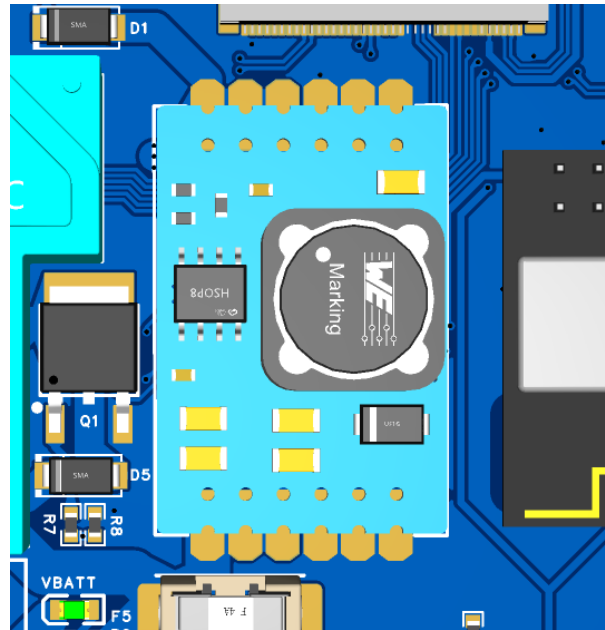


Figure 15: 12V Buck Converter

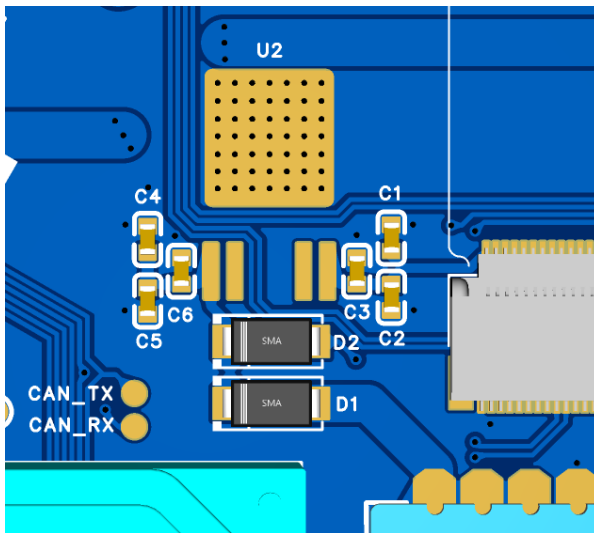


Figure 14: OR-ing Circuit / 3V3 LDO

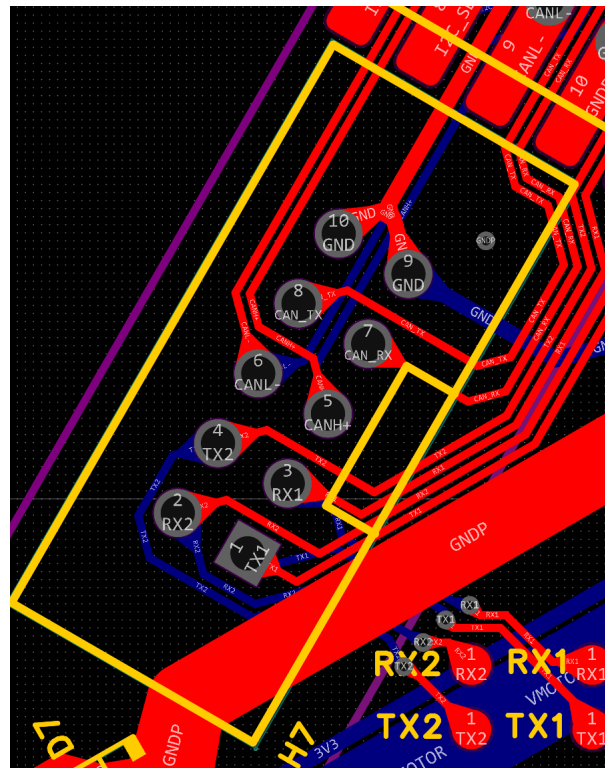


Figure 16: Debug Connector

Digital Logic Switching Blocks

Solder “switching blocks” are found at the back of the PCB for swapping logic lines for easy swapping depending on MicroMod LPC4078 version. The default set of pads are the bottom ones. See figure 17 for location.

Motor Power Relay

The relay serves as a way to cut off power to motors in case of an unintentional disconnect of the MicroMod controller. The specific relay is MFR# SLA-12VDC-SL-C. The component is SPDT with a 12V coil voltage rated for 30A @ 30VDC. Pullup GPIO Pin G4 to give USB C breakout 40V. See figure 18 for location.

