

Analog Line Follower — Technical Data Sheet

Revision: 1.0 Date: December 14, 2025 Neural Nexus

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1 Overview

The Analog Line Follower is a compact, two-wheel differential-drive robot designed for indoor line-following applications. It employs an array of IR reflective sensors and a fast analog control path to achieve smooth and responsive tracking of white lines on dark surfaces.

Sensor signals are processed using analog circuitry. The resulting control signals directly drive the motor driver, producing differential wheel speeds for line tracking without the use of digital processing or microcontrollers.

2 Key Features

- Compact and lightweight design
- 8 IR reflective sensor array with analog output
- Fully analog signal processing and control
- Adjustable sensor thresholds for track tuning
- Adjustable base speed (global drive level)
- Independent minimum speed adjustment for left and right wheels
- Adjustable PWM frequency for motor drive optimization
- Integrated motor driver and on-board power regulation

3 Functional Block Diagram

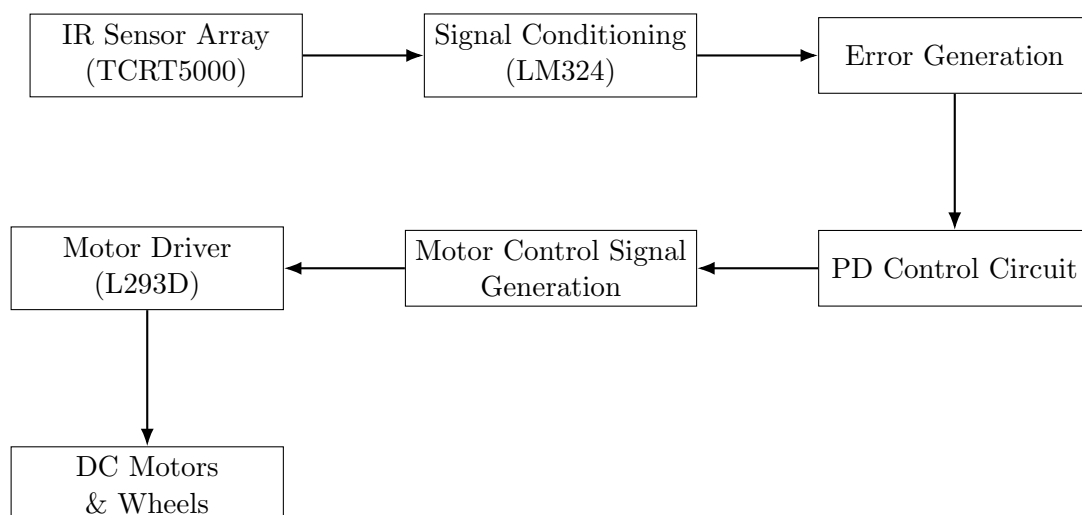


Figure 1: Functional block diagram of the analog line follower control system.

