Contents

1 Introduction

This document provides a comprehensive guide for the usage and implementation of the mini base PCB designed for educational purposes. It includes details on the components, connectors, motor configurations, and power supply requirements.

2 PCB Overview

The mini base PCB is designed to be a compact and versatile platform for developing desk robots. It supports through-hole components and pre-made modules to ensure ease of use and accessibility for both students and researchers.

3 Component List

The following components are included in the PCB design:

- Raspberry Pi Pico W
- N20 DC Motors (Up to 4)
- Various connectors for power and data
- XL4005 voltage regulator
- TP5100 charger module
- ADXL345 accelerometer
- HC-SR04 ultrasonic sensor

4 Connectors and Pin Configuration

The PCB has multiple connectors and pins for various components. Below are the details for each connector and its corresponding pins:

4.1 Connectors

- **H1, H2, H3, H4, H5, H6, H7, H8**: Connectors for hall sensor encoders.
- **B1, B2**: Bumper connectors.
- **SW1**: Reset switch.
- **M1, M2, M3, M4, M5, M6, M7, M8, M9, M10**. Motor locations for different configurations

4.2 Pin Configuration

- **PICO W GPIO Pins**:
  - GPIO 0 to GPIO 28: General purpose input/output pins.
  - VBUS, VSYS: Power supply pins.
  - GND: Ground pins.
- **Motor Connectors (MI1 to MI8)**:

  - MI1: Motor input 1
  - MI2: Motor input 2
  - MI3: Motor input 3
  - MI4: Motor input 4
  - MI5: Motor input 5
  - MI6: Motor input 6
  - MI7: Motor input 7
  - MI8: Motor input 8

- **Motor Outputs (MO1 to MO8)**:
  - MO1: Motor output 1
  - MO2: Motor output 2
  - MO3: Motor output 3
  - MO4: Motor output 4
  - MO5: Motor output 5
  - MO6: Motor output 6
  - MO7: Motor output 7
  - MO8: Motor output 8

5 Motor Configurations

Depending on the configuration and the number of motors used, the following pins should be connected:

5.1 Dual Motor Configuration

- **Rear Traction** Motor **M7** and **M9** should be used.
- **Center Traction** Motor **M1** and **M2** should be used.

5.2 Triple wheel configuration

. Either motors **M1** and **M7, M10** or **M2** and **M8, M9** should be used.

5.3 Quadruple wheel configuration

Motors **M8, M9** and **M7, M10** should be used.

6 Power Supply

The PCB operating voltage is a 5V. The XL4005 voltage regulator ensures stable output for the components. The TP5100 module is used for charging the connected batteries. Thus feed voltage for the pcb should be between 9V and 15V.

7 Mounting Instructions

To ensure proper assembly and functionality of the PCB, follow the steps below for mounting the components:

1. First, mount the BMS (Battery Management System).
2. Next, mount the TP5100 charger module.
3. Then, mount the HC-SR04 ultrasonic sensor.
4. Then, mount dip switch.
5. After that, mount the XL4005 voltage regulator.
6. Finally, mount the rest of the components based on your specific requirements and preferences.

8 Usage and Applications

This PCB can be used for various educational and research purposes, including but not limited to:

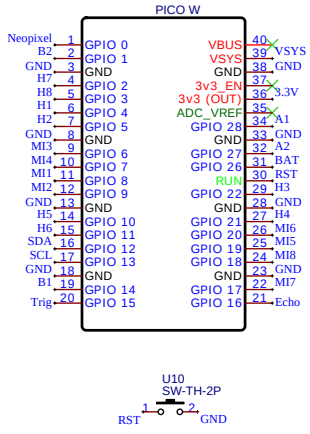
- Desk robots for student experiments.
- Robotics research in higher education.
- Prototype development for motor control systems.