AUX Output

Auxiliary output designed for use to breakout 40V from the battery to other controller boards such as the science controller. See figure 19 for location.

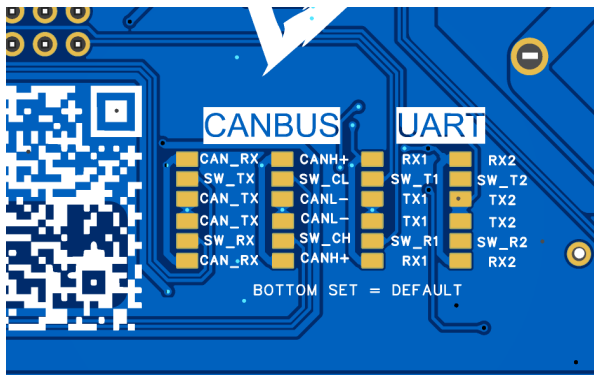


Figure 17: Switching Blocks

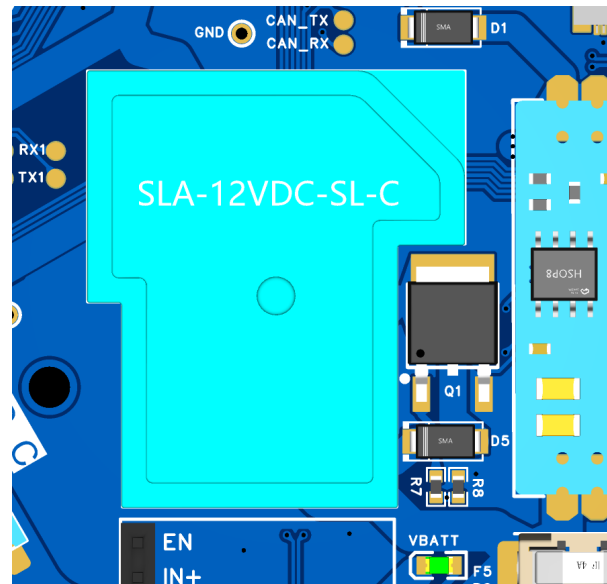


Figure 18: Motor Power Relay

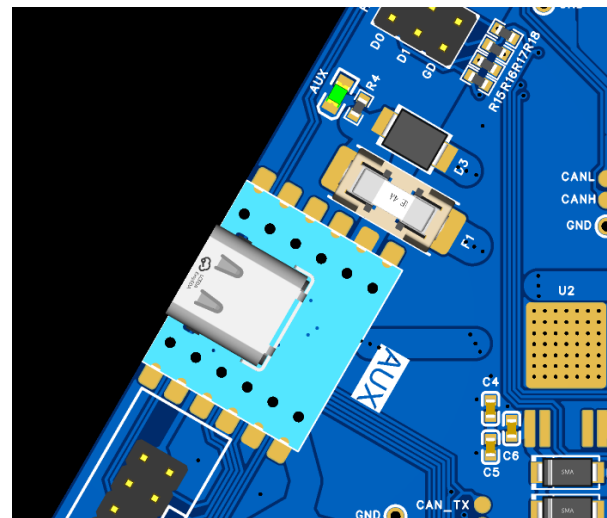


Figure 19: AUX Output

USB C Breakout

TXP pins are shorted together.

RXP pins are shorted together.

TXN pins are shorted together.

RXN pins are shorted together.

SUB pins are shorted together.

USB-C is broken out with the intention of using a USB 3.X C to C cable to make connections to different parts of the rover.

Connections for Leg Breakouts

| | | | | |
|-------|----------|----------|-----------|---------|
| VBUS | D+ | D- | TXP | TXN |
| VBATT | CANH | CANL | I2C_SDA | I2C_SCL |
| GND | RXP | RXN | SUB DRIVE | SUB ARM |
| GND | I2C_SDA1 | I2C_SCL1 | HOME_X | 3V3 |

Table 1: USB C Breakout Connections for Leg Breakouts

Connections for Auxiliary Breakout

| | | | | |
|-------|----------|----------|-----------|---------|
| VBUS | D+ | D- | TXP | TXN |
| VBATT | CANH | CANL | I2C_SDA | I2C_SCL |
| GND | RXP | RXN | SUB DRIVE | SUB ARM |
| GND | I2C_SDA1 | I2C_SCL1 | HOME_X | 3V3 |

