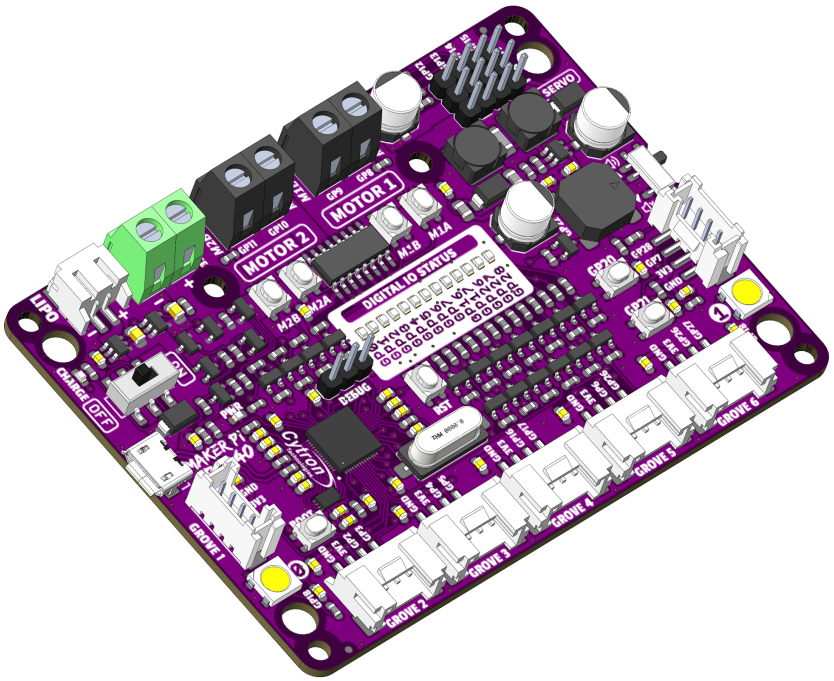
MAKER PI RP2040

Simplifying Robotics with Raspberry Pi® RP2040



Datasheet

Rev 1.2
January 2022

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1. BOARD LAYOUT & FUNCTION

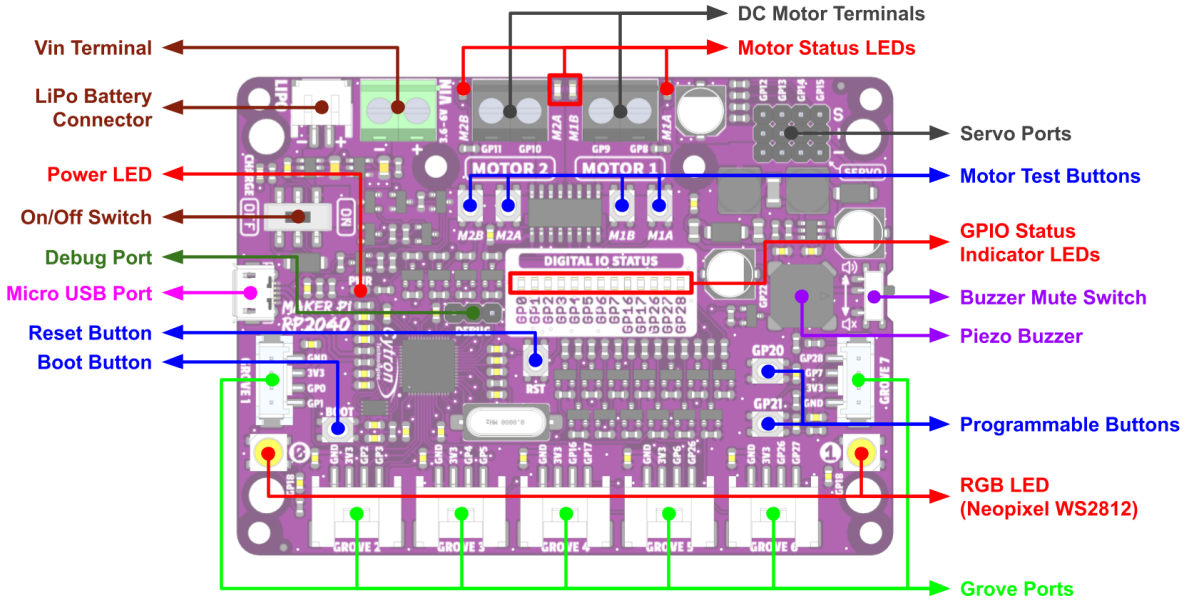

Figure 1: MAKER-PI-RP2040 Board Functions

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 USB. * *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.*
Power LED	Turn on when powered up.
On/Off Switch	Turn on/off the power.
Debug Port	Debugging port of the RP2040.
Micro USB Port	Used for upload programs from PC. Can also be used to power up the board.
Reset Button	Press to reset the RP2040.
Boot Button	Press and hold this button while resetting the RP2040 will enter the bootloader mode. Used to load the Micropython/Circuitpython or custom C/C++ firmware.

<table>
<tr><th>Function</th><th>Description</th></tr>
<tr><td>Grove Ports</td><td>Connect to external Grove modules.
<table>
<tr><th>Grove Port</th><th>GPIO</th><th>PWM</th><th>SPI</th><th>I2C</th><th>UART</th><th>Analog</th></tr>
<tr><td rowspan="2">1</td><td>0</td><td>PWM0-A</td><td>SDI0</td><td>SDA0</td><td>TX0</td><td>-</td></tr>
<tr><td>1</td><td>PWM0-B</td><td>CSn0</td><td>SCL0</td><td>RX0</td><td>-</td></tr>
<tr><td rowspan="2">2</td><td>2</td><td>PWM1-A</td><td>SCK0</td><td>SDA1</td><td>-</td><td>-</td></tr>
<tr><td>3</td><td>PWM1-B</td><td>SDO0</td><td>SCL1</td><td>-</td><td>-</td></tr>
<tr><td rowspan="2">3</td><td>4</td><td>PWM2-A</td><td>SDI0</td><td>SDA0</td><td>TX1</td><td>-</td></tr>
<tr><td>5</td><td>PWM2-B</td><td>CSn0</td><td>SCL0</td><td>RX1</td><td>-</td></tr>
<tr><td rowspan="2">4</td><td>16</td><td>PWM0-A</td><td>SDI0</td><td>SDA0</td><td>TX0</td><td>-</td></tr>
<tr><td>17</td><td>PWM0-B</td><td>CSn0</td><td>SCL0</td><td>RX0</td><td>-</td></tr>
