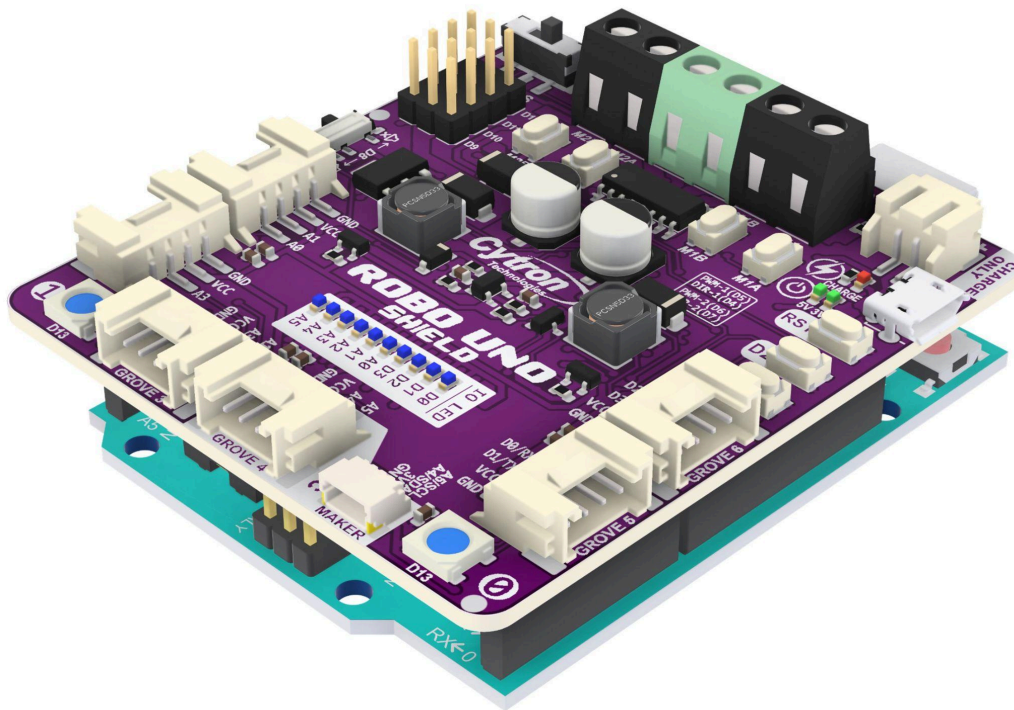




Robo Uno Shield



Datasheet

Rev 1.0
February 2025

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BOARD LAYOUT & FEATURES

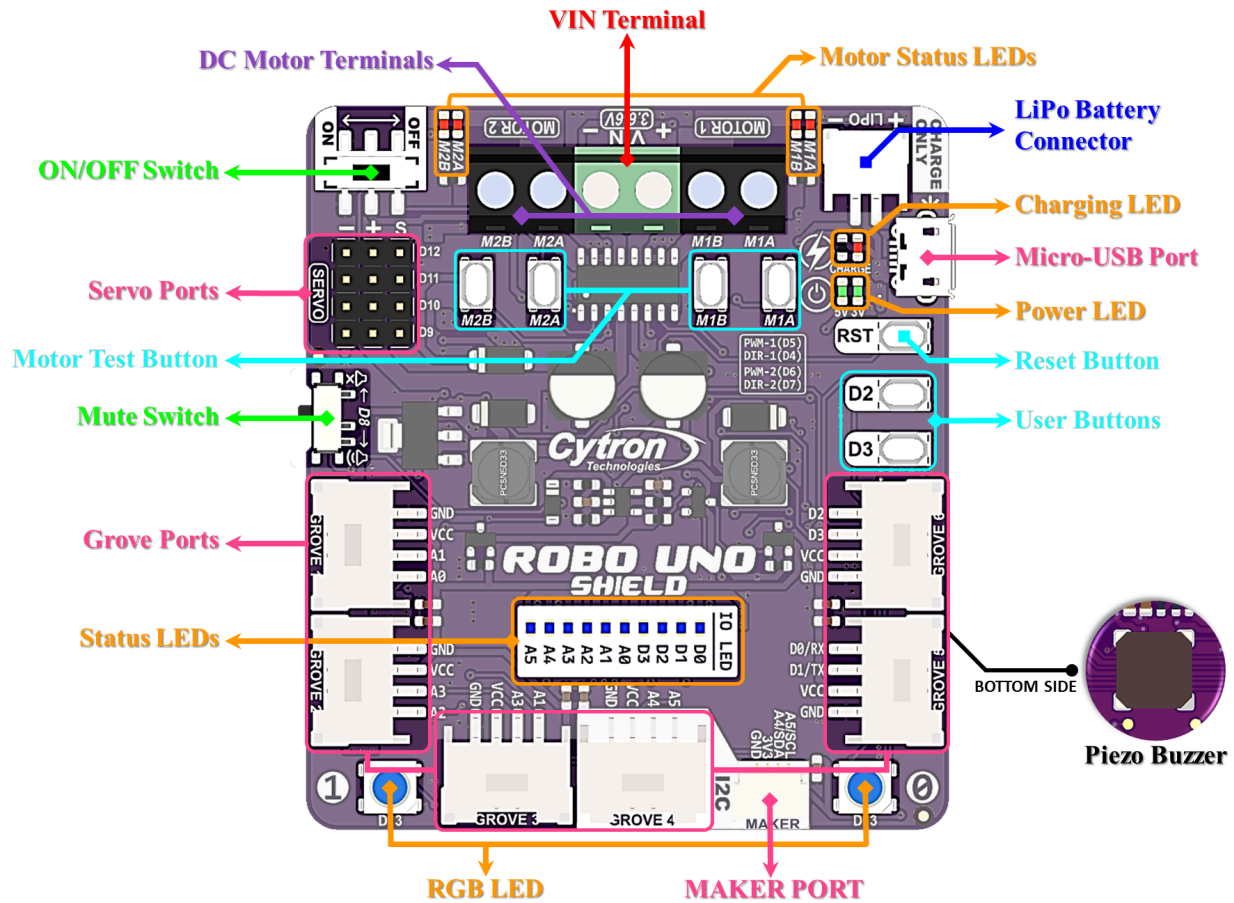


Figure 1: Robo Uno Shield Layout and Functions

Function	Description
Vin Terminal	Connect to any power source within 3.6 - 6V.
LiPo Battery Connector	Connect to Single Cell LiPo / Li-Ion Battery The battery is rechargeable via a micro-USB port on the shield. <i>* The battery is protected from overcharged and over discharged. If the board cannot be turned on when the battery is connected, Please charge the battery to activate the battery protection circuit.</i>
Micro-USB Port	Connect to micro USB to charge the LiPo battery.
Power LED	The LED will turn ON when powered up.

On/Off Switch		Turn the board's power ON/OFF.																																														
Reset Button		Press to reset the shield and the microcontroller.																																														
RGB LEDs		User-programmable RGB LED. Connected to pin D13.																																														
Piezo Buzzer		Located at the bottom side of the board. It can be used to play tone or melody. Connected to pin D8.																																														
Programmable Buttons		Accessible from the user program. Connected to pins D2 and D3.																																														
Grove Ports		Connect to external Grove modules.																																														
		<table><tr><th>Grove Port</th><th>PIN</th><th>I2C</th><th>UART</th></tr><tr><td rowspan="2">1</td><td>A0</td><td>-</td><td>-</td></tr><tr><td>A1</td><td>-</td><td>-</td></tr><tr><td rowspan="2">2</td><td>A2</td><td>-</td><td>-</td></tr><tr><td>A3</td><td>-</td><td>-</td></tr><tr><td rowspan="2">3</td><td>A1</td><td>-</td><td>-</td></tr><tr><td>A3</td><td>-</td><td>-</td></tr><tr><td