DriveBot: Assembly, Electrical Connections, and Remote Control

1. Tape components to chassis (Figure 1)

Arrange the battery, Power Supply Unit (PSU), Motor Driver Board, Resistor Board, Bluetooth Receiver/Transceiver, PSoC, and power switch on the top surface of the DriveBot chassis. Secure each component to chassis using electrical tape (on back surface of each component).
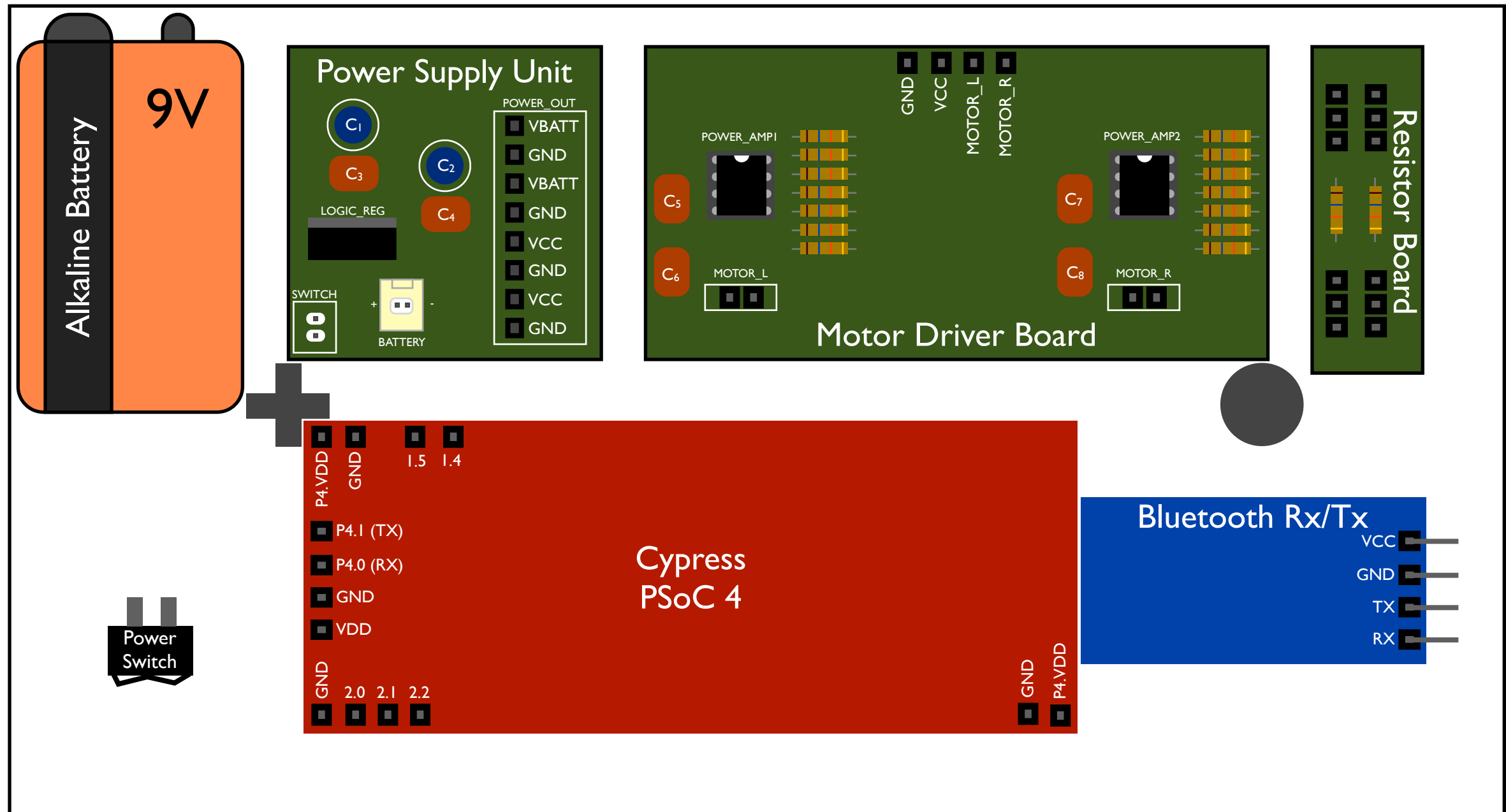
Alkaline Battery

9V

Power Supply Unit

C1

C3

C2

C4

LOGIC_REG

SWITCH

BATTERY

POWER_OUT

VBATT
GND
VBATT
GND
VCC
GND
VCC
GND

GND
VCC
MOTOR_L
MOTOR_R

POWER_AMP1

POWER_AMP2

C5

C6

MOTOR_L

C7

C8

MOTOR_R

Motor Driver Board

Resistor Board

P4.VDD
GND
1.5   1.4

P4.1 (TX)

P4.0 (RX)

