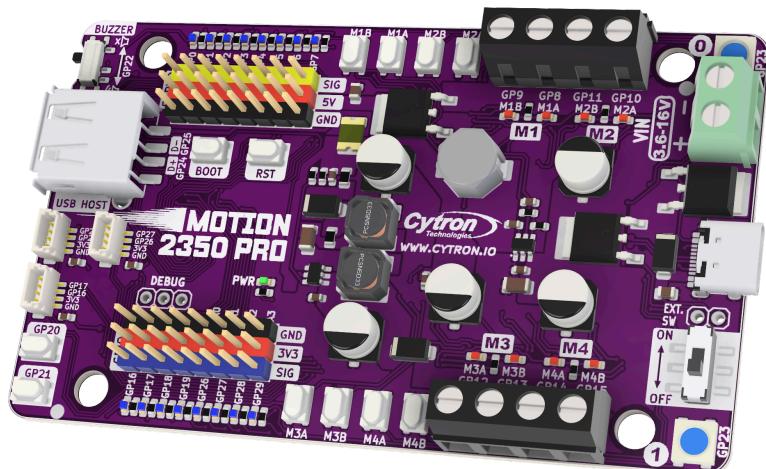




MOTION 2350 Pro

An Advanced Robotics Controller for Beginners



Datasheet

Rev 1.0
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1. BOARD LAYOUT & FUNCTION

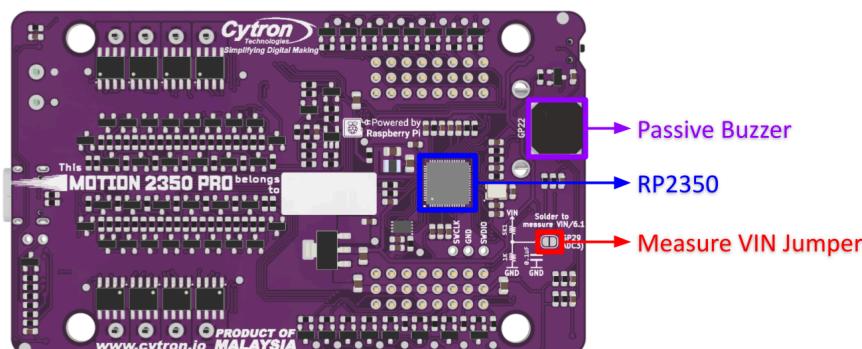
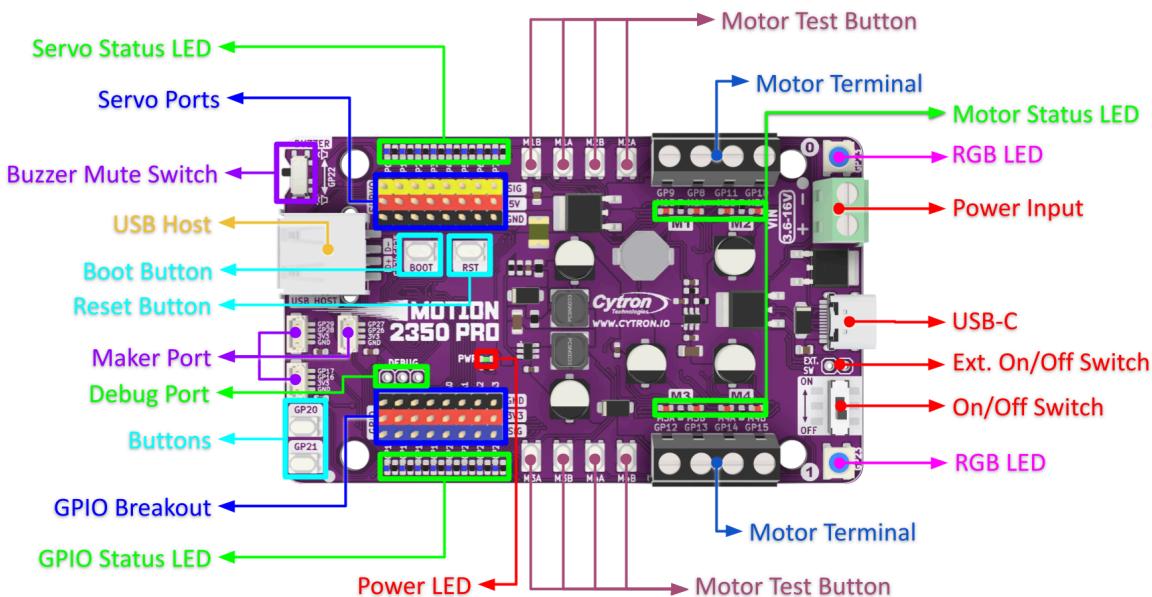