rowspan="2">4</td><td>A4</td><td>SDA</td><td>-</td></tr><tr><td>A5</td><td>SCL</td><td>-</td></tr><tr><td rowspan="2">5</td><td>D0</td><td>-</td><td>RX</td></tr><tr><td>D1</td><td>-</td><td>TX</td></tr><tr><td rowspan="2">6</td><td>D2</td><td>-</td><td>-</td></tr><tr><td>D3</td><td>-</td><td>-</td></tr></table>	Grove Port	PIN	I2C	UART	1	A0	-	-	A1	-	-	2	A2	-	-	A3	-	-	3	A1	-	-	A3	-	-	4	A4	SDA	-	A5	SCL	-	5	D0	-	RX	D1	-	TX	6	D2	-	-	D3	-	-
		Grove Port	PIN	I2C	UART																																											
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Maker Port		Compatible with QWIIC / Stemma QT / Grove (with conversion cable). <i>The pins are shared with the Grove 4 port (PIN A4, A5).</i>																																														
Mute Switch		Used to mute or unmute the piezo buzzer.																																														
Status LEDs		IO LED indicators for the pins on Grove Ports. Turn on when the pin's state is high.																																														
Motor Test Buttons		Press to test the functionality of the motor driver. The motor will run at full speed. ● MxA: Forward* ● MxB: Backward*																																														
Servo Ports		Connectors for 4 x RC servo motors. The signal is connected to pins D9, D10, D11, and D12. V+ voltage is equal to the power source voltage.																																														

Motor Status LEDs		Turn ON when the motor is running. ● MxA: Forward* ● MxB: Backward*
DC Motor Terminals		The motor voltage at full speed is equal to the power source voltage. Motor direction is dependent on the polarity. ● M1A: D4 ● M1B: D5 ● M2A: D6 ● M2B: D7

Table 1: Robo Uno Shield Features Details

* *Actual motor direction is dependent on the motor connection.
Swapping the connection (MxA & MxB) will reverse the direction.*