GND

VDD

Power Switch

GND   2.0 2.1 2.2

Cypress PSoC 4

GND   P4.VDD

Bluetooth Rx/Tx

VCC
GND
TX
RX

Figure 1. Arrangement of components on top of DriveBot chassis

2. Connect PSU and battery (Figure 2)

Connect the battery to the PSU using the <u>snap-molex connector</u>. The snap connector aligns with the battery in only one orientation, and the molex connector slides into the battery slot on the PSU, also in one orientation.
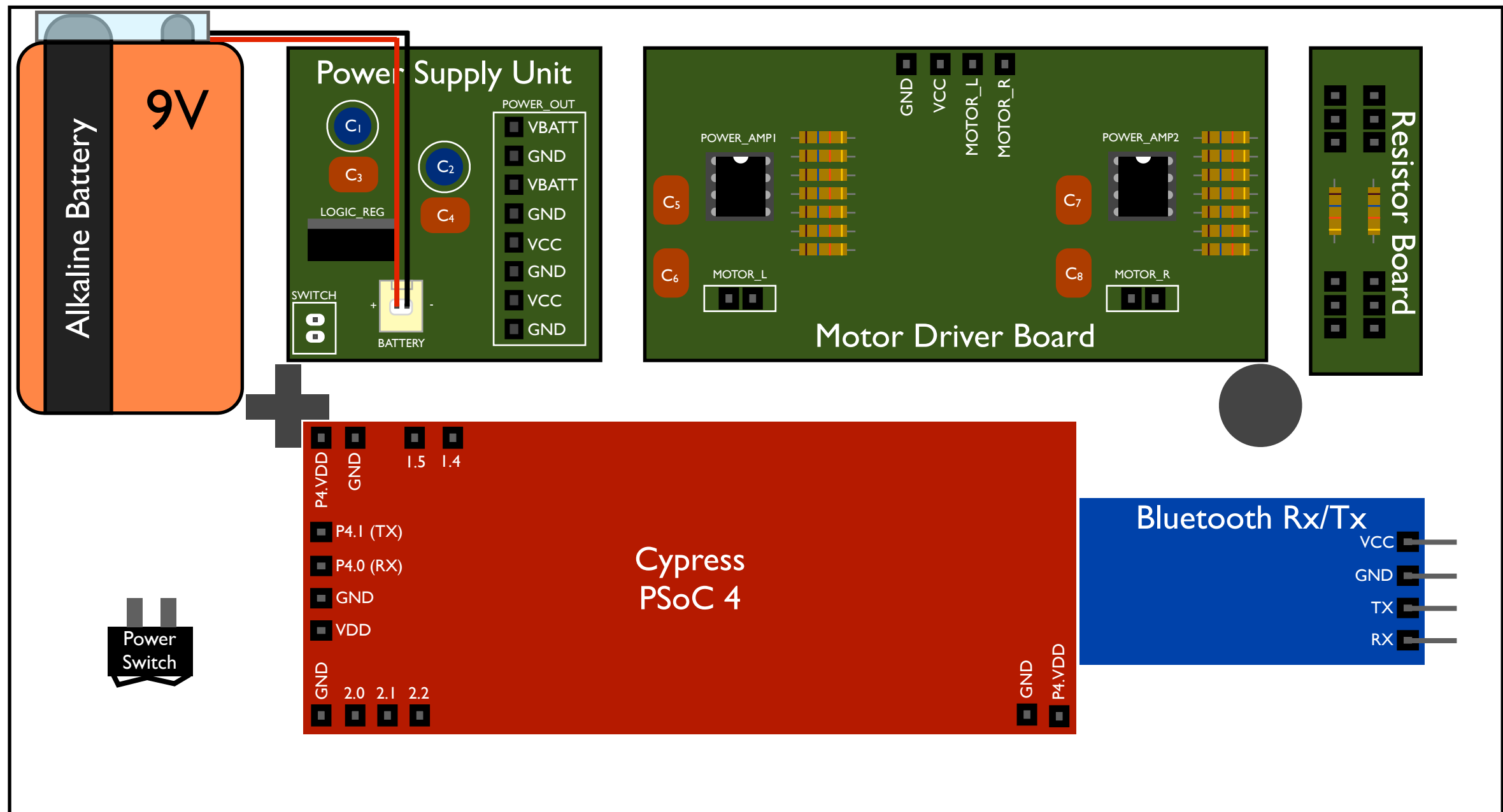

Figure 2. Connecting PSU and battery using snap-molex connector

3. Connect PSU and Power Switch (Figure 3)
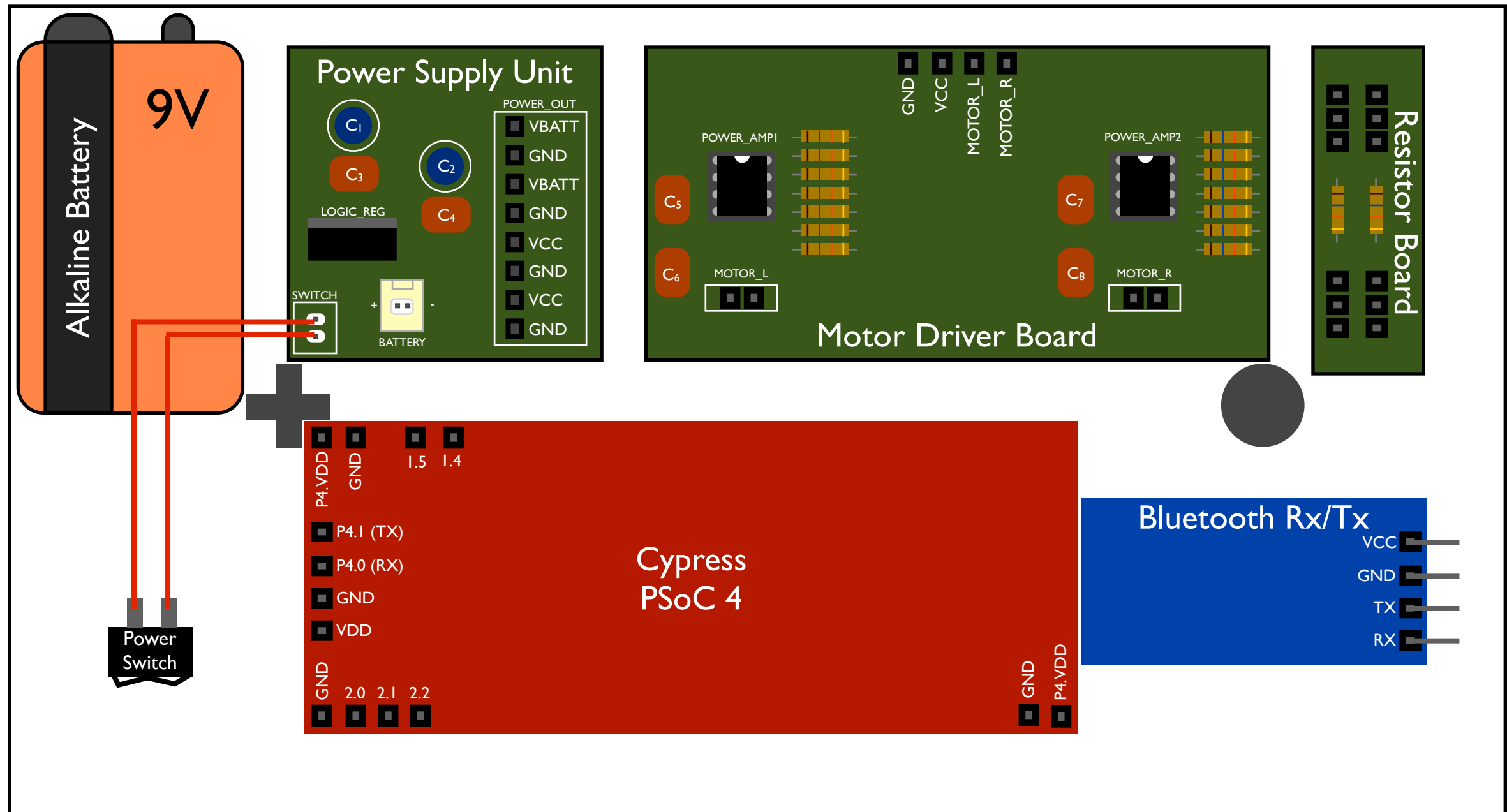Using two red jumper wires, connect the power switch to the switch block in the lower left corner of the PSU.

