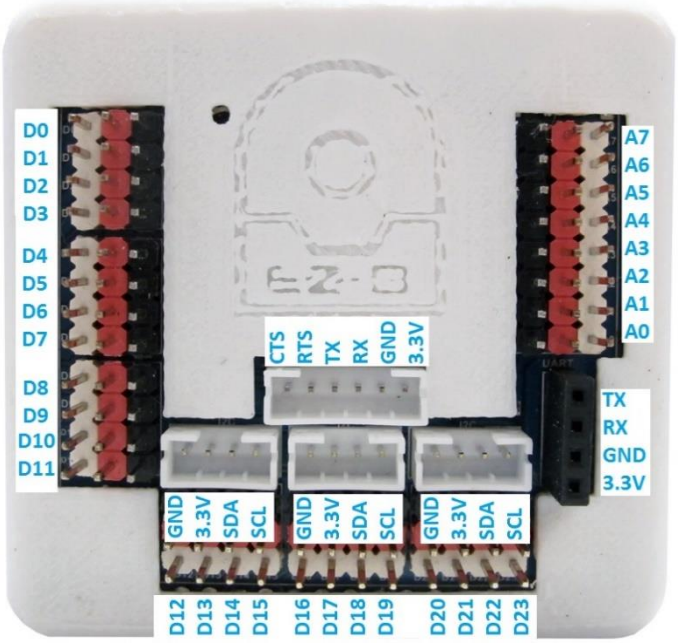
EZ-Bv4 Datasheet v0.6



The EZ-Bv4 takes robotics to the next level, with Wi-Fi, Video, Audio capabilities, and the standard features you've come to love from the previous generation EZ-B. The v4 allows your robot to track objects/motion/colors/faces, speak, play music, move servos, read sensors, control H-bridges and more. Connect your Laptop/PC or Mobile device to the EZ-B v4 through an Adhoc or Client connection over Wi-Fi. Both options can be fully configured with the embedded Web Server. The v4 leverages the power and speed of two 32-bit processors (120 MHz ARM Cortex-M3 and 80MHz Microchip PIC32). It is also very expandable with 3 x I2C headers for additional sensors and displays, 24 multi-use Digital I/O, 8 x Analog-to-Digital and Dynamixel servo support. Let the Robot Revolution begin!



Electrical Characteristics

Vin = Battery or DC Power Supply voltage supplied to the board minus the diode's forward voltage drop

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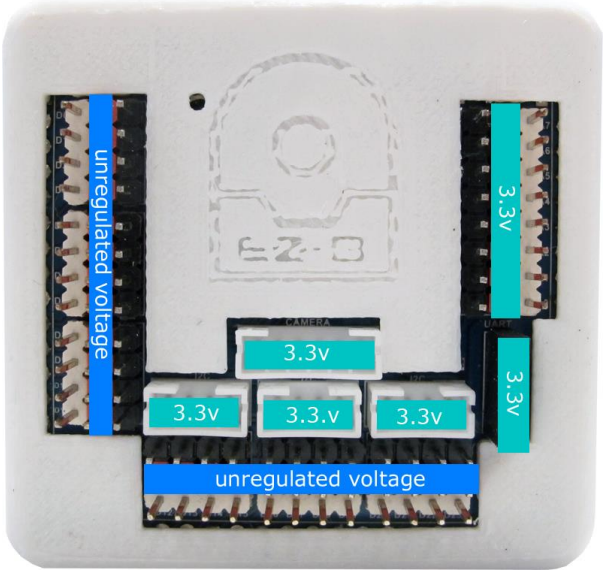
Rev 0.5

(0.14 to 0.36V) which is current dependent.
Vcc = regulated by the on-board switching power supply to 3.3VDC.

Parameter	Minimum	Maximum	Unit
Voltage input (Vin)	4.5	16	VDC
Vin Continuous Current Draw	0.008	5	A
Vin Current Spikes	-	20	A
Vcc Continuous Current Draw	-	1	A
Vcc Current Spikes	-	3	A
Vin Default Low Battery Warning	6	-	VDC
Current Draw with No Peripherals	-	80	mA
Current Draw with Camera		180	mA
Digital I/O TTL Voltage Level (input high)	1.6	5	VDC
Digital I/O TTL Voltage Level (input low)	0	1	VDC
Digital I/O TTL Voltage Level (output)	-	3.3	VDC
Digital I/O Power Pin Voltage	-	16	VDC (Vin)
ADC Voltage level	0	3.6	VDC (5V tolerant)
ADC Power Pin Voltage	3.3	3.3	VDC (Regulated)
I2C TTL Voltage Level (input/output)	3.3	5	VDC
I2C Power Pin Voltage	3.3	3.3	VDC (Regulated)
UART TTL Voltage Level (input/output)	3.3	5	VDC
UART Power Pin Voltage	3.3	3.3	VDC (Regulated)
Camera Voltage Level (input/output)	3.3	5	VDC
Camera Power Pin Voltage	3.3	3.3	VDC (Regulated)

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We learned from the EZ-B v3 to not use voltage regulators on digital I/O of the EZ-B v4. This is because digital ports are generally used for servos. It is very energy inefficient to regulate power for servo motors and therefore generates a lot of heat, kills batteries quickly, etc.. We recommend powering the EZ-B v4 with a 7.4v LiPo battery and therefore the servos do not need regulators. Here is a diagram of regulated and unregulated power pins.



