

# **Virtual Quality Control Robot Electrical System**

**White-Paper                  Updated – April 12, 2021**

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## Abstract

A driver system is developed to power the motors of the Quality control robot. The quality control robot is capable of three and a half DOF and is powered by 4 identical OTS graphite communicated motors. The torque requirements of the robot are met with the addition of planetary gear heads of reduction ratio 64:1 on the base arms. The driver system is of H-bridge form and outputs 11.1V to the motors from 5V input. A PCD design is of the driver is developed to create a mother-daughter board with the Arduino Leonardo.

In this paper, Section on describes motor selection. Section 2 describes driver design. Section 3 describes linear modeling of the drivers. Section 4 describes PCB layout of the design. Section 5 describes the datasheets of our motor parts.

## Nomenclature

DOF	Degrees of Freedom
OTS	Off-the-shelf
PCB	Printed Circuit Board
K	Gain
A	Inverse Time Constant
CM	Centimeters
CAD	Computer-aided Design



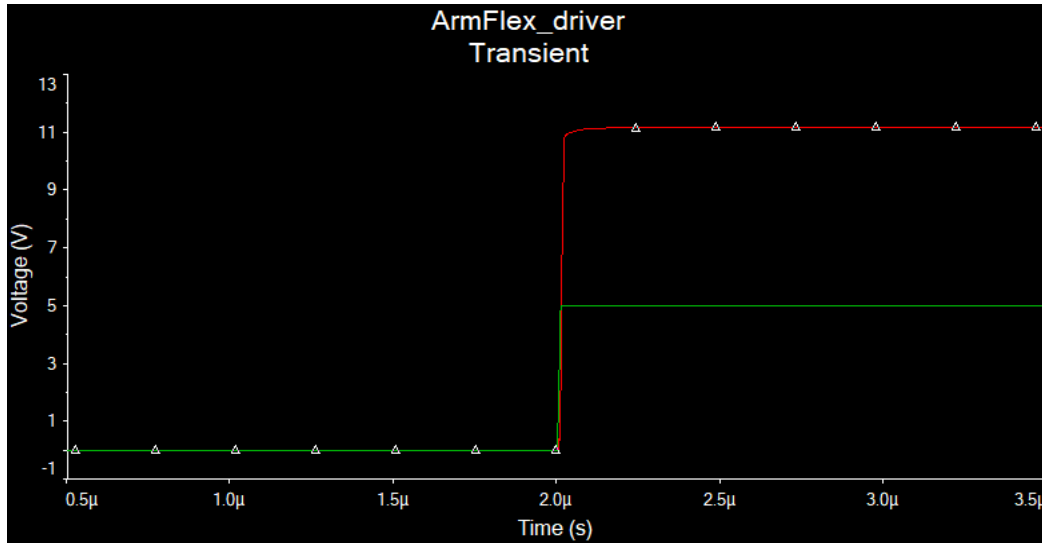


Figure 3.1

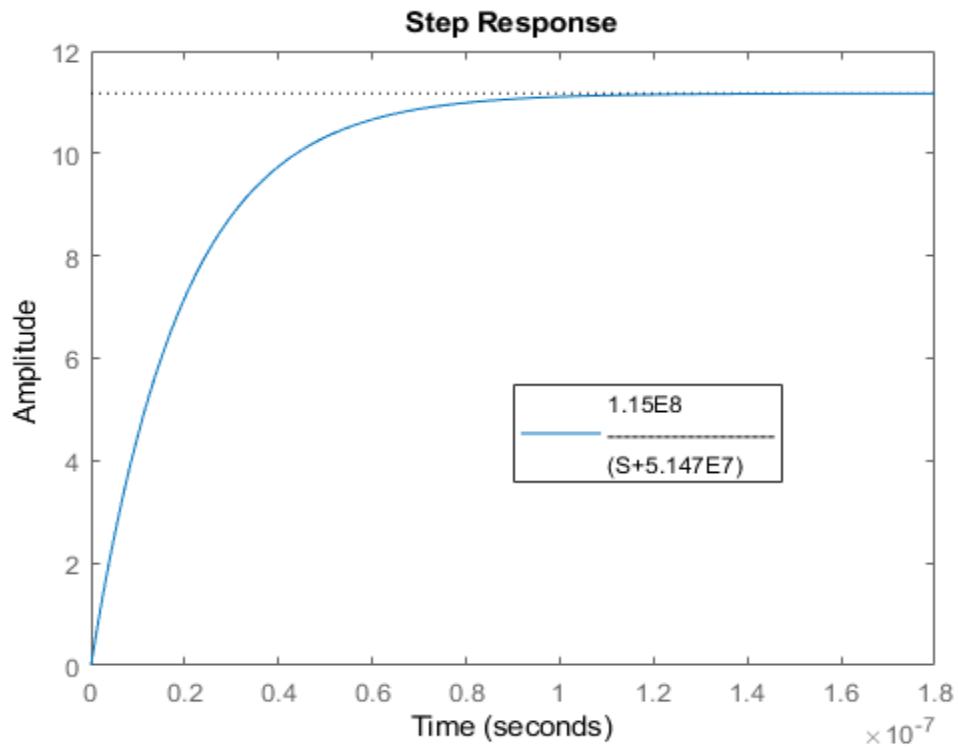


Figure 3.2

#### 4. PCB Design

The PCB design of the drivers is restricted to one board. The design used in our project has all drivers a single board and has the dimensions 15CM x 7CM. The PCB is designed in a mother-daughter board configuration with mounting holes aligned to the holes of the Arduino Leonardo. The PCB board has a ground power plane on the bottom layer with minimal non-ground traces. The board is designed with

power flow from right to the left. The board has 10 connectors, 8 for motor control, 1 for power and 1 for a ground connection. The cost of this PCB board components is \$21.74. The Ultiboard model is shown in Figure 4.1. A CAD model of the top and bottom on the PCB are shown in Figure 4.2 and Figure 4.3 respectively.