Figure 3. Connecting PSU and Power Switch with two red jumper wires

4. Connect PSU and PSoC (Figure 4)

Use <u>one red jumper wire</u> to connect the bottommost 5V header (VCC) of the righthand panel on the PSU to the top right P4.VDD on the PSoC. Then, use <u>one black jumper wire</u> to connect the bottommost ground (GND) header of the PSU to the top left GND on the PSoC.
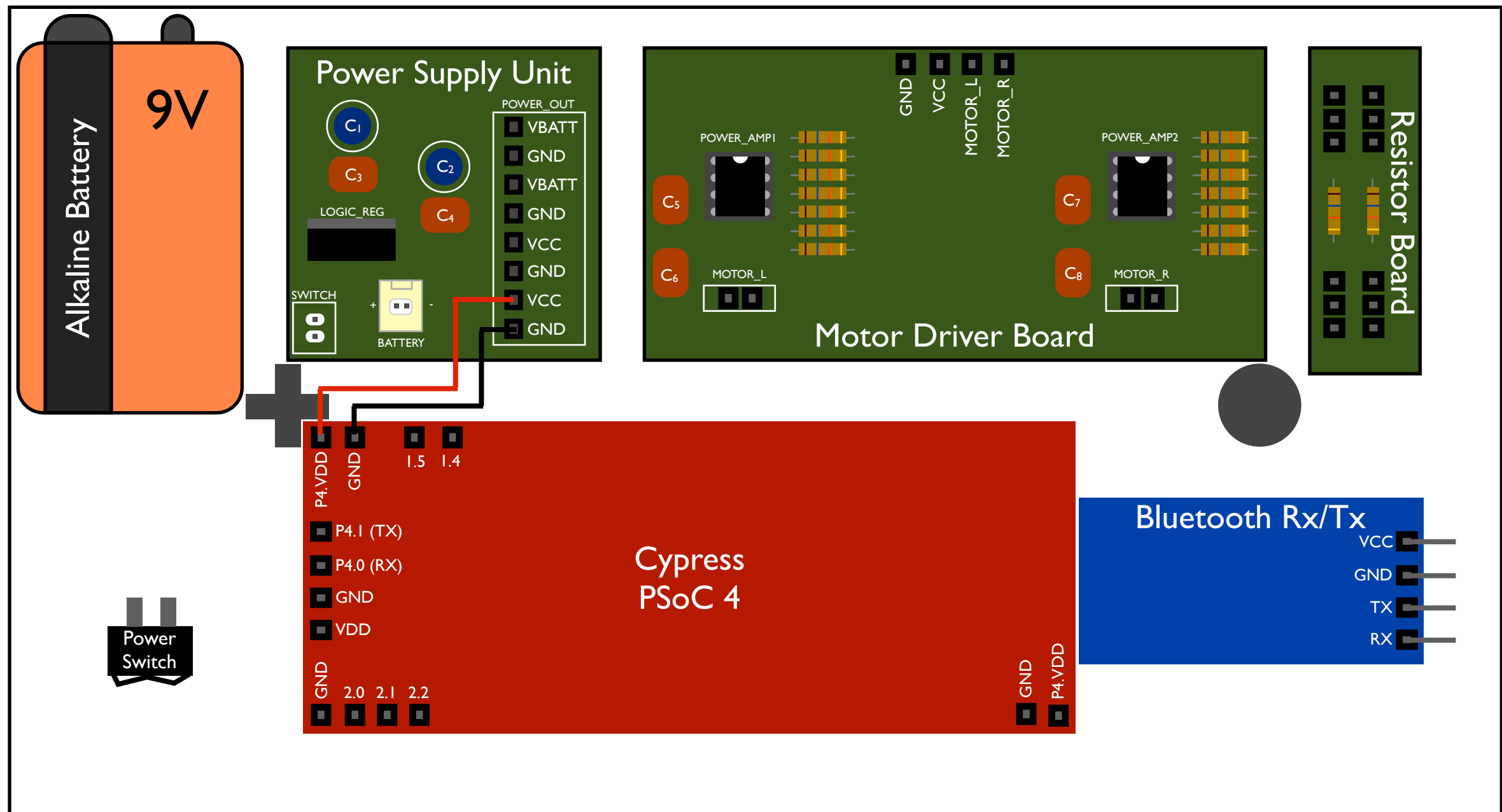

Figure 4. Connecting ground and power from PSU to PSoC, with one red jumper wire and one black jumper wire