1. ROBO UNO SHIELD PINOUT DIAGRAM

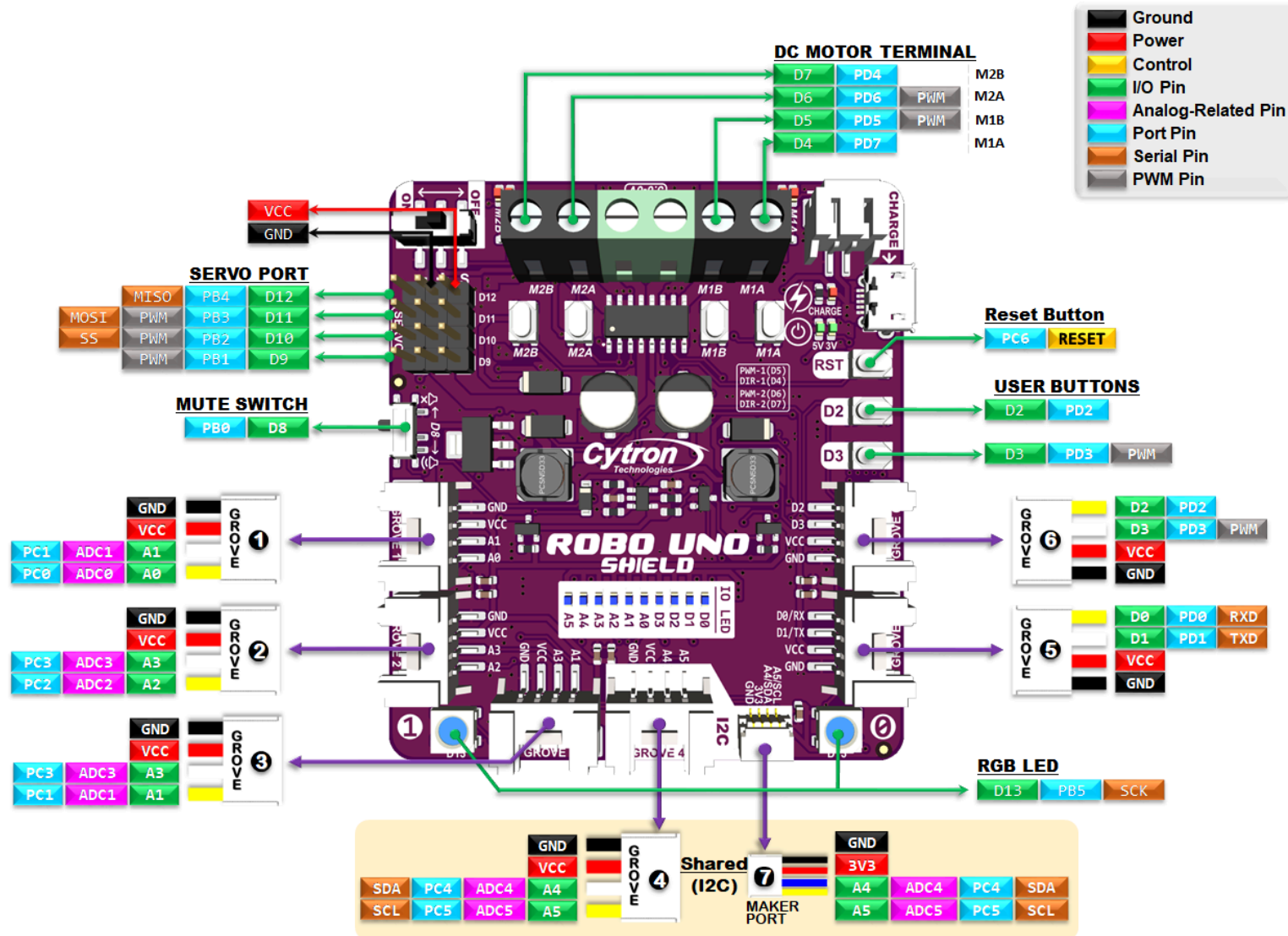


Figure 2: Robo Uno Shield Pinout Diagram

2. SPECIFICATIONS

No	Parameters		Min	Max	Unit
1	Power Input Voltage (USB, LiPo or VIN) *		3.6	6	V
2	Digital Input Voltage	Low Level	0	0.5	V
		High Level	2.7	5	V
3	Digital Output Voltage	Low Level	0	0.5	V
		High Level	4.2	5	V
4	Analog Input Voltage		0	5	V
5	Vmotor & Vservo (Only USB is connected)		VUSB - 0.4		V
6	Vmotor & Vservo (Only either one of LiPo or VIN is connected)		VLiPo or VIN		V
7	Vmotor & Vservo (USB and LiPo are connected)		VUSB - 0.4		V
8	Vmotor & Vservo (USB and VIN are connected)	VIN < VUSB	VUSB - 0.4		V
		VIN > VUSB and VIN - VUSB < 0.6	VIN - 0.4		V
		VIN - VUSB > 0.6	VIN		V
9	Maximum DC Motor Current (Per Channel)	Continuous	-	1	A
		Peak (< 5 seconds)	-	1.5	A
10	DC Motor Driver PWM Frequency		-	20	kHz
11	Total 5V Output Current (Grove Ports)		-	400	mA
12	Operating Temperature		-20	85	°C

Table 2: Robo Uno Shield Absolute Maximum Ratings

- * Voltage for the DC motor and servo is equal to power input voltage.
- * It's not recommended to connect both LiPo and VIN at the same time.
Although it's perfectly safe to do so.

