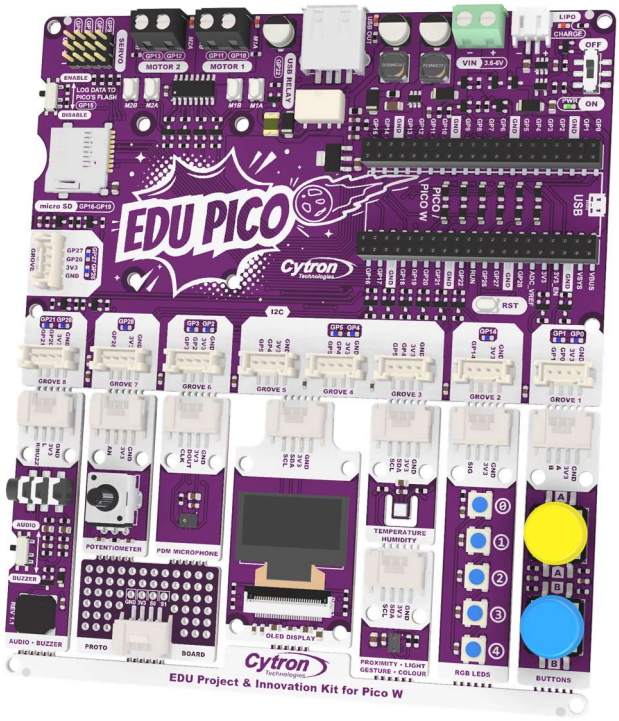
# EDU PICO

## EDU Project & Innovation Kit for Pico W




Datasheet

Rev 1.0
December 2023

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# 1. INTRODUCTION

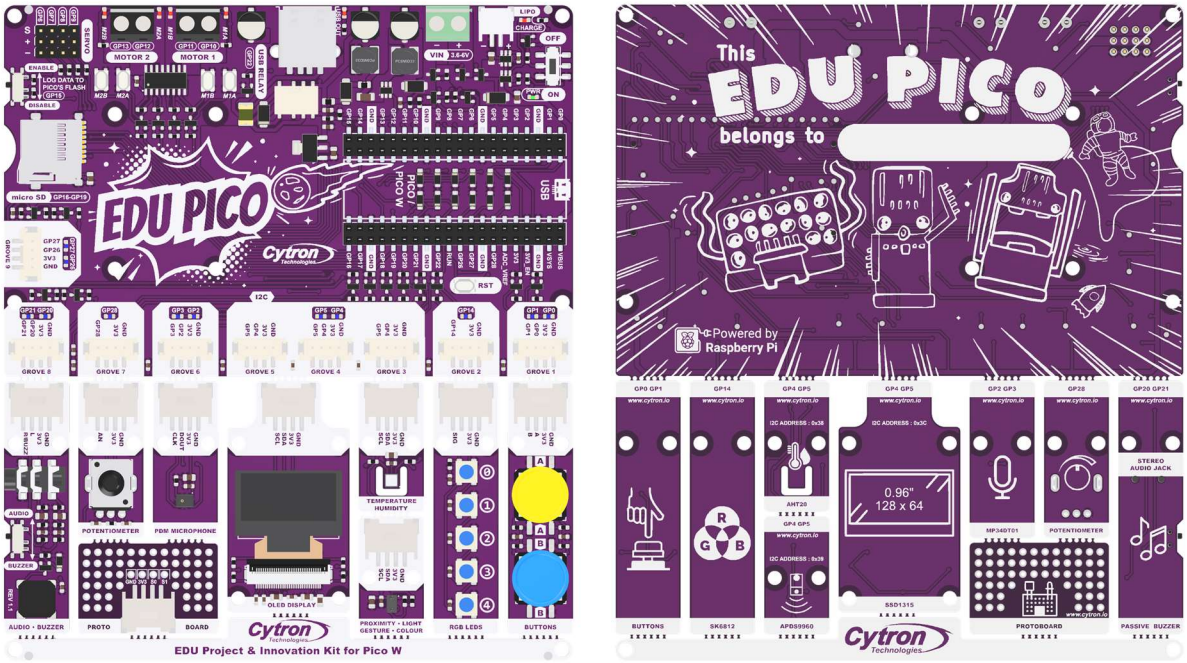


*Figure 1: EDU-PICO Front View (Left), Back View (Right).*

EDU PICO is designed to work seamlessly with the Raspberry Pi Pico W microcontroller. The board comes with various built-in modules and sensors, such as:

- OLED display
- Temperature and humidity sensor
- Proximity, light, gesture and colour sensor
- RGB LEDs
- Push buttons
- Potentiometer
- Buzzer and stereo audio jack
- PDM microphone
- Dual channel motor driver
- Servo ports
- USB relay
- Micro SD card socket

Besides, it can be powered by USB, LiPo battery, or external power source within 3.6 - 6V range. For more information on the board features can refer the Board Layout & Function section.