5. Test steps 1-4: Does the PSoC receive power? (Figure 5)

Turn on the power, by pushing the <u>Power Switch</u> to the "on" position ("1" down, instead of "0" down). You should notice that the power light (orange light) of the PSoC turns on. Turn off the power once test is complete.
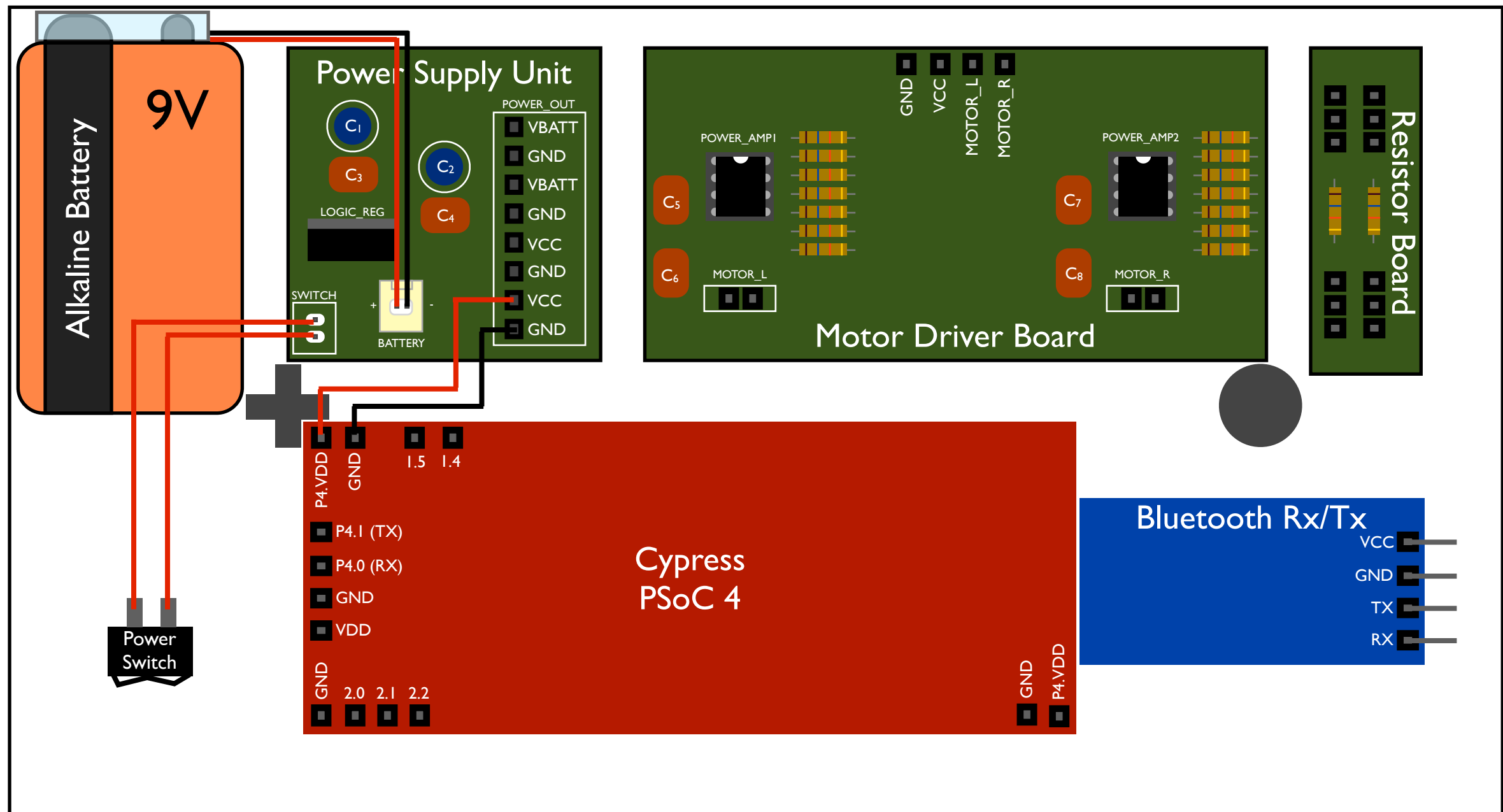

Figure 5. Testing connections between battery, power switch, PSU, and PSoC

6. Connect PSoC and Bluetooth Rx/Tx (Figure 6)

a. First, look at the underside of the <u>Bluetooth Rx/Tx</u> and locate four headers: VCC, GND, Tx, and Rx. Connect <u>two blue jumper wires</u> to the Rx and Tx headers of the Bluetooth module. Connect the Rx wire to *port 1.4* on the PSoC, and the Tx wire to *port 1.5* on the PSoC.

b. Next, use <u>one black jumper wire</u> to connect GND from Bluetooth module to GND on the left side of the PSoC. Use <u>one red jumper wire</u> to connect VCC on the Bluetooth module to VDD on the left side of the PSoC.
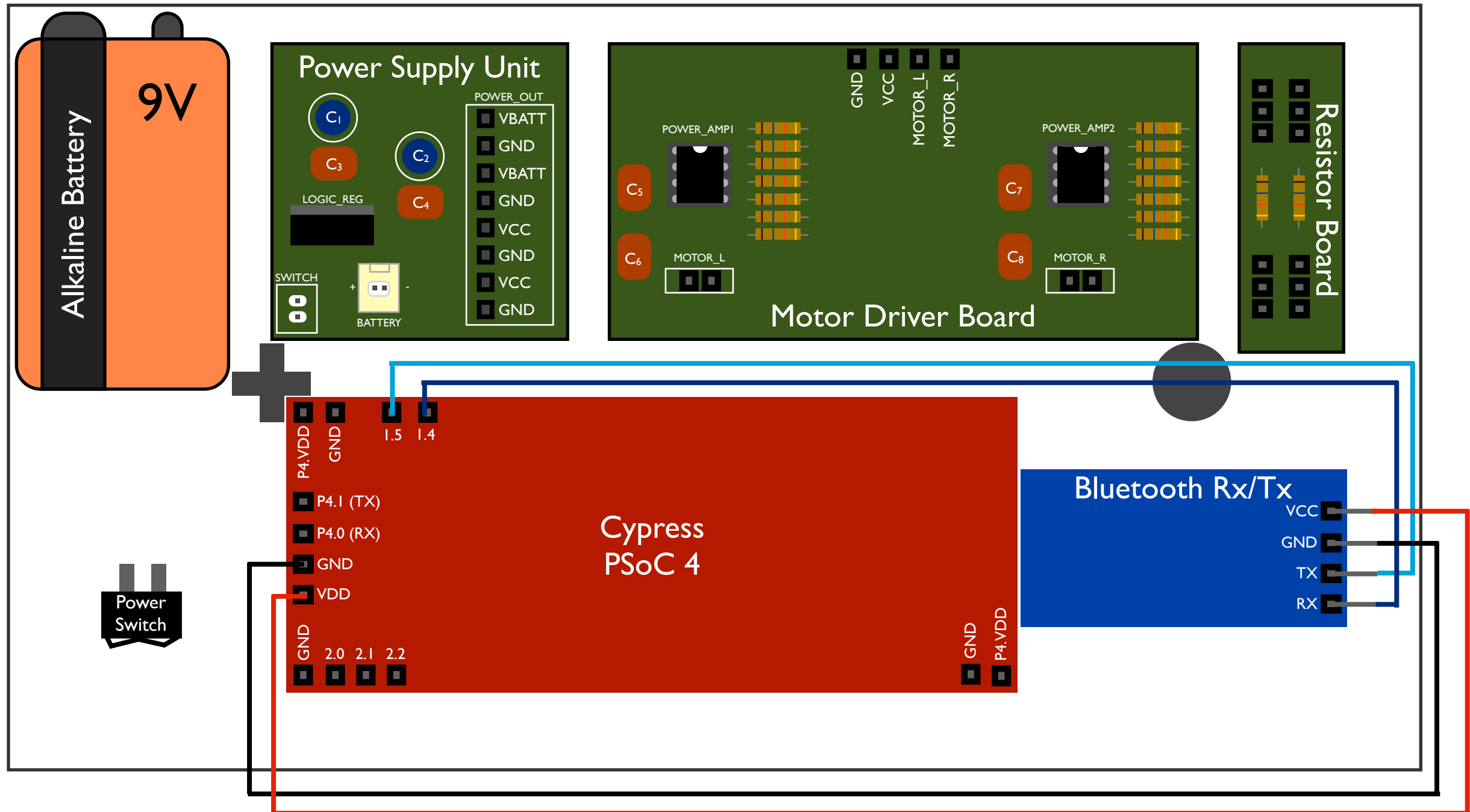