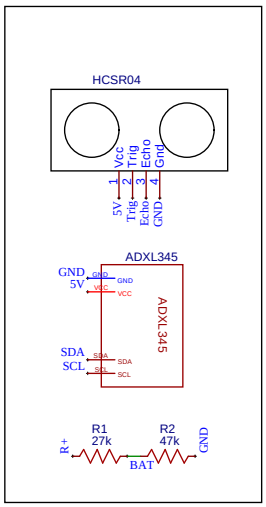
9 Maintenance and Troubleshooting

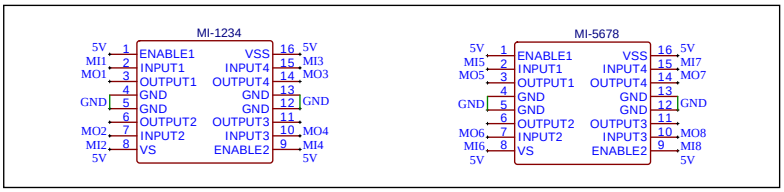
Regular maintenance includes checking connections and ensuring that all components are securely attached. Troubleshooting steps for common issues are as follows:

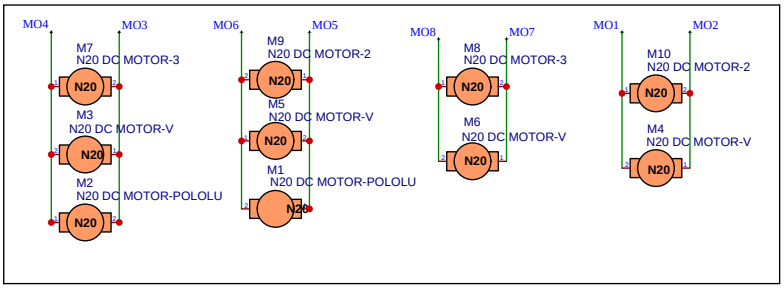
- **No Power**: Check the power supply connections and the voltage regulator.
- **Motor Not Working**: Verify motor connections and check the corresponding driver outputs.
- **Sensor Issues**: Ensure proper connection to the GPIO pins and verify sensor functionality.