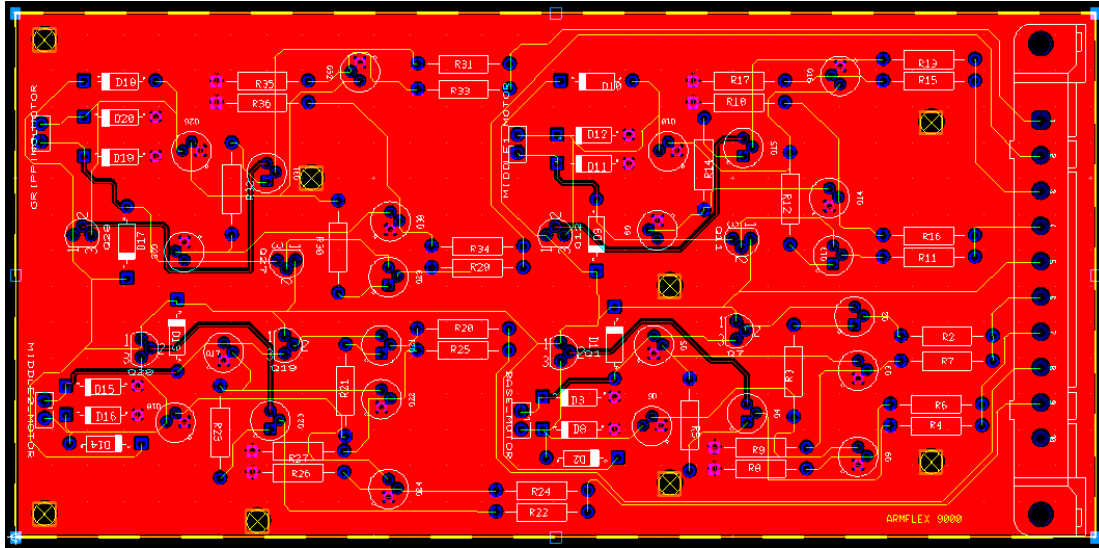


Figure 4.1

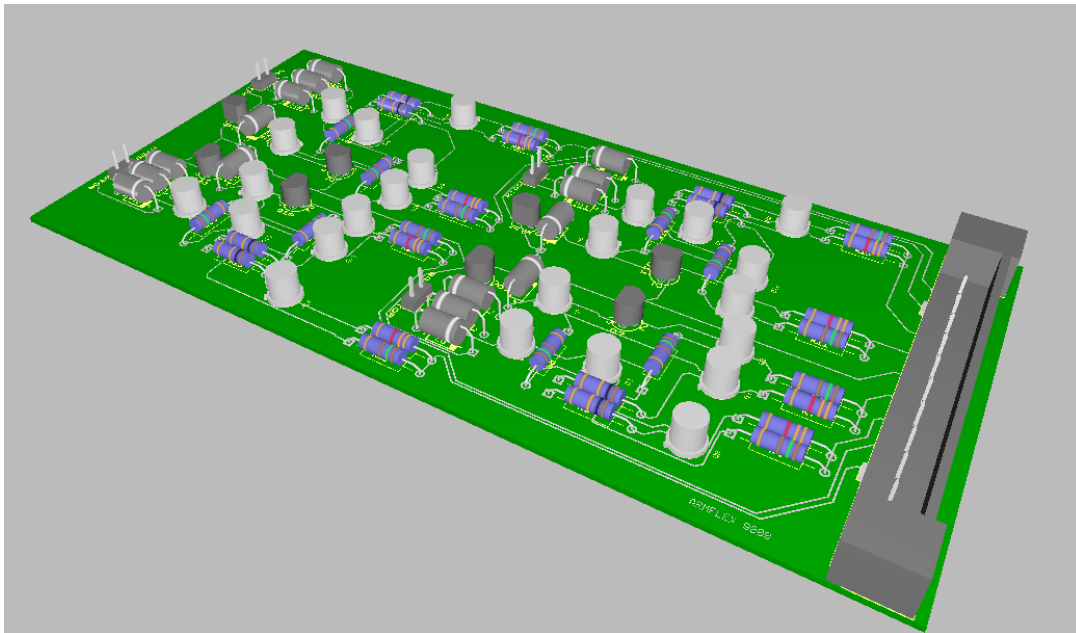
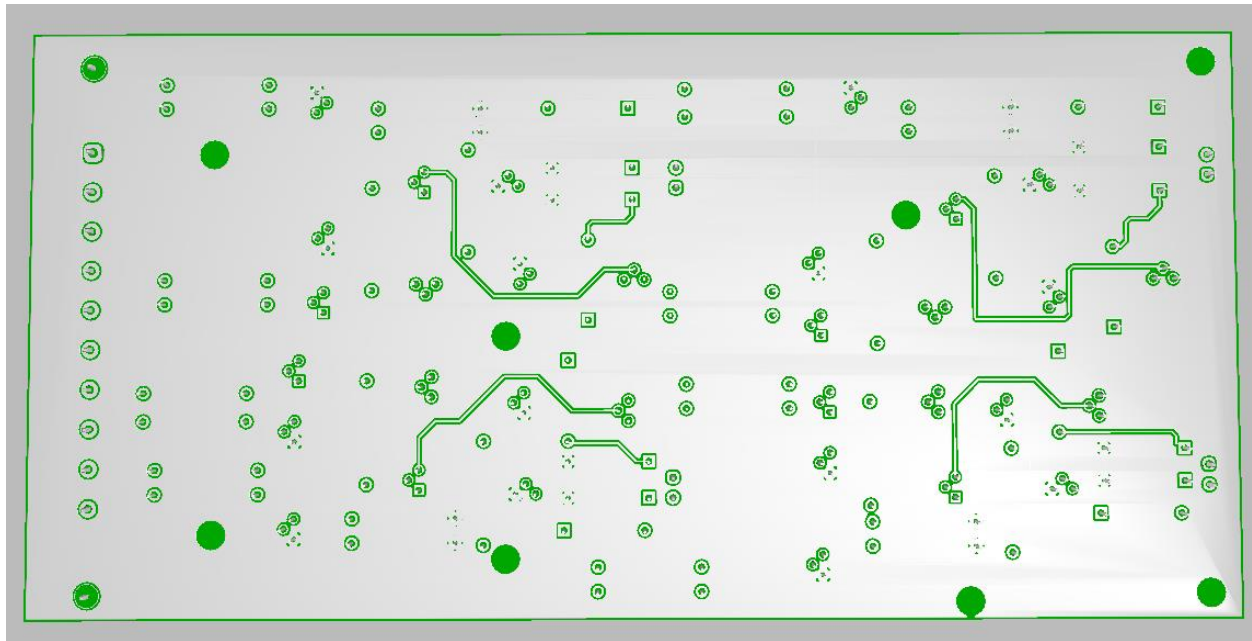


Figure 4.2



*Figure 4.3*

## **5. Data Sheets**

The datasheets of the motor, encoder, and gearheads are attached with submitted document.