Figure 6. Connecting PSoC and Bluetooth Rx/Tx, with two blue jumper wires, one black jumper wire, and one red jumper wire

7. Test steps 1-5: Does the Bluetooth Rx/Tx receive power? (Figure 7)

Turn on the power again, by pushing the <u>Power Switch</u> to the "on" position. You should notice that the power light (blue light) of the Bluetooth Rx/Tx turns on. Turn off the power once test is complete.
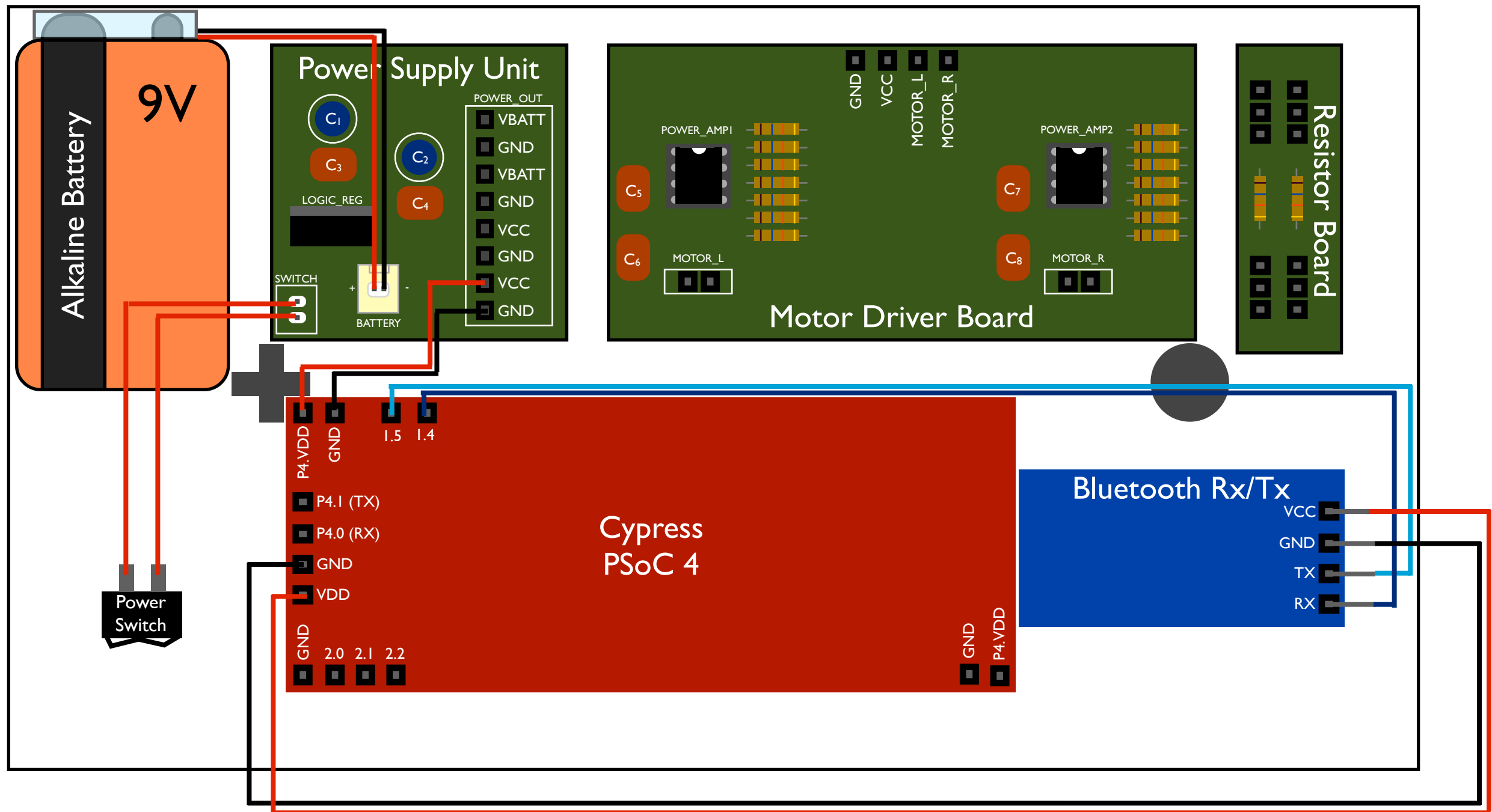