3. MOTOR DRIVER TRUTH TABLE

Input A (GP8 / GP10)	Input B (GP9 / GP11)	Output A (M1A / M2A)	Output B (M1B / M2B)	Motor
Low	Low	Low	Low	Brake
High	Low	High	Low	Forward*
Low	High	Low	High	Backward*
High	High	Hi-Z (Open)	Hi-Z (Open)	Coast

Table 3: Motor Driver Truth Table

* Actual motor direction is dependent on the motor connection.
Swapping the connection (MA & MB) will reverse the direction.

4. DIMENSION

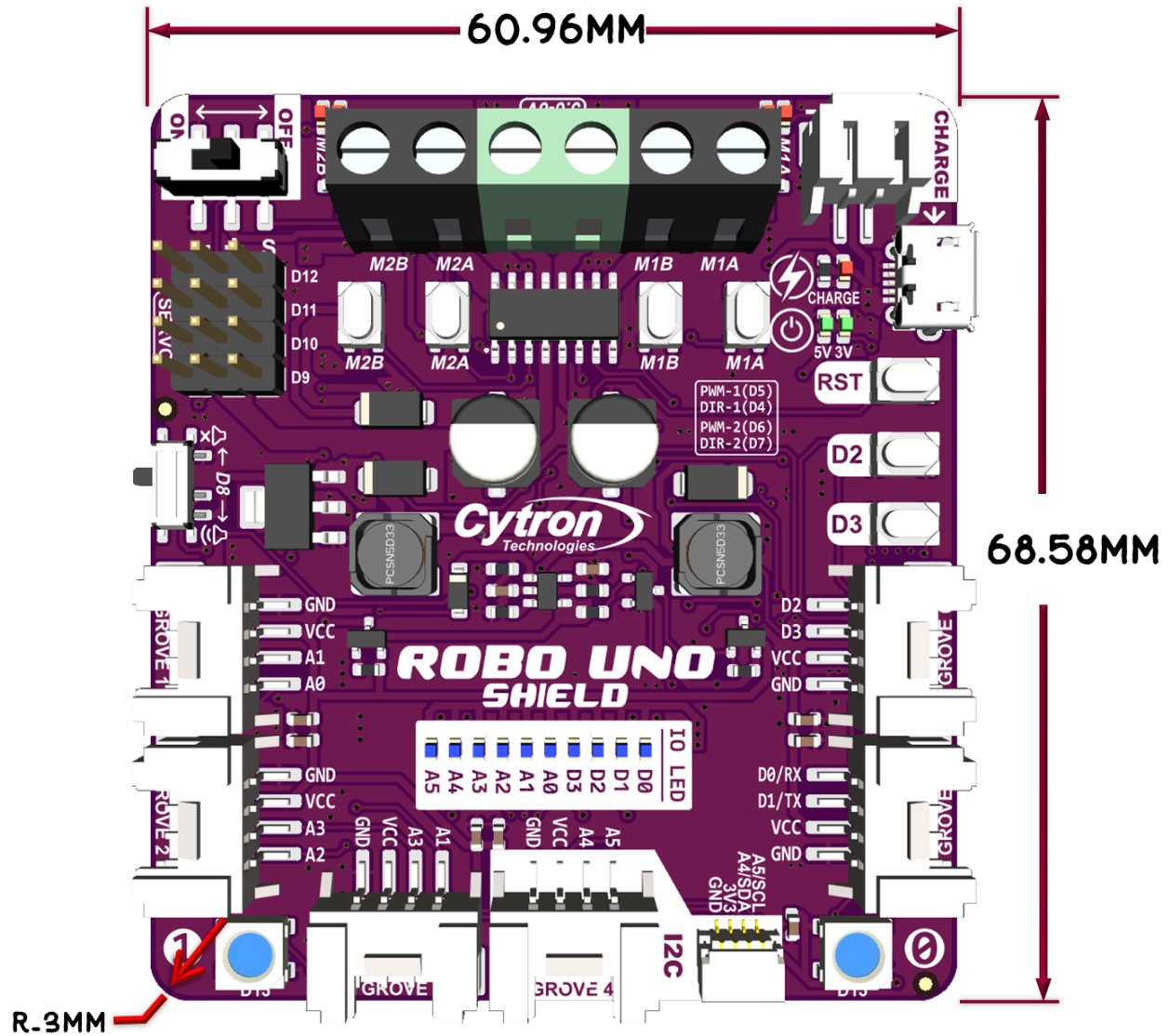
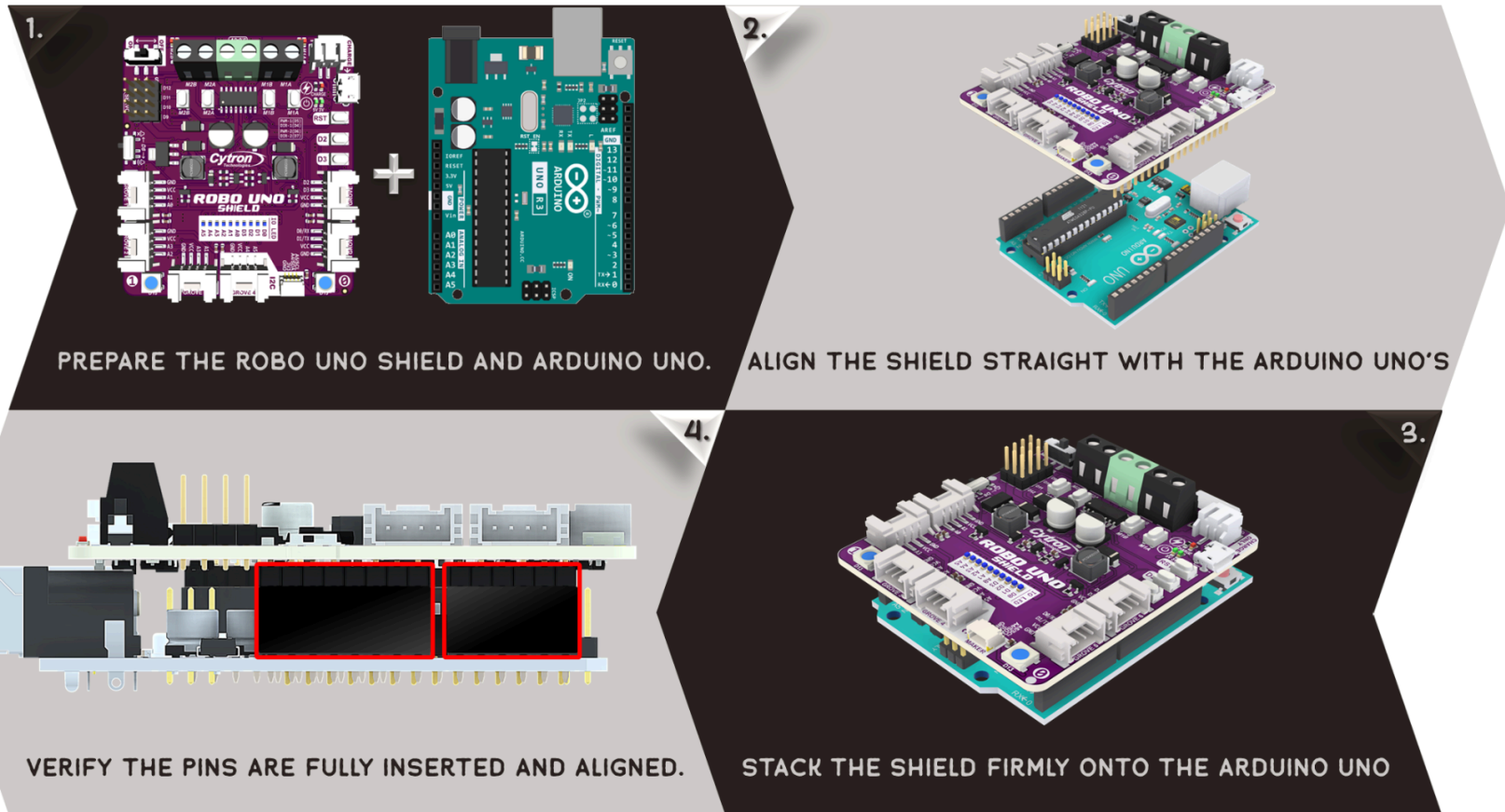