Table 2: USB C Breakout Connections for Auxiliary Breakout

**** USB C CABLE CROSSES TX > RX and RX > TX (KEEP IN MIND FOR UPSTREAM CONNECTIONS) ****

**** USE ONLY 240W USB 3.X C TO C CABLES FOR CONNECTIONS OTHERWISE RISK OF BURNING CABLE ****

Designed Ratings

| Parameter | Rating |
|------------------------|--------|
| USB C Breakout Current | 5A |
| Buck Converter Current | 3A |

Table 3: Designed Ratings

Physical Dimensions / Mechanical Mounting Points

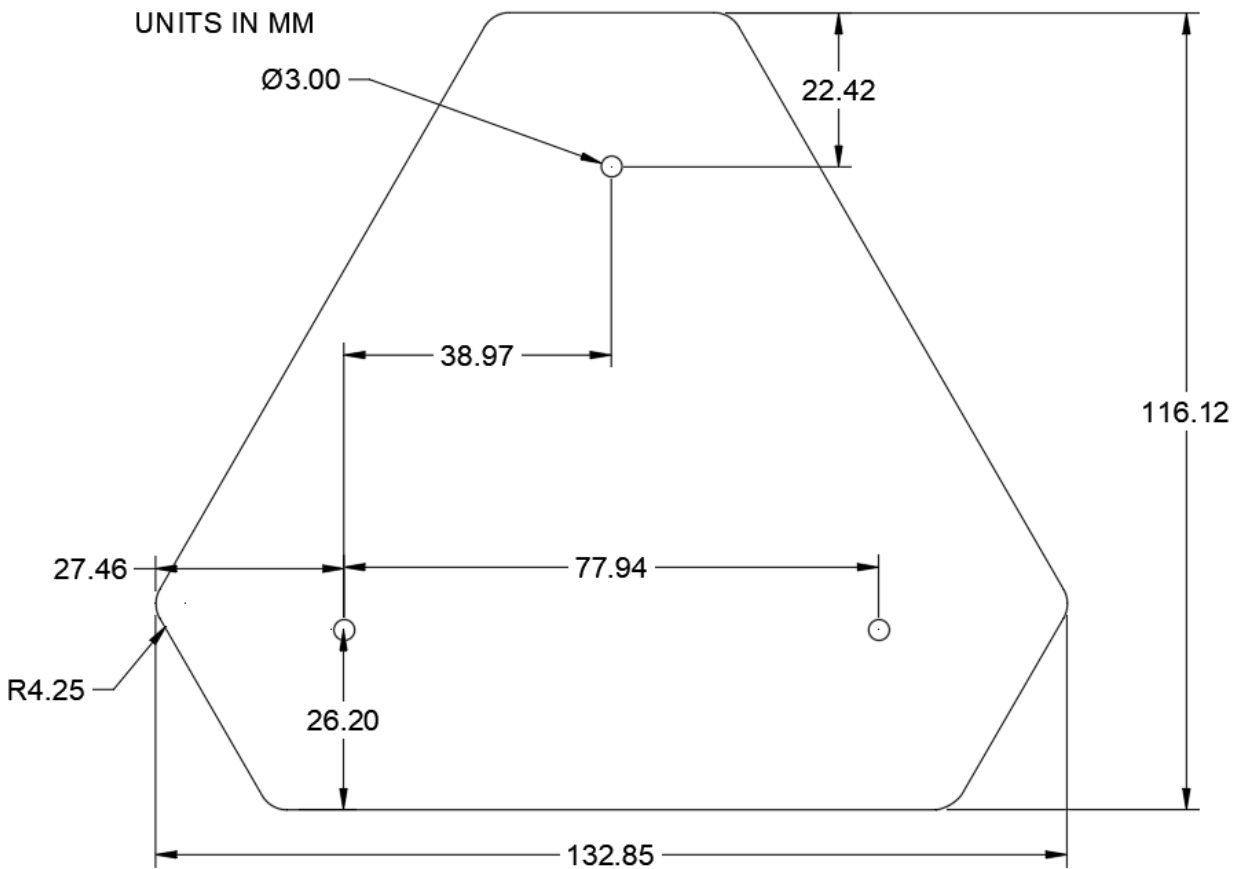


Figure 21: Max Length / Width

Extra Remarks

Pulldown G3 to enable turn on CAN transceiver, pull up to put in sleep mode.

Pullup G4 to give USB C breakout 40V

*Note Home A and Home B are swapped from REV B