Figure 7. Testing connections between PSoC and Bluetooth module

8. Connect Motors to Motor Driver Board (Figure 8)

Insert <u>motor soldered with green wires</u> into the right side of DriveBot, and the <u>motor soldered with yellow wires</u> into the left side. Connect two jumper wires of corresponding color (green for right; yellow for left) to each motor, feed wires up through circular hole in DriveBot chassis, and then plug wires into respective headers (green in Motor_R; yellow in Motor_L).
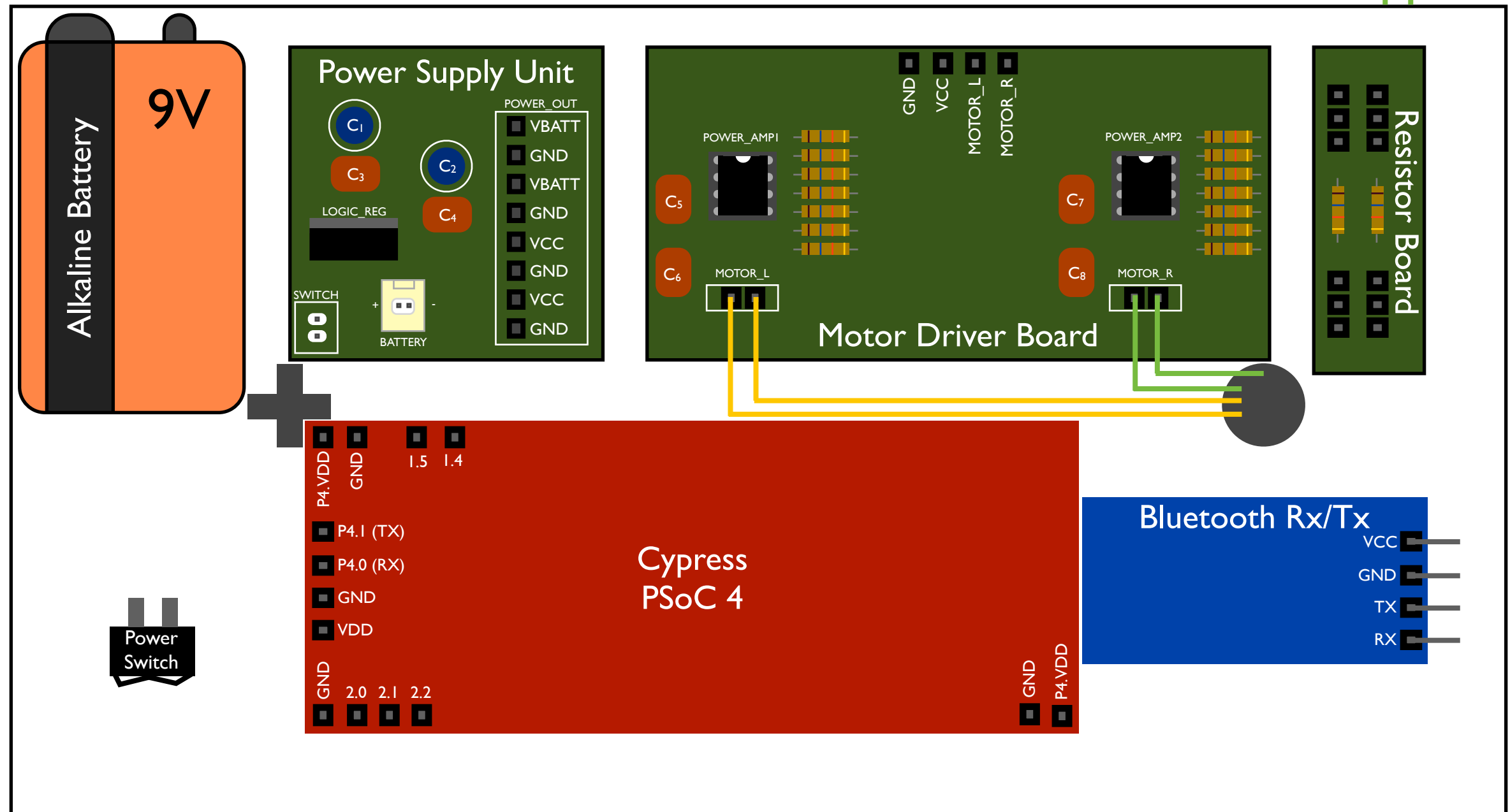

Figure 8. Connecting motors to motor driver board using green and yellow jumper wires

9. Connect PSU to Motor Driver Board (Figure 9)

Use <u>one red jumper wire</u> to connect the remaining VCC on PSU to VCC on the top of the Motor Driver Board. Use <u>one black jumper wire</u> to connect the other GND on the bottom half of the PSU header panel to GND on the top of the Motor Driver Board.
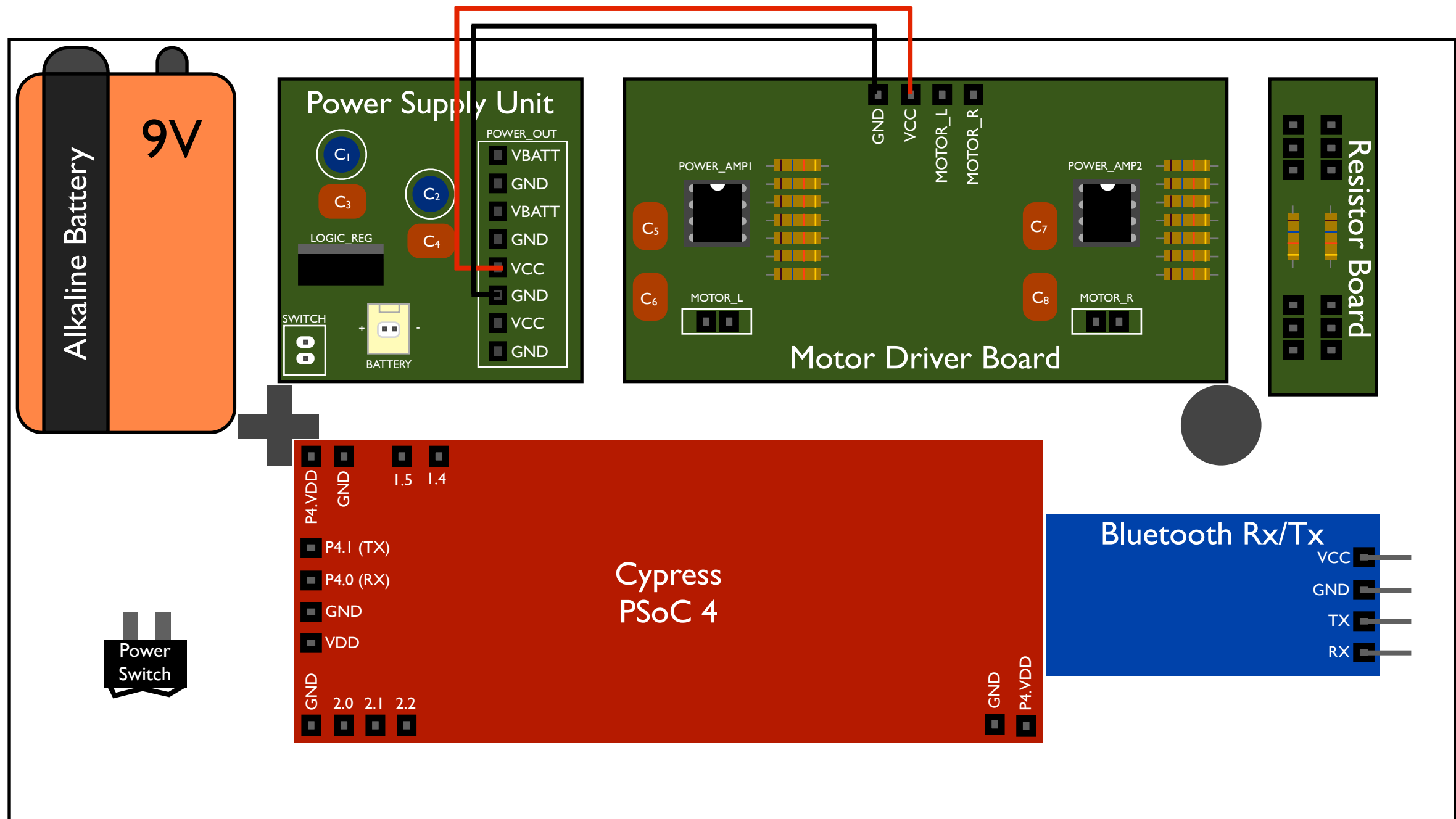
Figure 9. Connecting ground and power from PSU to Motor Driver Board using one red and one black jumper wire