Figure 1: MOTION 2350 Pro Board Functions

Function	Description						
Power Input	Terminal for external 3.6V - 16V DC power input. Can be powered up with external LiPo or 4x AA batteries.						
On/Off Switch	Turn On/Off the power.						
Ext. On/Off Switch	Header for external On/Off switch. The onboard switch must be in Off position to use the external switch.						
5V Supply	<p>Power output for external servos. Controlled by an automatic voltage selector, the output of 5V supply depends on the input from the VIN.</p> <table border="1"> <thead> <tr> <th>VIN</th> <th>5V Supply output</th> </tr> </thead> <tbody> <tr> <td>VIN > 5.8V</td> <td>It will step down the VIN voltage to 5V.</td> </tr> <tr> <td>VIN < 5.5V</td> <td>It will follow the VIN voltage.</td> </tr> </tbody> </table>	VIN	5V Supply output	VIN > 5.8V	It will step down the VIN voltage to 5V.	VIN < 5.5V	It will follow the VIN voltage.
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USB-C	Used for upload programs from PC. Used to power up the board.					
GPIO/Servo Status LEDs	LED indicator for digital IO. Turn on when the IO state is high.					
GPIOs Breakout	Arranged in color-coded GVS format. With 3.3V power output for each GPIO.					
	GPIO	PWM	SPI	I2C	UART	Analog
	16	PWM0-A	SPI0 RX	I2C0 SDA	UART0 TX	-
	17	PWM0-B	SPI0 CSn	I2C0 SCL	UART0 RX	-
	18	PWM1-A	SPI0 SCK	I2C1 SDA	UART0 CTS	-
	19	PWM1-B	SPI0 TX	I2C1 SCL	UART0 RTS	-
	26	PWM5-A	SPI1 SCK	I2C1 SDA	UART1 CTS	ADC0
	27	PWM5-B	SPI1 TX	I2C1 SCL	UART1 RTS	ADC1
	28	PWM6-A	SPI1 RX	I2C0 SDA	UART0 TX	ADC2
	29	PWM6-B	SPI1 CSn	I2C0 SCL	UART0 RX	ADC3
Servo Ports	Connectors for 8 x RC servo motors. Signal is connected to GP0, GP1, GP2, GP3, GP4, GP5, GP6, and GP7. For 5V, please refer to the 5V Supply section.					
Maker Ports	JST-SH 4-Ways Connector for external modules. Compatible with Qwiic, STEMMA QT and Grove (Via Conversion Cable). These pins are available on Maker Ports: GP16, GP17, GP26, GP27, GP28 and GP29.					
Motor Test Buttons	Press to test the functionality of the motor driver. Motor will run at full speed.					
Motor Terminals	Connect to the motor terminal. Motor voltage at full speed is equal to power source voltage. Motor direction is dependent on the polarity.					
Motor Status LEDs	Turn on when the motor is running.					
USB Host	USB type A port for USB Host. The connected pins to USB data transmission on this port are:					
	USB Pins		GPIO			
	D+		GP24			
	D-		GP25			

RGB LEDs	User programmable WS2812B RGB LEDs, NeoPixel compatible. Connected to GP23.
Piezo Buzzer	Can be used to play tone or melody. Connected to GP22.
Buzzer Mute Switch	Used to mute the piezo buzzer.
Measure VIN Jumper	Solder this jumper to measure VIN on the GP29(ADC3). <i>* Please be aware that the GPIO LED on GP29 will always turn on due to the high input from the VIN measurement.</i>

Table 1: MOTION 2350 Pro Board Functions

2. SPECIFICATIONS

No	Parameters		Min	Max	Unit
1	Power Input Voltage (USB or VIN) *		3.6	16	V
2	Digital Input Voltage	Low Level	-0.3	0.8	V
		High Level	2.0	3.6	V
3	Digital Output Voltage	Low Level	0	0.5	V
		High Level	2.6	3.3	V
4	Analog Input Voltage		0	3.3	V
5	Vmotor (Only USB is connected)		VUSB - 0.4		V
6	Vmotor (Only VIN is connected)		VIN		V
7	Vmotor (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
8	5V Output Voltage (Servo Ports)	VIN > 5.8V	5		V
		VIN < 5.5V	VIN		V
9	USB Host Output Voltage		-	5	V
10	USB Host Output Current		-	500	mA
11	Maximum DC Motor Current	Continuous	-	3	A
		Peak (< 5 seconds)	-	5	A
12	DC Motor Driver PWM Frequency		-	20	kHz
13	Total +3V3 Output Current (GPIO Breakout & Grove Ports)		-	200	mA
14	Total +5V Output Current (Servo Ports)		-	3	A
15	Operating Temperature		-20	85	°C