## 2. PACKING LIST

Please check the parts and components according to the packing list. If there are any parts missing, please contact us at sales@cytron.io immediately.


Figure 2: Included Items.

| No. | ITEMS | QUANTITY |
|---|---|---|
| 1 | EDU PICO Board | 1 |
| 2 | Step-by-step Guidebook (English) | 1 |
| 3 | Raspberry Pi Pico W (not available in EDU-PICO-NB variant) | 1 |
| 4 | USB Micro B Cable | 1 |
| 5 | Grove 4 Pin Buckled 20cm Cable | 8 |
| 6 | Micro Servo with Servo Horns | 1 |
| 7 | DC2-6V Miniature Motor with 20cm Wire | 1 |
| 8 | Mini Phillips Head Screwdriver | 1 |
| 9 | DIY 4 Blades 56mm Motor Propeller (Blue) | 1 |
| 10 | USB LED Light Stick (Blue) | 1 |

*Table 1: EDU-PICO Packing List*

 

# 3. BOARD LAYOUT & FUNCTION

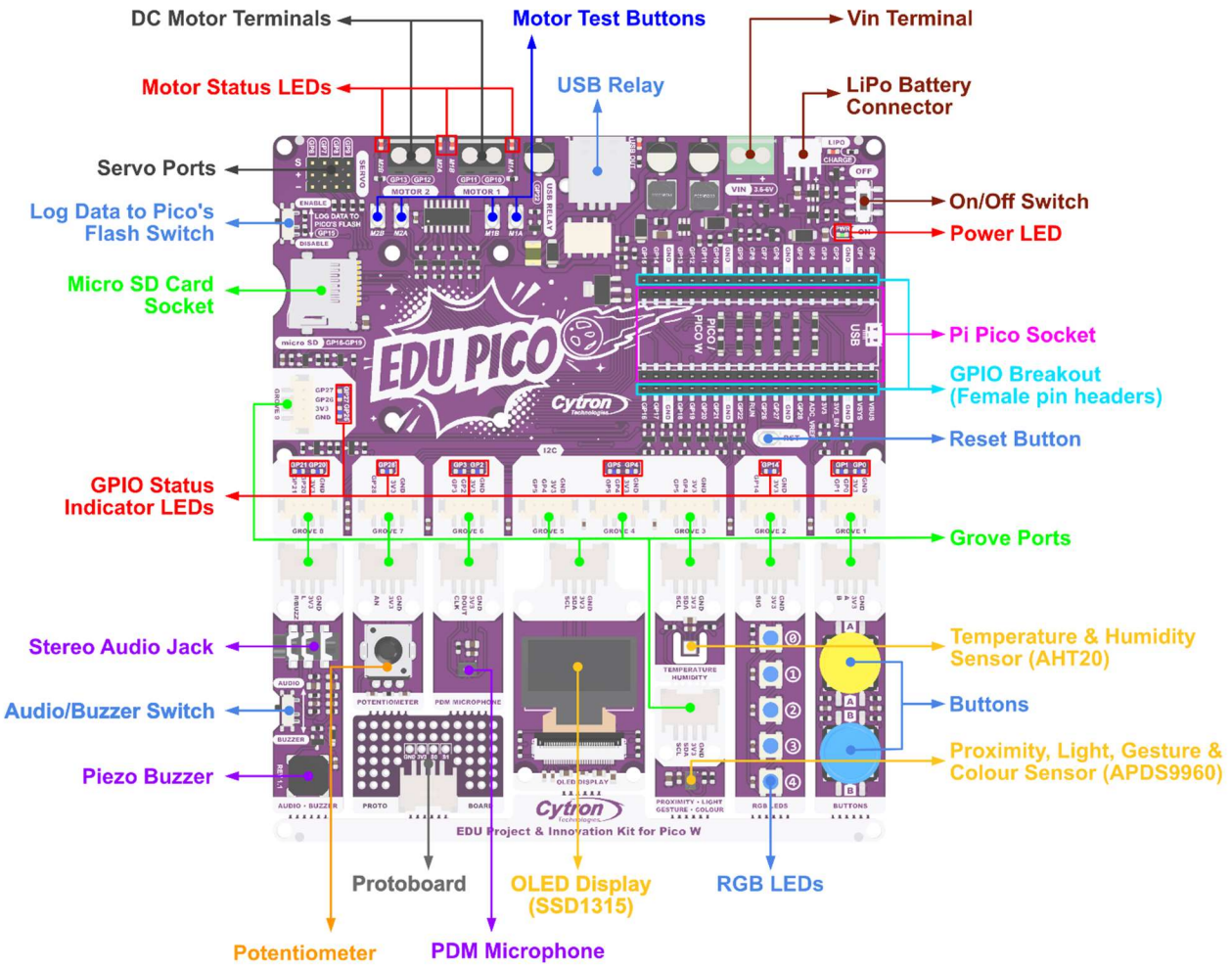


*Figure 3: EDU-PICO Board Function*

<table>
<tr><th>Function</th><th>Description</th></tr>
<tr><td>Vin Terminal</td><td>Connect to any power source within 3.6 - 6V.</td></tr>
<tr><td>LiPo Battery Connector</td><td>Connect to Single Cell LiPo / Li-Ion Battery<br>The battery is rechargeable via USB port on the Raspberry Pi Pico / Pico W.<br><br>* 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.</td></tr>