10. Connect Motor Driver Board to PSoC, through the Resistor Board (Figure 10)
Use <u>one green jumper wire</u> to connect Motor_R on the top of the Motor Driver Board to the header in the upper right of the Resistor Board. Use <u>another green jumper wire</u> to connect a header in the same row as the first green jumper wire, to *port 2.0* on the PSoC. Follow a similar procedure for the left motor, this time using <u>two yellow jumper wires</u> and connecting to *port 2.1* on the PSoC.
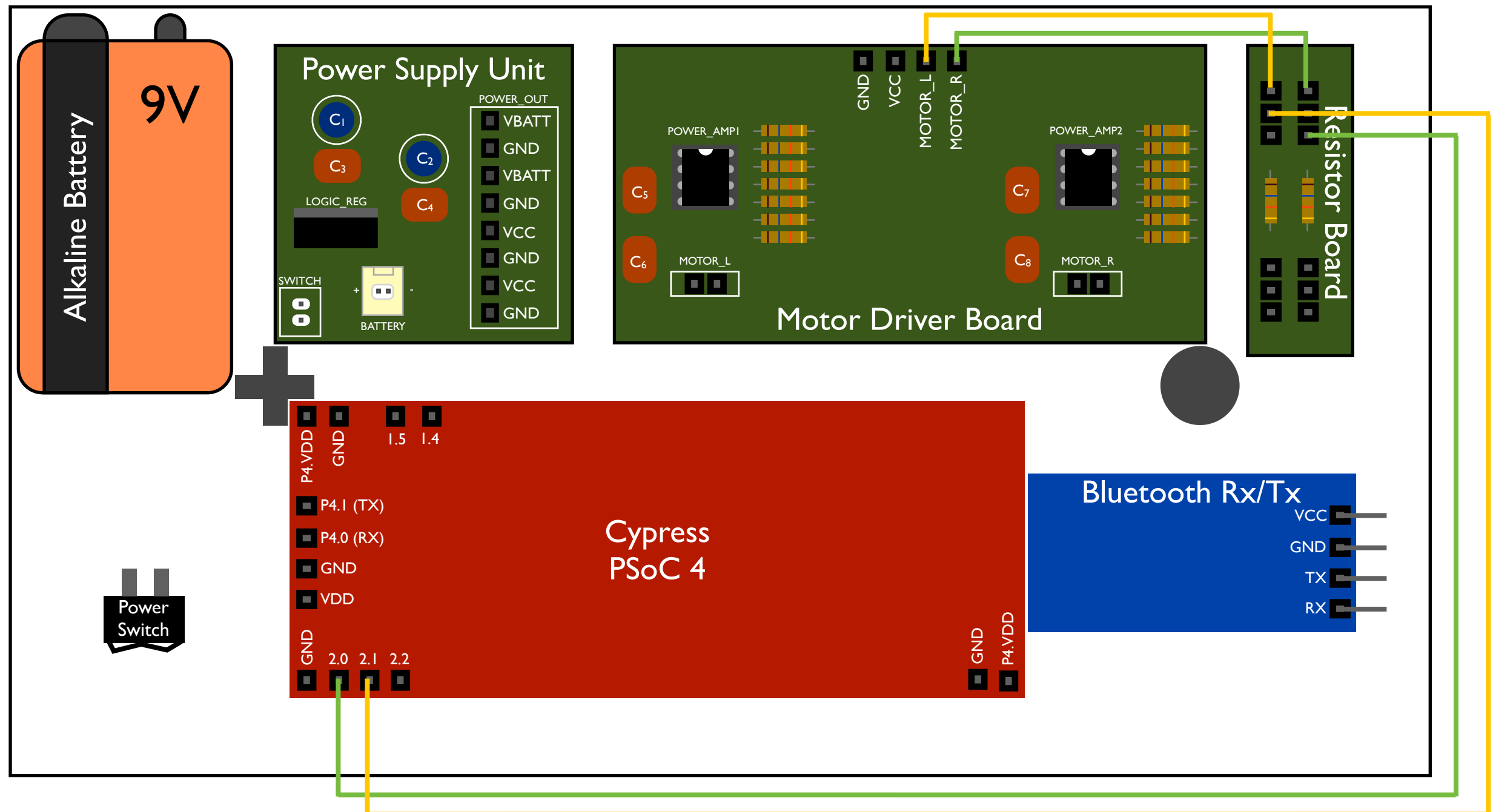

Figure 10. Using green and yellow jumper wires to connect Motor Driver Board to PSoC, through the Resistor Board