4 Mechanical Dimensions

Chassis Dimensions

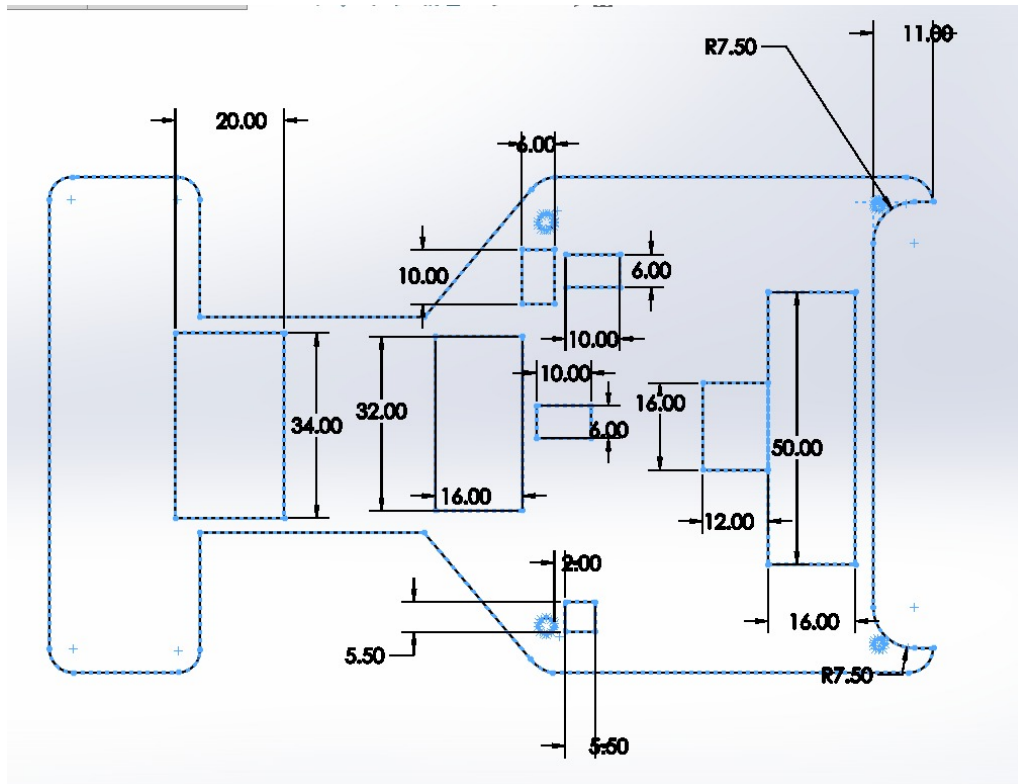


Figure 2: Overall chassis dimensions.

Battery Holder Dimensions

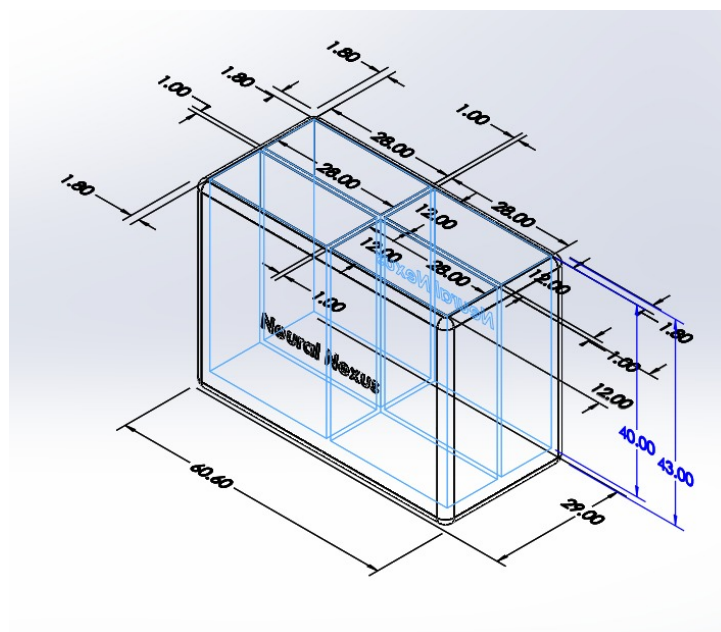


Figure 3: Battery holder dimensions.

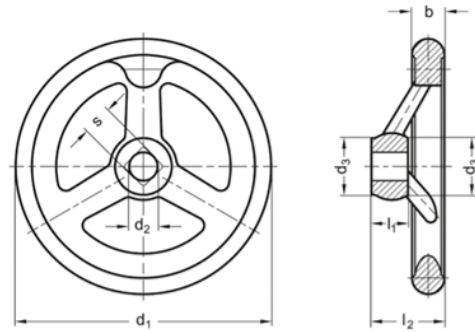
Designed to securely hold four LiPo cells in series configuration.