Regulated Power Pins (green):

- ADC
- I2c
- UART
- Camera

Unregulated Power Pins (blue):

- Digital I/O

Low Battery Warning

The EZ-B v4 includes a low battery warning feature enabled by default, designed for LiPo batteries. We recommend using LiPo batteries at 7.4v to power the EZ-B v4. The default Vin Battery Warning voltage is 6 VDC. If the EZ-B v4 is powered on with less than 6 VDC, a verbal message will repeat that the battery is low. While the verbal message is repeating, the EZ-B v4 ports will be unresponsive. The battery warning can be disabled in software.

To disable or adjust the minimum voltage of the Low Battery Warning, visit the Connection Control in the EZ-Builder Software. The Configuration Dialog of the Connection Control includes options to disable or adjust the minimum voltage for the Low Battery Warning. The EZ-B v4 must be connected to the software for changes to this setting to take effect.

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Hardware Features

Main CPU

- 120MHz ARM 32-bit Cortex-M3 CPU
- 12-bit ADC
- 12-Bit DAC
- CPU internal temperature sensor
- 96-bit unique ID
- 330 ohm current limiting Resistors on each Digital I/O pin
- Temperature range: -40°C to +105°C



Fuse Protection

- 14A (Resettable) Polyfuse protecting Vin, Battery and Circuit board traces
- 500mA Polyfuse protecting STM32 Chip (Green component under the yellow Polyfuse in the lower right)



Note: Polyfuses have an upper temperature limit and will trip (go open) to protect the EZ-B if it gets too hot. If this happens, disconnect the power to allow the EZ-B v4 to cool down and the fuses will reset.

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Audio (Amplified)

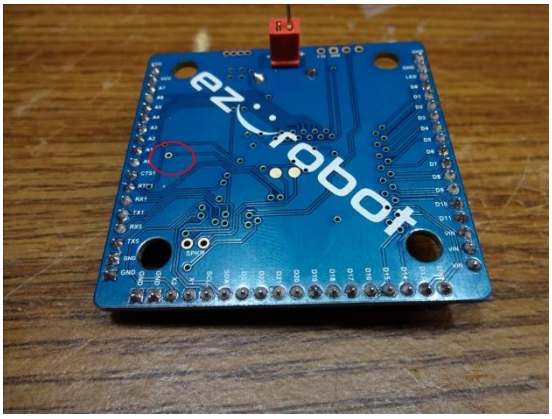
This is information on the amplification process and how to access the amplified audio for small external speakers.

- Audio amplifier chip output rating: 0.3W max.
- Amplifier in High Pass filter configuration.
- Included Speaker rating: 8ohm 0.5W.
- Via to the upper right of the chip is raw audio from the DAC before the amplification stage.
- Speaker out (amplified audio) pins are left open for an optional external speaker.



Audio (Non-Amplified)

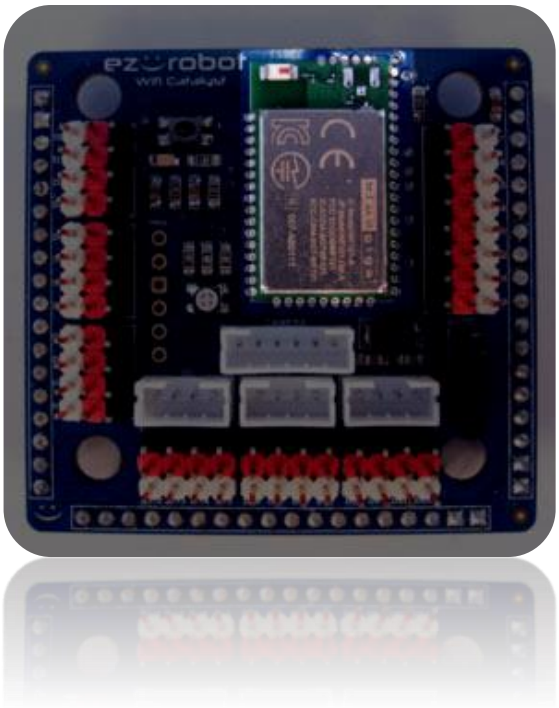
The non-amplified audio can be extracted for those who wish to run their own amplifiers. The pad for the non-amplified audio is directly connected to the DAC of the microcontroller. Be extra cautious when connecting this pin to not short it, or you will risk damaging the microcontroller.