11. Test steps 1-10: Do the motors spin? (Figure 11)

Attach one wheel to each motor. Turn on the power again, by pushing the Power Switch to the "on" position. You should notice that both the right and left motors spin. Turn off the power once test is complete.
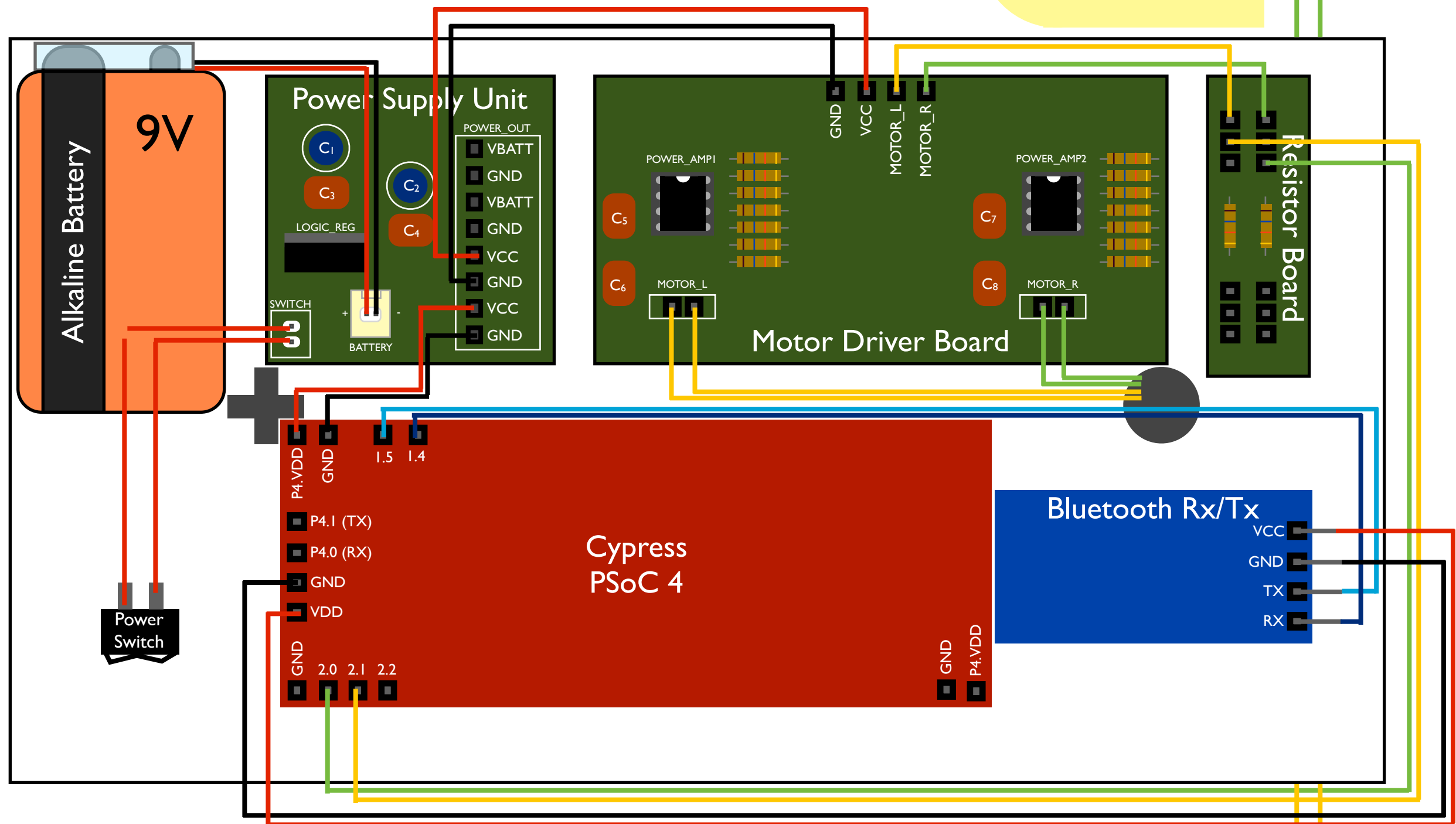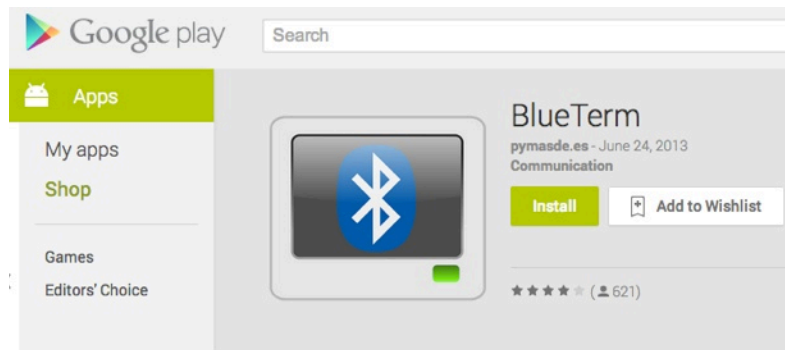

Figure 11. Testing DriveBot's ability to spin both motors, based on all connections

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12. Connect DriveBot to Android Phone

a. On an Android phone, download the application "BlueTerm" from the Google play store.

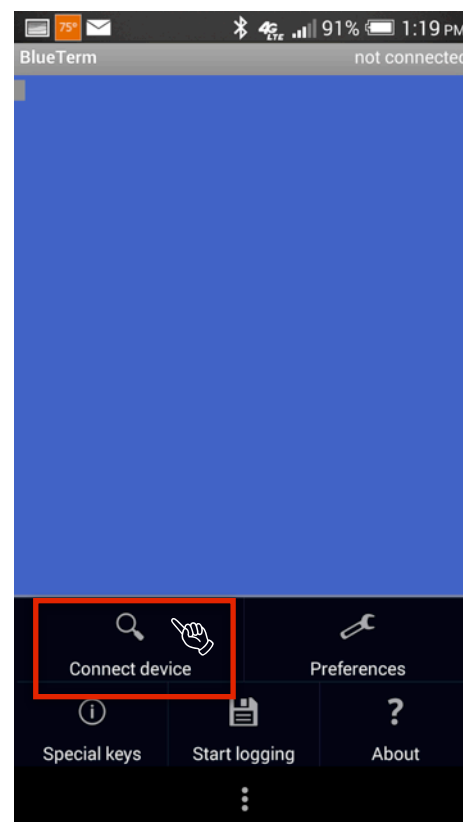**b.** Once installed, open "BlueTerm" and if prompted to turn on Bluetooth, accept the request.

c. Click on the three vertical dots at the bottom of the screen, to see options. Click on "Connect device."

Step **12b**   Step **12c**

d. Next, turn on DriveBot. On phone, click on "Scan for devices."

e. You should see a device appear, with a device tag formatted as 20:14:04:29:28:90. Write down the last 4 digits, which correspond to the specific Bluetooth module, for future reference. For instance, 28:90.

f. Take note of the blinking light on the Bluetooth Rx/Tx. Next, select the device on the phone. The password to connect is "1234". Once the phone is connected to the Bluetooth Rx/Tx, the Bluetooth light should stop blinking and remain on.

Step **12d**   Steps **12e**, **12f**

g. Within BlueTerm, type any letter, to see a "Welcome to DriveBot" message. Then, type one letter at a time to control the direction of DriveBot.

"w" = forward   "d" = right
"s" = backward   "a" = left