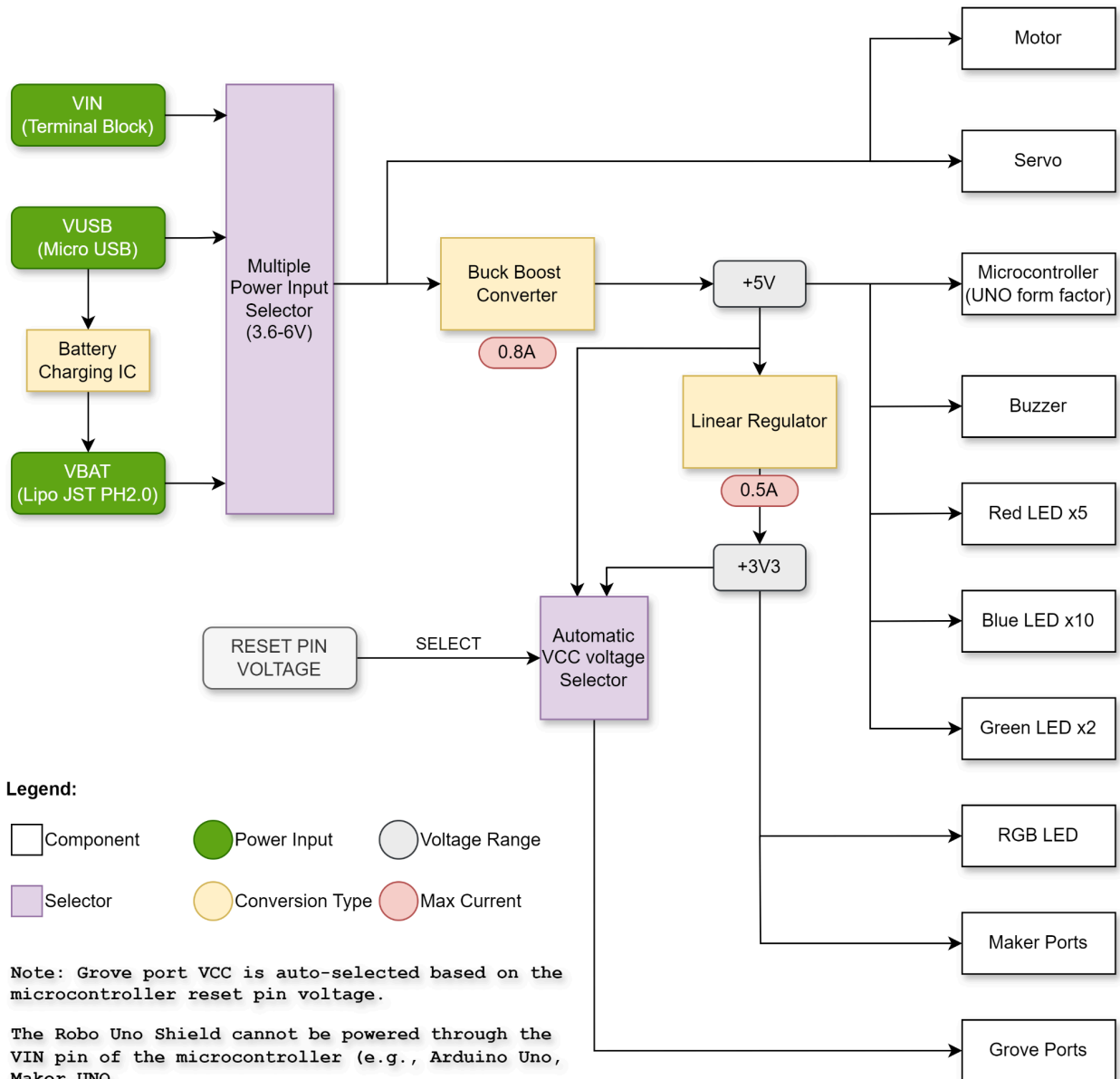
Figure 4: Robo Uno Shield Dimension

5. HARDWARE INSTALLATION

5.1. Stacking the Robo Uno Shield



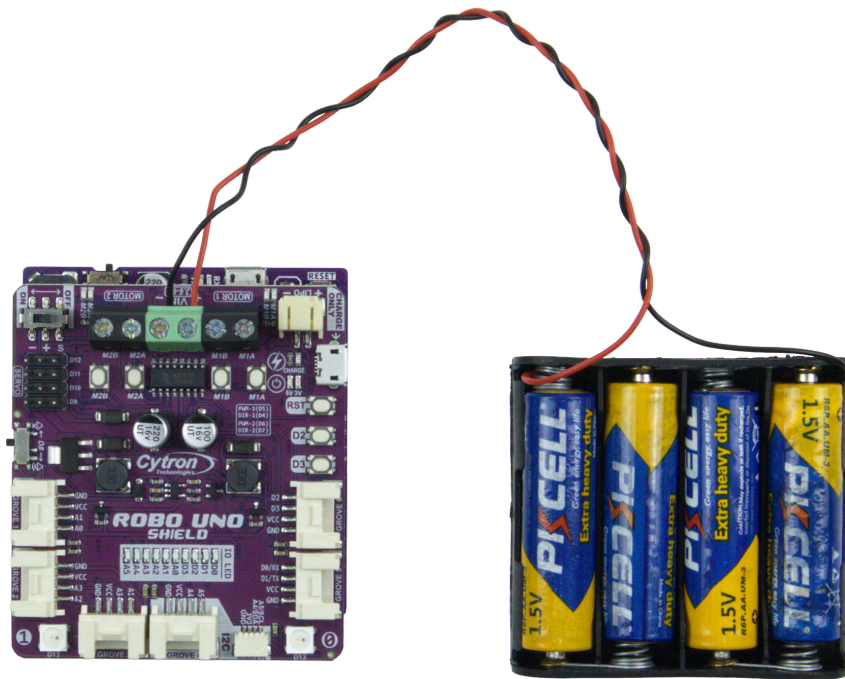
5.2. Robo Uno Shield Power Tree



5.3. Robo Uno Shield Power Supply

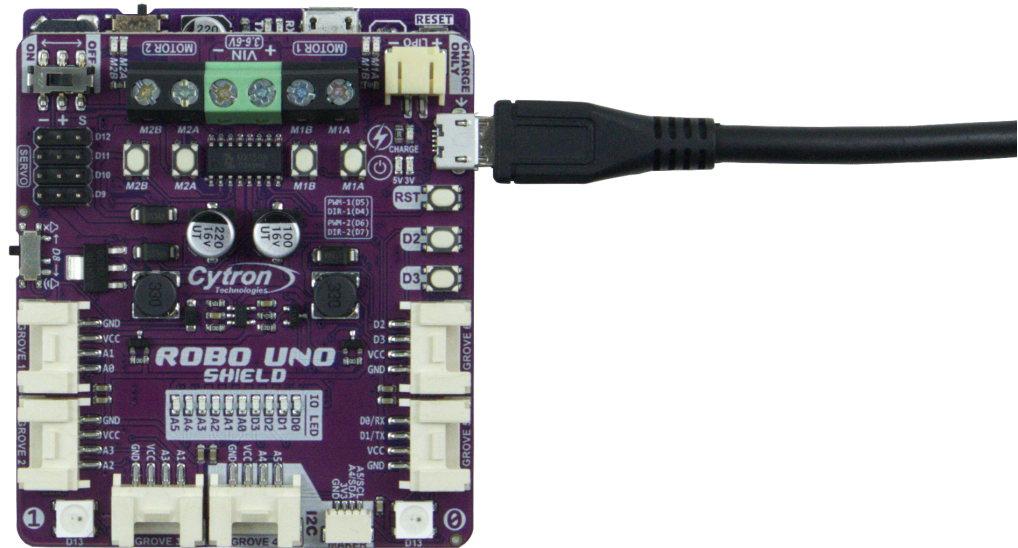
1. External Supply (VIN- Terminal Block):

The VIN terminal accepts a voltage range of 3.6V to 6V and provides power directly to the board and motors. It serves as the primary source for external power, particularly for motor operations, and includes reverse polarity protection to safeguard against incorrect connections.



2. Micro USB (VUSB- micro USB port):

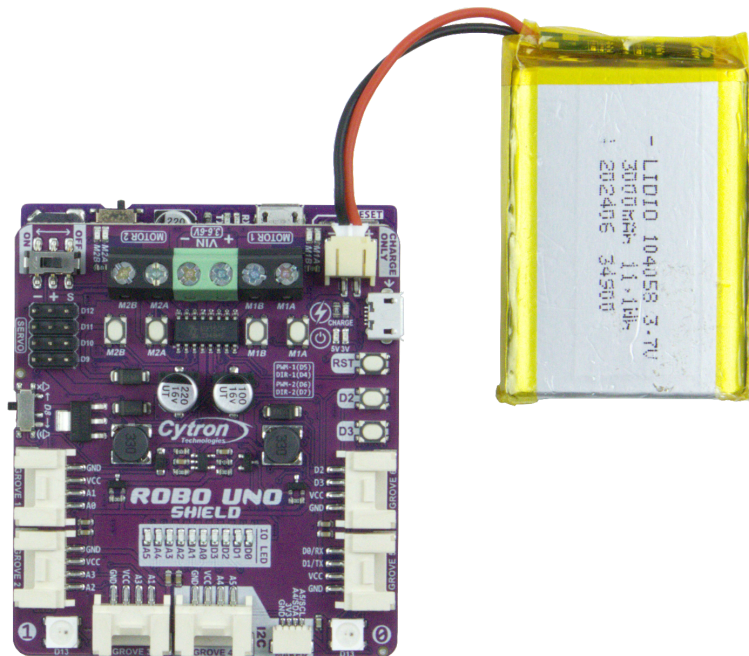
The Micro USB port serves as both a power source for the board and for the motor voltage (V_m). Its main function is to efficiently charge the connected battery (VBAT), ensuring continuous operation when external power sources are unavailable.



Note: The Micro USB port is used only to power up the Robo Uno Shield and charge the battery. It cannot be utilized for data communication or uploading code to the microcontroller.

3. Single Cell Battery (VBAT- JST PH2.0 LiPo port):

The VBAT connector supplies power to the board using a single-cell lithium-ion or lithium-polymer battery, serving as both a power source for the board and for the motor voltage (V_m).