<tr><td>LED Battery Charging Indicator</td><td>The LED will turn on when charging the LiPo battery. It will turn off when fully charged. This LED might also flicker if the battery is not connected, it's normal.<br><br>* But if it flickers frequently or turns on even when the battery is not connected, it's an indication the board has not received enough power from the USB port.</td></tr>
<tr><td>Power LED</td><td>Turn on when powered up.</td></tr>
<tr><td>On/Off Switch</td><td>Turn on/off the power, including the Raspberry Pi Pico / Pico W.</td></tr>
<tr><td>Reset Button</td><td>Press to reset the Raspberry Pi Pico or Pico W.</td></tr>
<tr><td>Pi Pico Socket</td><td>Socket for Raspberry Pi Pico and Pico W.</td></tr>
<tr><td>GPIO Breakout</td><td>Female Pin Headers Breakout of the Raspberry Pi Pico / Pico W GPIO pins.</td></tr>
<tr><td>Status LEDs</td><td>LED indicators for Raspberry Pi Pico GPIOs on Grove Ports.<br>Turn on when the GPIO state is high.</td></tr>
<tr><td>Micro SD Card Socket</td><td>SPI connection between the SD Card socket and the Raspberry Pi Pico W.
<table>
<tr><th>Raspberry Pi Pico W GPIO</th><th>SD Card</th></tr>
<tr><td>GP16<br>GP17<br>GP18<br>GP19</td><td>SDO<br>CSn<br>SCK<br>SDI</td></tr>
</table></td></tr>
<tr><td>Log Data to Pico's Flash Switch</td><td>To enable writing to the filesystem on the Raspberry Pi Pico W using CircuitPython by setup boot.py file. The switch is connected to GP15.<br>● Enable : Pulled Low<br>● Disable : Pulled High<br>* You can also repurpose this switch for other functions.</td></tr>
</table>