Wheel Dimensions

Wheel Size: 32 mm × 7 mm

Wheel Type: Rubber traction wheel

Mounting: Press-fit on motor shaft



Caster Wheel Dimensions

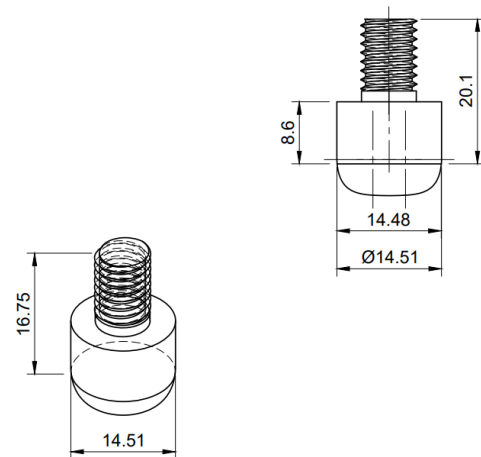
Caster Type: Low-profile swivel caster

Wheel Diameter: 8 mm

Overall Height: 13 mm

Mounting: Screw-mounted to chassis

Caster height defines the sensor-to-floor distance and allows mechanical adjustment of sensor clearance.



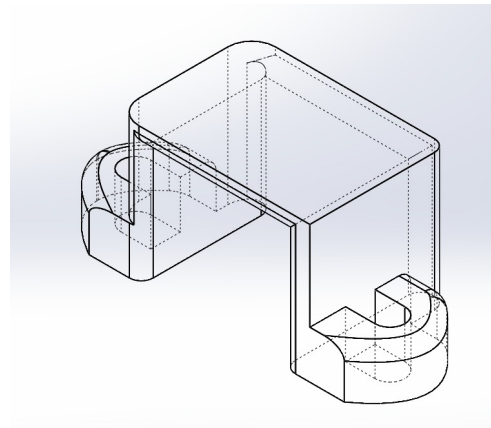
5 Motors and Mounting

Drive Motors

- Motor type: N20 DC gear motor
- Rated speed: 300 RPM (no-load)
- Operating voltage: 6 V (typ.)
- Gearbox type: Metal gearhead
- Shaft type: D-shaft

Motor Mounting

- Custom-designed motor brackets used for mounting
- Ensures accurate wheel alignment
- Provides mechanical rigidity and vibration reduction



6 Weight

- Total mass (assembled, including battery): 180 g (typ.)
- Chassis only: 90 g (typ.)

7 Sensor and Sensing Geometry

- Sensor type: IR reflective sensors (analog output)
- Sensor-to-floor distance: **13 mm (typ.)**, adjustable via caster height
- Sensor height mechanically referenced to chassis plane through front caster
- Sensor spacing: 12 mm
- Track surface: matte black with white reflective line
- Sensor thresholds adjustable via trimmer potentiometers
- Mode selection via on-board DPDT switches

8 Electrical Specifications

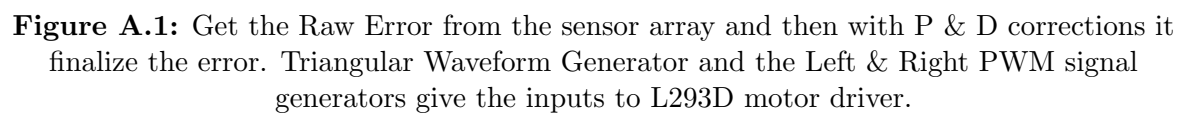
| Parameter | Min | Typ | Max | Notes |
|------------------------|--------|--------|--------|-----------------|
| Battery supply voltage | 14.0 V | 15.2 V | 16.8 V | 4× LiPo cells |
| Logic supply voltage | 4.8 V | 5.0 V | 5.2 V | Divided output |
| Sensor supply voltage | 4.8 V | 5.0 V | 5.2 V | Regulated |
| Motor supply voltage | 5.8 V | 6.0 V | 6.2 V | Regulated |
| Quiescent current | — | 50 mA | 70 mA | Motors OFF |
| Operating current | 400 mA | 600 mA | 900 mA | Normal tracking |
| Peak current | — | 1.5 A | 2.0 A | Startup / stall |
| Operating temperature | 0 °C | 25 °C | 60 °C | Indoor use |