<tr><td rowspan="2">5</td><td>6</td><td>PWM3-A</td><td>SCK0</td><td>SDA1</td><td>-</td><td>-</td></tr>
<tr><td>26</td><td>PWM5-A</td><td>-</td><td>SDA1</td><td>-</td><td>ADC0</td></tr>
<tr><td rowspan="2">6</td><td>26</td><td>PWM5-A</td><td>-</td><td>SDA1</td><td>-</td><td>ADC0</td></tr>
<tr><td>27</td><td>PWM5-B</td><td>-</td><td>SCL1</td><td>-</td><td>ADC1</td></tr>
<tr><td rowspan="2">7</td><td>7</td><td>PWM3-B</td><td>SDO0</td><td>SCL1</td><td>-</td><td>-</td></tr>
<tr><td>28</td><td>PWM6-A</td><td>-</td><td>-</td><td>-</td><td>ADC2</td></tr>
</table></td></tr>
<tr><td>RGB LEDs (WS2812)</td><td>User programmable WS2812B RGB LED. Connected to GP18.</td></tr>
<tr><td>Programmable Buttons</td><td>Accessible from the user program. Connected to GP20 and GP21</td></tr>
<tr><td>Piezo Buzzer</td><td>Can be used to play tone or melody. Connected to GP22.</td></tr>
<tr><td>Buzzer Mute Switch</td><td>Used to mute the piezo buzzer.</td></tr>
<tr><td>GPIO Status LEDs</td><td>LED indicators for RP2040 GPIOs on Grove Ports.
Turn on when the GPIO state is high.</td></tr>
<tr><td>Motor Test Buttons</td><td>Press to test the functionality of the motor driver.
Motor will run at full speed.
● MxA : Forward*
● MxB : Backward*</td></tr>
<tr><td>Servo Ports</td><td>Connectors for 4 x RC servo motors.
Signal is connected to GP12, GP13, GP14 and GP15.
V+ voltage is equal to power source voltage.</td></tr>
<tr><td>Motor Status LEDs</td><td>Turn on when the motor is running.
● MxA : Forward*
● MxB : Backward*</td></tr>
<tr><td>DC Motor Terminals</td><td>Connect to the motor terminal.
Motor voltage at full speed is equal to power source voltage.
Motor direction is dependent on the polarity.
● M1A : GP8 ● M2A : GP10
● M1B : GP9 ● M2B : GP11</td></tr>
</table>