<table>
<tr><th>Function</th><th>Description</th></tr>
<tr><td>Grove Ports</td><td>The Grove Ports are already connected to the adjacent 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><th>Connected Module</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><td rowspan="2">Buttons</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>x</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td rowspan="2">RGB LEDs</td></tr>
<tr><td>14</td><td>PWM7-A</td><td>SCK1</td><td>SDA1</td><td>-</td><td>-</td></tr>
<tr><td rowspan="2">3, 4, 5</td><td>4</td><td>PWM2-A</td><td>SDI0</td><td>SDA0</td><td>TX1</td><td>-</td><td rowspan="2">AHT20, APDS9960, SSD1315</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">6</td><td>2</td><td>PWM1-A</td><td>SCK0</td><td>SDA1</td><td>-</td><td>-</td><td rowspan="2">PDM Microphone</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">7</td><td>x</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td rowspan="2">Potentiometer</td></tr>
<tr><td>28</td><td>PWM6-A</td><td>-</td><td>-</td><td>-</td><td>ADC2</td></tr>
<tr><td rowspan="2">8</td><td>20</td><td>PWM2-A</td><td>-</td><td>SCL0</td><td>-</td><td>-</td><td rowspan="2">Audio & Buzzer</td></tr>
<tr><td>21</td><td>PWM2-B</td><td>-</td><td>SDA0</td><td>-</td><td>-</td></tr>
<tr><td rowspan="2">9</td><td>26</td><td>PWM5-A</td><td>-</td><td>SDA1</td><td>-</td><td>ADC0</td><td rowspan="2">-</td></tr>
<tr><td>27</td><td>PWM5-B</td><td>-</td><td>SCL1</td><td>-</td><td>ADC1</td></tr>
</table></td></tr>
<tr><td>Servo Ports</td><td>Connectors for 4 x RC servo motors.<br>The signal pins are connected to GP6, GP7, GP8 and GP9.<br>V+ voltage is equal to power source voltage.</td></tr>
<tr><td>Motor Test Buttons</td><td>Press to test the functionality of the motor driver.<br>Motor will run at full speed.<br>● MxA : Forward*<br>● MxB : Backward*</td></tr>
<tr><td>Motor Status LEDs</td><td>Turn on when the motor is running.<br>● MxA : Forward*<br>● MxB : Backward*</td></tr>
<tr><td>DC Motor Terminals</td><td>Connect to the motor terminal.<br>Motor voltage at full speed is equal to power source voltage.<br>● M1A : GP10 ● M2A : GP12<br>● M1B : GP11 ● M2B : GP13<br>* Actual motor direction is dependent on the motor connection. Swapping the connections (MxA & MxB) will reverse the direction.</td></tr>
<tr><td>USB Relay</td><td>5V USB output only, controlled by a relay connected to GP22.<br>Overcurrent protection for current draws greater than 500 mA.</td></tr>
</table>

| Function | Description |
|---|---|
| **Buttons** | Accessible from the user program.<br>● Button A : GP0<br>● Button B : GP1 |
| **RGB LEDs** | Five addressable RGB LED in series. SK6812-based RGB LEDs, compatible with WS2812B. Connected to GP14. |
| **Temperature & Humidity Sensor** | Temperature and Humidity sensor AHT20, I2C address 0x38.<br>● I2C SDA : GP4<br>● I2C SCL : GP5<br>* For accuracy, it is recommended to measure data every 2 seconds to reduce temperature rises due to high measurement frequency. |
| **Proximity, Light, Gesture, & Colour Sensor** | Digital Proximity, Ambient Light, Gesture and Colour Sensor APDS9960, I2C address 0x39.<br>● I2C SDA : GP4<br>● I2C SCL : GP5 |
| **OLED Display** | 0.96Inch 128x64 OLED white display SSD1315, I2C address 0x3C.<br>● I2C SDA : GP4<br>● I2C SCL : GP5 |
| **PDM Microphone** | MEMS audio sensor omnidirectional digital microphone MP34DT01, PDM output.<br>● DOUT : GP2<br>● CLK : GP3 |
| **Potentiometer** | Connected to GP28 (ADC2). |
| **Protoboard** | Protoboard with Grove port. Only the pins near the Grove port pins are connected. |
| **Stereo Audio Jack** | Non amplified audio output. Can be connected to an earphone or amplified speaker.<br>● Right Channel : GP20<br>● Left Channel : GP21 |
| **Piezo Buzzer** | Can be used to play tone or melody. Connected to GP21. |
| **Audio/Buzzer Switch** | Used to switch between left channel audio out and the piezo buzzer. |