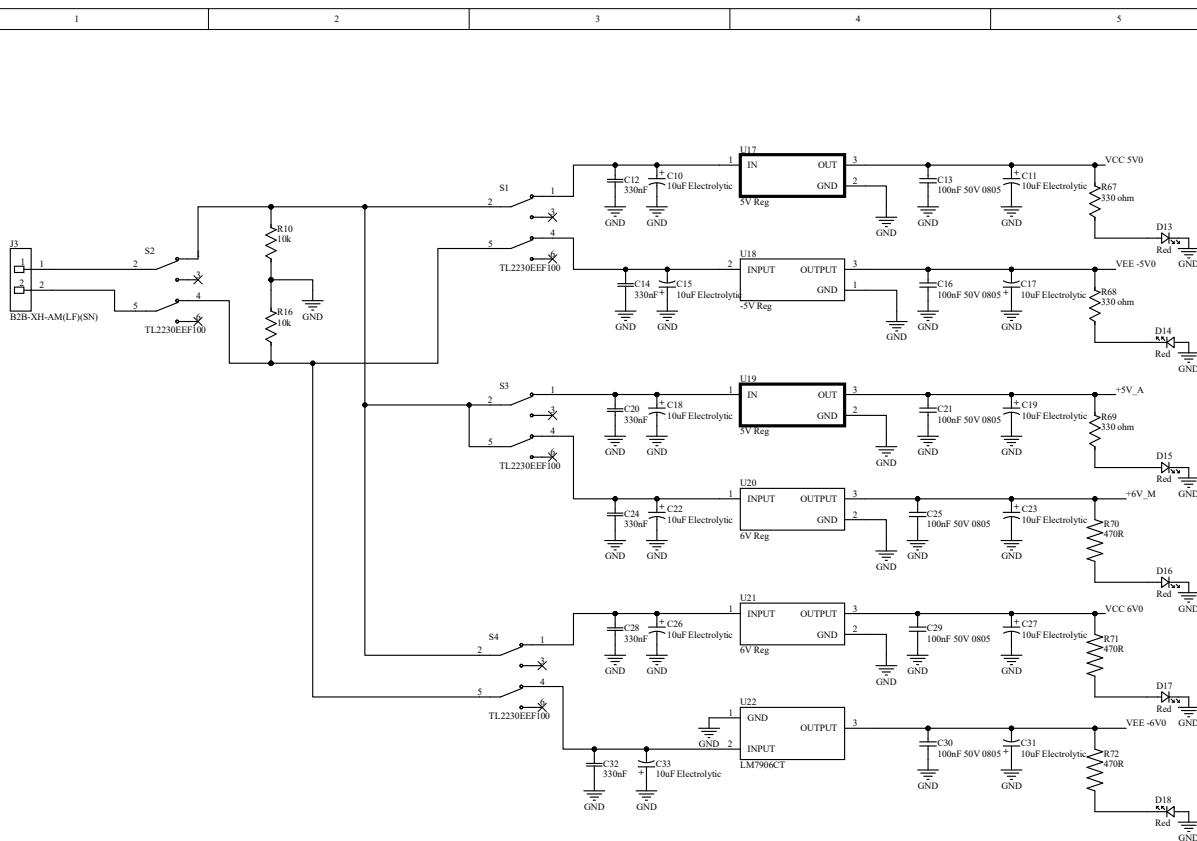
Table 1: Electrical characteristics at $T_A = 25\text{ °C}$ unless otherwise specified.

9 Notes

- Electrical values are typical measurements from a fully assembled unit.
- Performance depends on surface reflectivity, ambient lighting, and threshold tuning.

10 Control Circuits



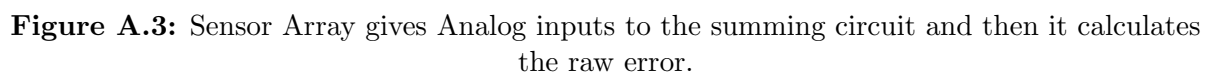


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Figure A.2:

We have 6 Voltage Regulators in this Schematic.