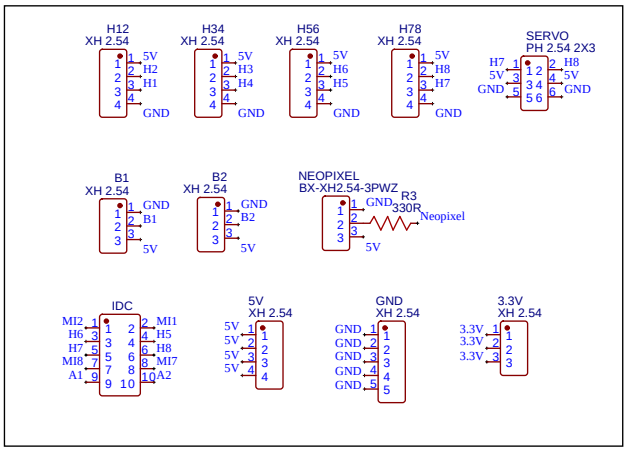
10 Schematic and Layout

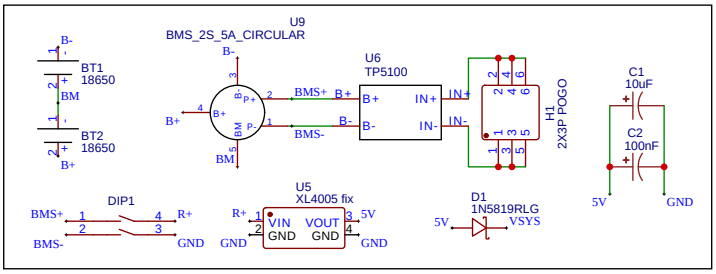












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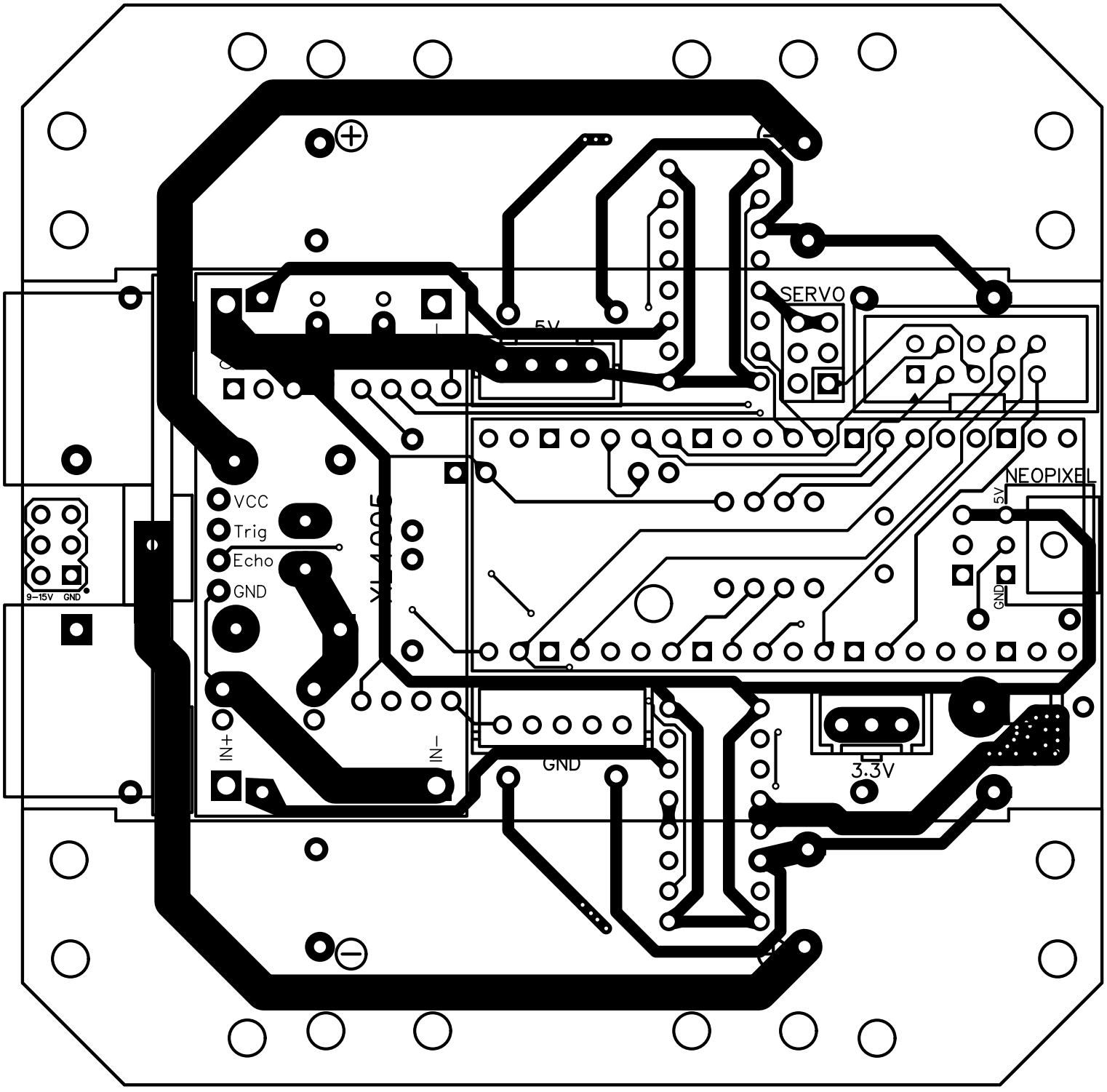
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5V
NEOPIXEL
5V
GND
VCC
Trig
Echo
GND
XL4005
9–15V GND
IN+
IN−
GND
3.3V