Table 2: MOTION 2350 Pro Absolute Maximum Ratings

- * It's not recommended to connect both USB and VIN at the same time.
Although it's perfectly safe to do so.

3. DIMENSION

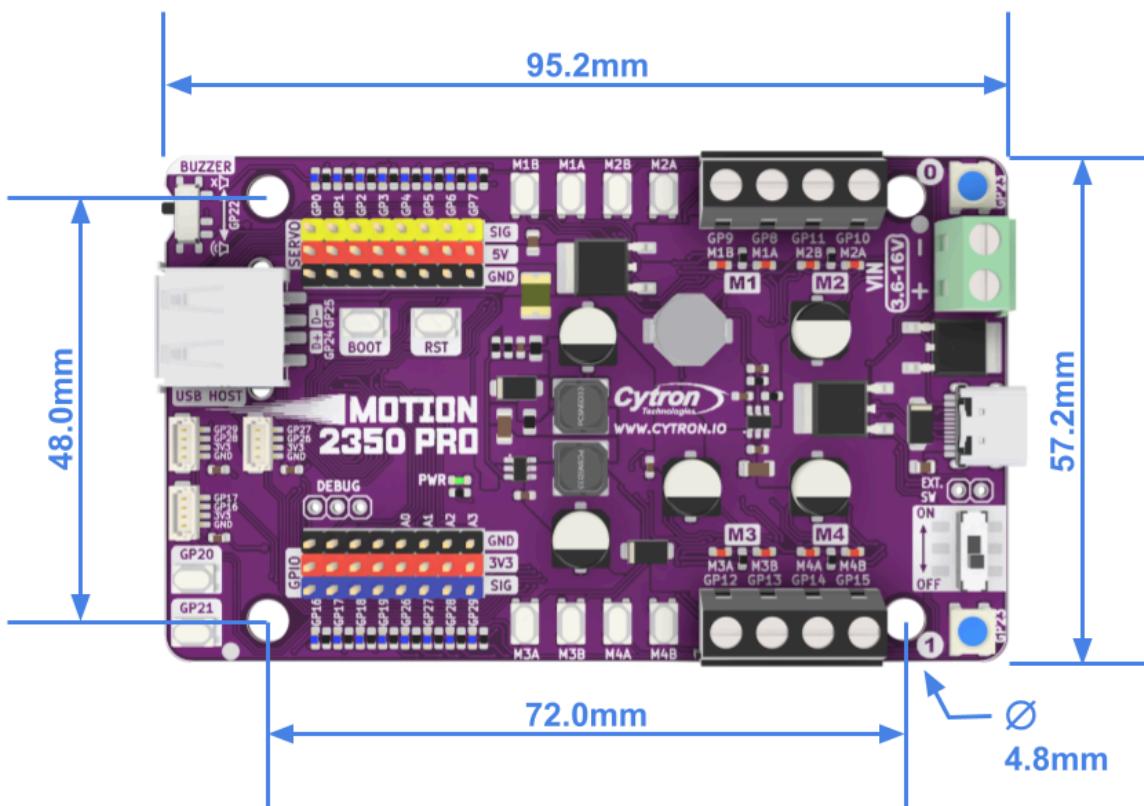


Figure 2: MOTION 2350 Pro Dimension

4. INTERFACE

Motor Driver

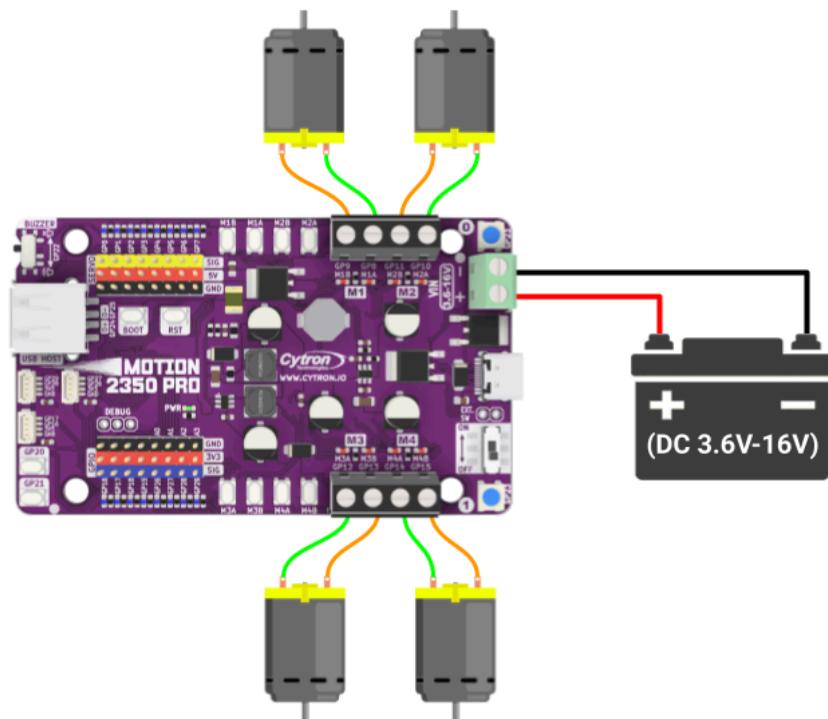


Figure 3: Connection Diagram for Brushed DC Motor

- * Actual motor direction is depending on the motor connection.
Swapping the connection (MA & MB) will reverse the direction.
- * The motor driver do not have overcurrent protection, please be aware with the max current rating on the motor. Overdraw the current can damage the motor driver.