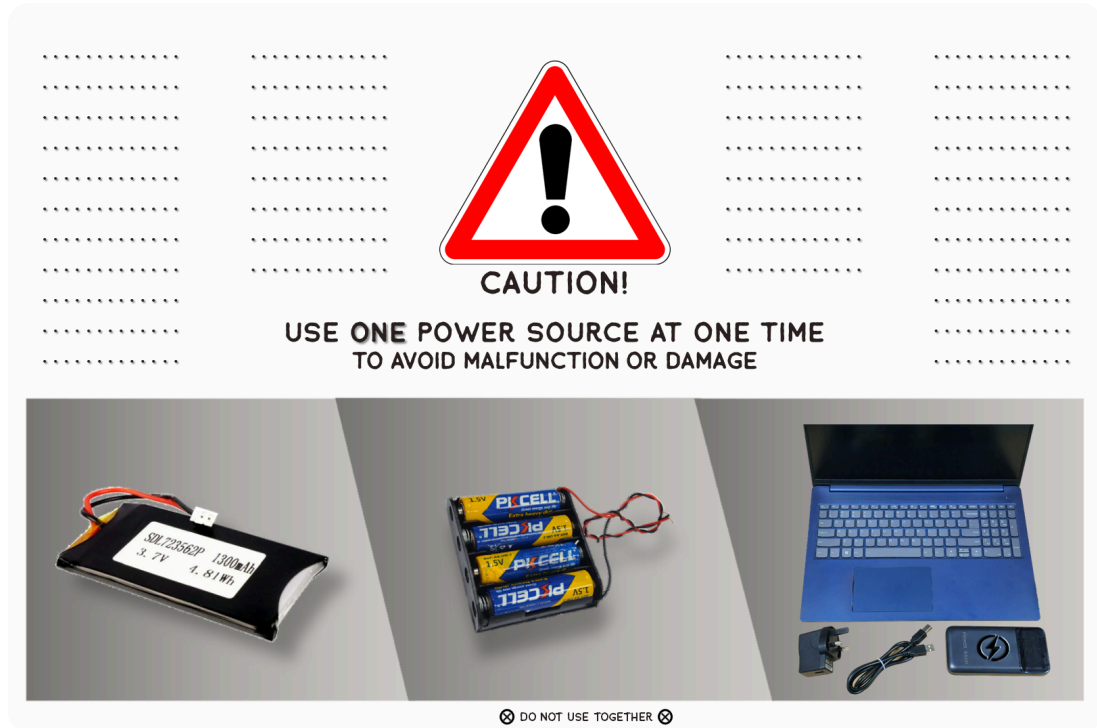


Note:

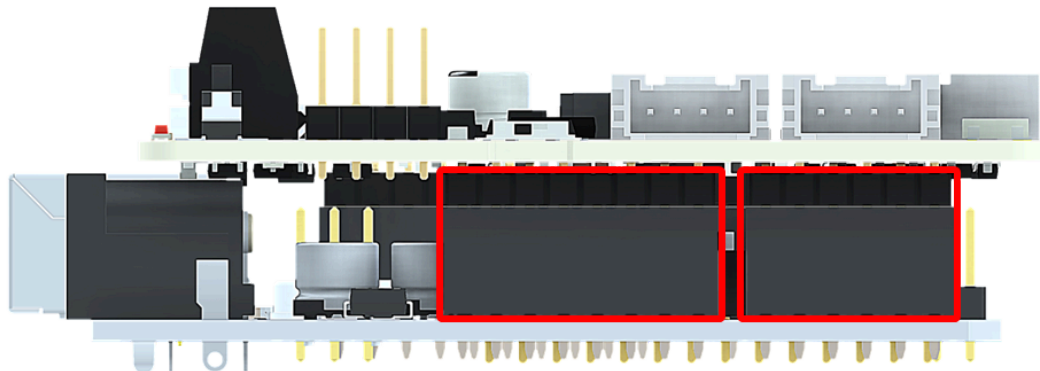
The Robo Uno Shield cannot be powered through the VIN pin of the microcontroller (e.g., Arduino Uno, Maker UNO).

6. PRECAUTION MEASURE

- 1) **Multiple Power Source Warning:** While it's technically possible to connect both LiPo and VIN at the same time, it strongly advises to have **one power source only at one time** due to potential damage or malfunction.



- 2) **Safe Robo Uno Shield Stacking:** To prevent damage to the pin header, ensure the microcontroller pins are vertically aligned with the shield's header before carefully inserting and removing it.



- 3) **External Power Supply for Motors Application:** Motors and servos require a significant amount of current, especially when under heavy load. For reliable operation, it's important to use a suitable external power source that meets the requirements of your project.

When selecting a power source, consider:

- a) **Voltage:** Ensure the power source matches the operating voltage range of the motors and servos.
- b) **Current Capacity:** Choose a battery with sufficient capacity (e.g., 2000mAh or higher) to sustain operation without frequent recharging or replacement.
- c) **Load Requirements:** If you're using all the servo and motor ports, ensure the battery can handle the combined current demand.
- d) Only single cell battery is supported by the Robo Uno Shield.

Examples of power sources include:

- a) High-capacity LiPo batteries (e.g., 3.7V with 2000mAh or more).
- b) 4xAA batteries connected to the VIN terminal of the Robo Uno Shield, though they may drain quickly in demanding applications.

- 4) **Free-Wheeling vs. Braking:** Explain the difference between the "Coast" and "Brake" functions in [Table 3: Motor Driver Truth Table](#) and when each might be appropriate depending on the application.

Coast: When the motor driver is set to "Coast," power is removed from the motor windings entirely. The motor will continue to spin due to its own inertia until friction slows it down to a stop. This can be a good option for situations where the motor's momentum can be beneficial, such as allowing a robot to coast to a stop after completing a movement.

Brake: When the motor driver is set to "Brake," the motor windings are actively shorted together. This creates a braking effect that will stop the motor quickly. However, this can also put additional strain on the motor and reduce its overall lifespan. Braking is typically used when a quick and precise stop is required.

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