*Table 2: EDU-PICO Board Functions*

# 4. RASPBERRY PI PICO PINOUT DIAGRAM

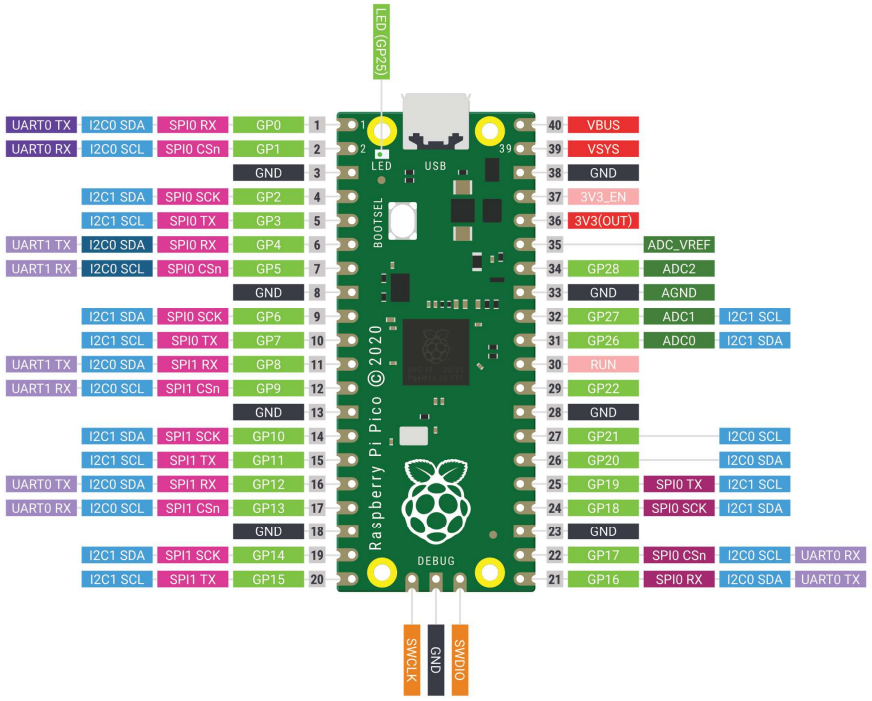


*Figure 4: Raspberry Pi Pico Pinout Diagram*

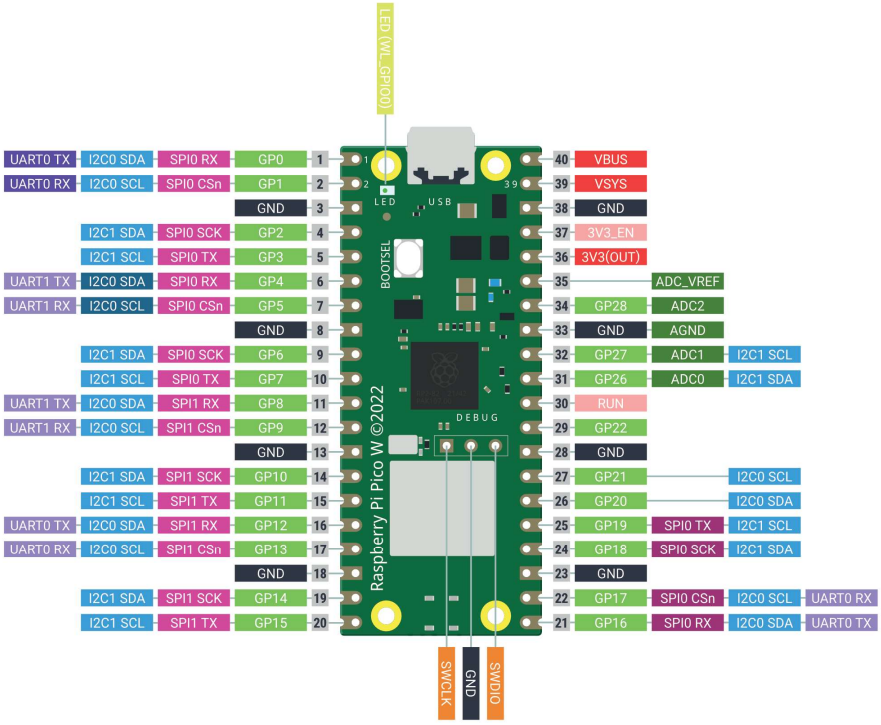


*Figure 5: Raspberry Pi Pico W Pinout Diagram*

# 5. PRODUCT SPECIFICATION

Absolute Maximum Rating of EDU-PICO:

| 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 | USB Relay Output Voltage | | - | 5 | V |
| 12 | USB Relay Output Current | | - | 500 | mA |
| 13 | Total +3V3 Output Current (Grove Ports) | | - | 300 | mA |
| 14 | Operating Temperature | | -20 | 85 | ℃ |