- Two pairs of (L7805, L7905) and (L7806, L7906) for Op-Amp operation
- L7805 for uninterrupted sensor operation without noise
- L7806 for the motor drive voltage



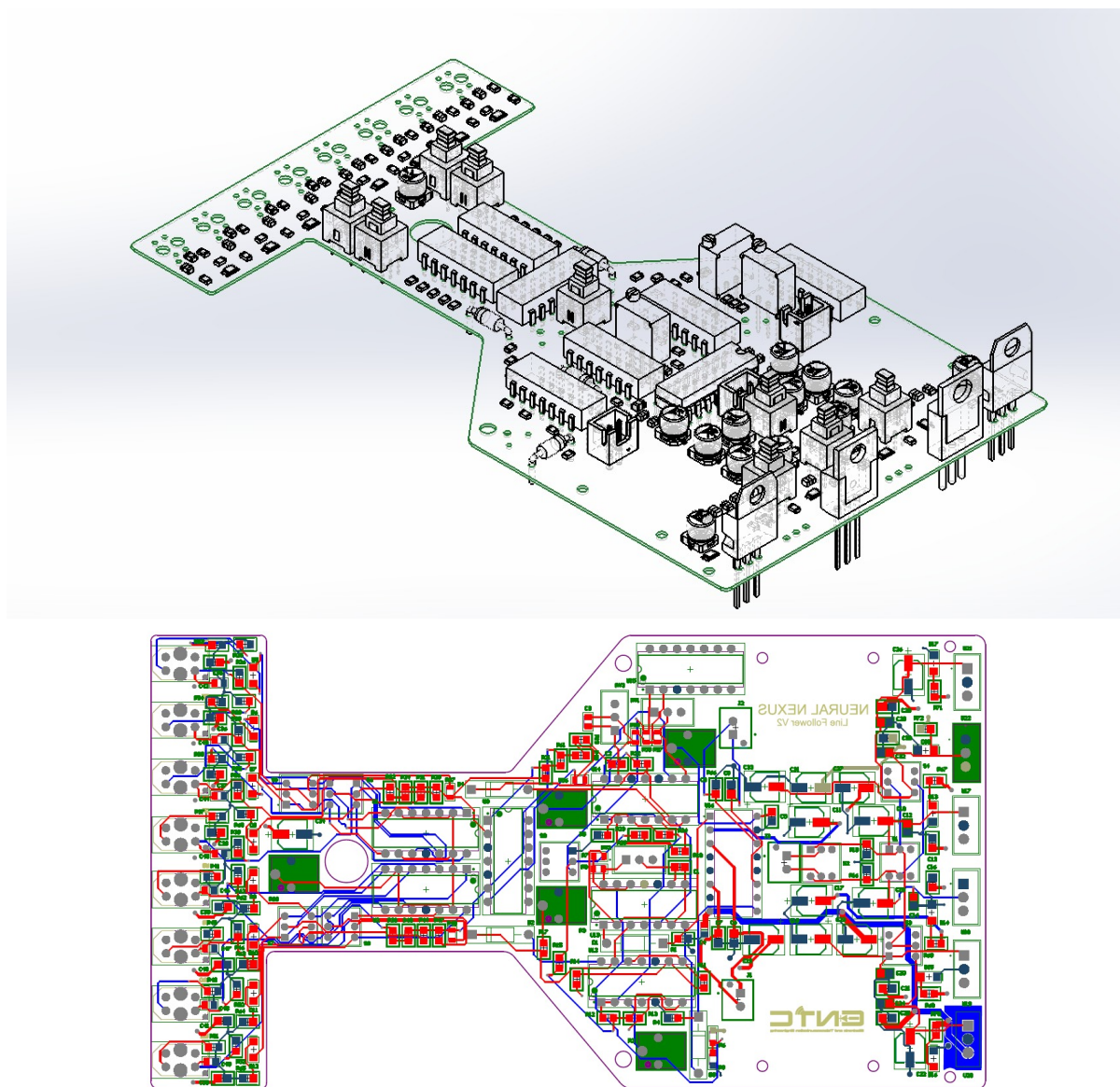


Figure 4: PCB Outline