Input Voltage Measurement

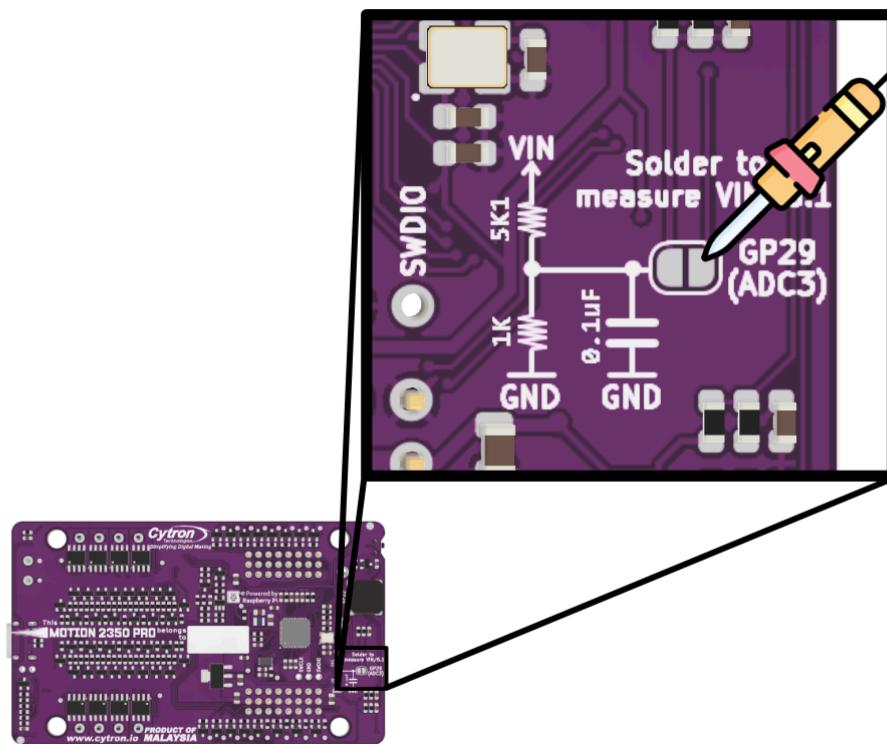


Figure 4: Solder to measure the VIN

Calculate the VIN on the GP29(ADC3) using this formula:

$$V_{IN} = V_{ADC} / 6.1$$

Where:

V_{IN} = VIN input terminal or VUSB input voltage (whichever is higher).

V_{ADC} = The ADC input voltage after converted from raw input data.

Prepared by:

Cytron Technologies Sdn Bhd
www.cytron.io

No. 1, Lorong Industri Impian 1,
Taman Industri Impian,
14000 Bukit Mertajam,
Penang, Malaysia.

Tel: +604 - 548 0668
Fax: +604 - 548 0669

Email:
support@cytron.io
sales@cytron.io