*Table 3: EDU-PICO 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.*

## 6. 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 4: Motor Driver Truth Table*

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

# 7. DIMENSION

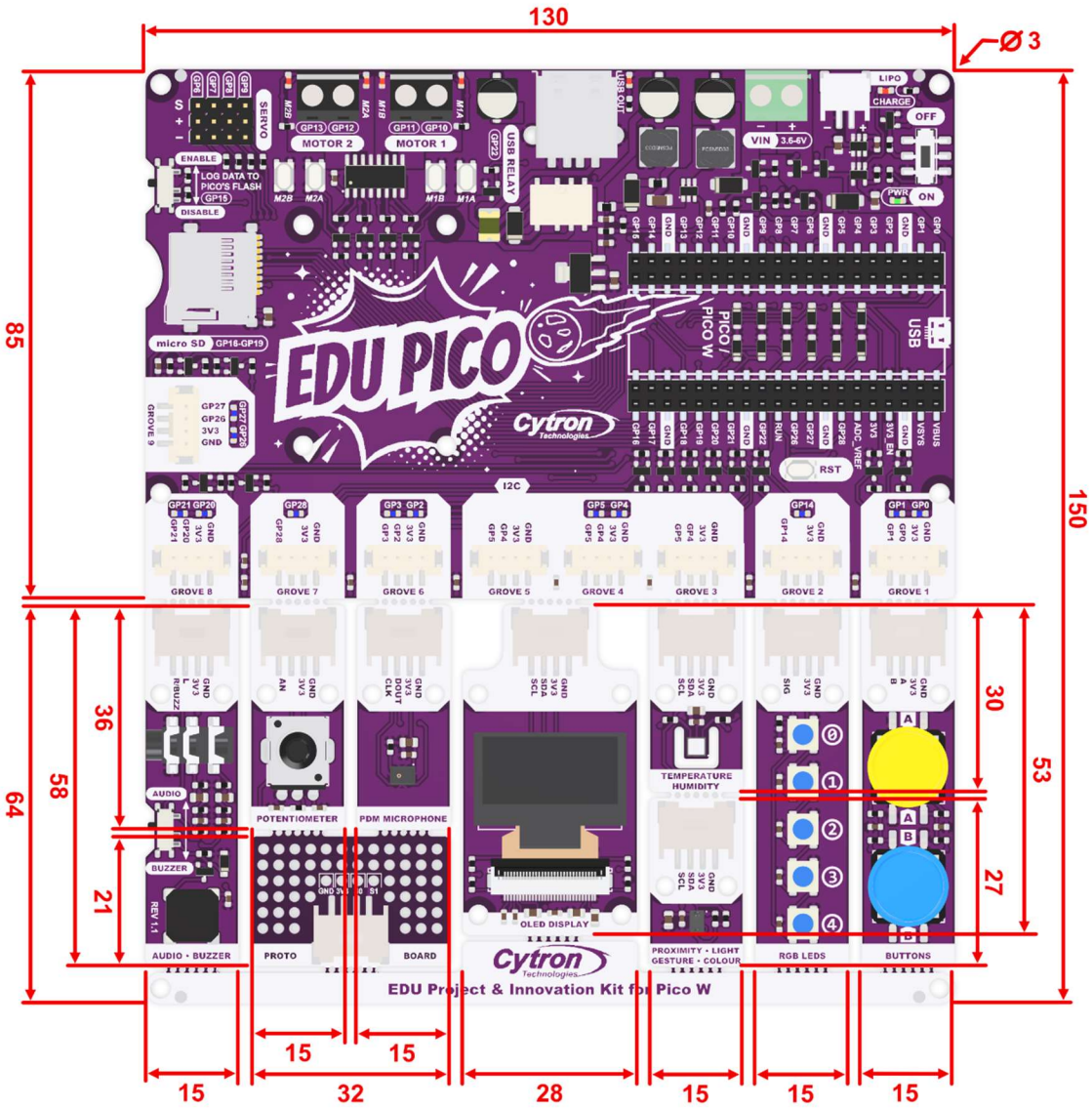


*Figure 6: EDU-PICO Dimension (mm)*

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