Table 1: MAKER-PI-RP2040 Board Functions

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

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	-0.3	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 & 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 +3V3 Output Current (Grove Ports)		-	300	mA
12	Operating Temperature		-20	85	℃
13	USB VID & PID (CircuitPython & Arduino Core)	VID	0x2E8A		
		PID	0x1000		

Table 2: MAKER-PI-RP2040 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 depending on the motor connection.*
Swapping the connection (MA & MB) will reverse the direction.

4. DIMENSION

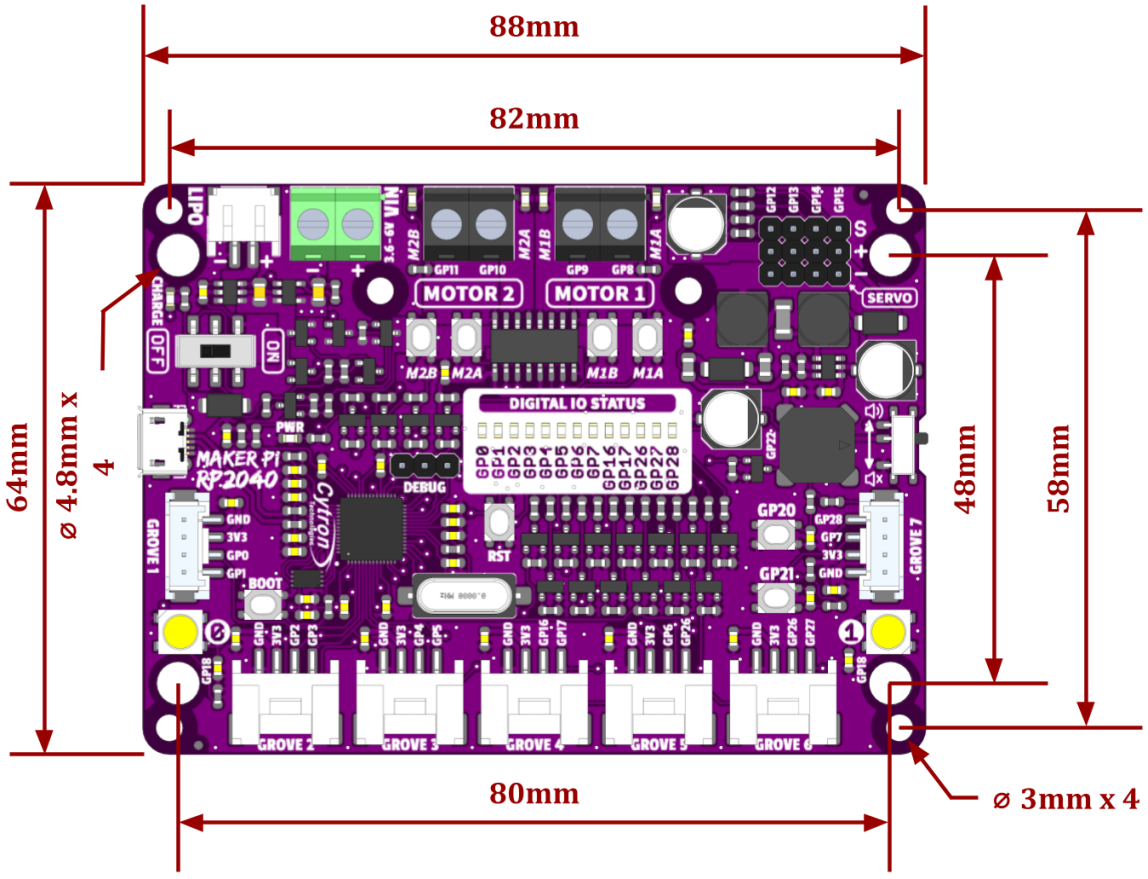

Figure 2: MAKER-PI-RP2040 Dimension

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