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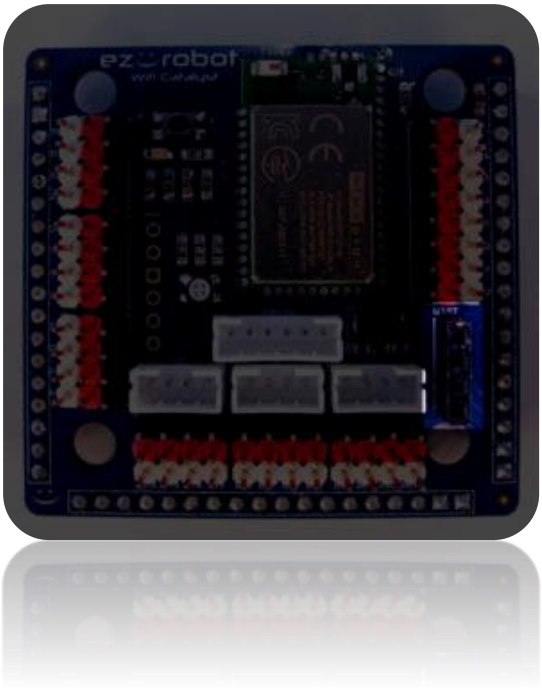
Wi-Fi Specifications

- IEEE 802.11 b/g/n 2.4GHz radio frequency.
- 80 MHz 32-bit Processor.
- 3.33 Mbps Channel for EZ-B Data.
- 3.33 Mbps Channel for Video.
- Certifications: CE, FCC, IC, Japan, South Korea.
- Access Point (AP) & Client modes supported.
- Embedded Web Server.
- WPA2, WPA and WEP encryption.
- Transmit power: +17 dBm.
- Receiver sensitivity: -97 dBm.
- Temperature range: -40°C to +85°C.



UART Serial Expansion Port

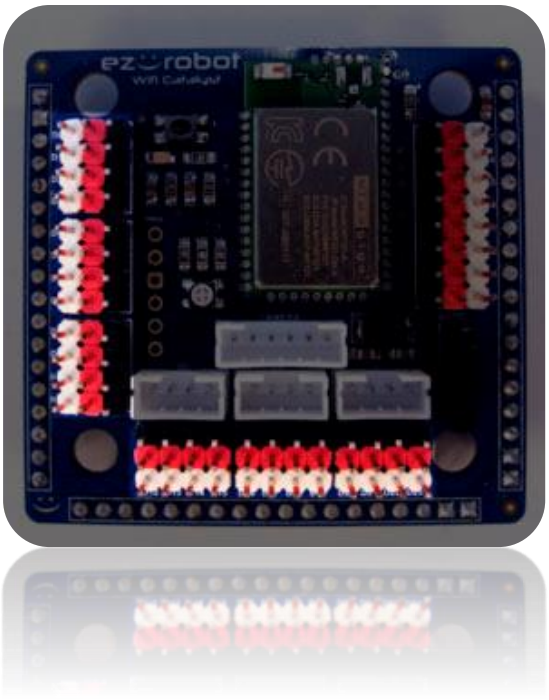
- Asynchronous serial Communication up to 3.75 Mbaud.
- Receive Buffer size: 5kB.
- 2.54mm (0.1”) Pitch Female header in bottom right corner on board.
- Represents UART0 in software.



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Digital I/O Ports

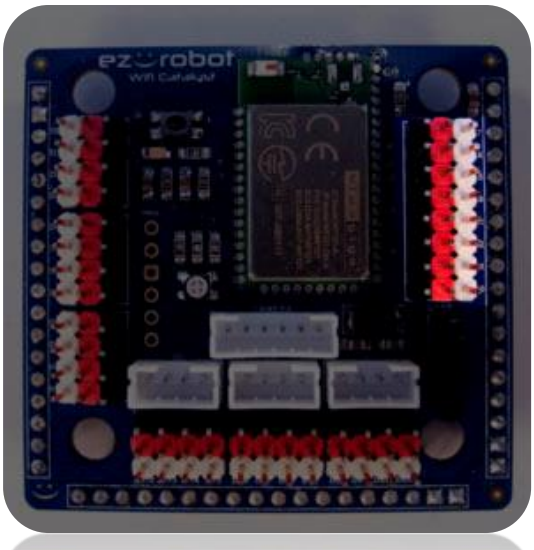
- 24 Multi-Use Digital I/O ports: D0-D23
- Software configurable for servos, transmit serial, output 3.3/GND, PWM, and more.
- Input Max 5 VDC TTL Logic.
- Output Max 3.3 VDC TTL Logic
- Special functions:
  - D5 can control Dynamixel servos
  - D5 (TX) and D6 (RX) can be used as UART1 with 5kB Receive buffer
  - D18 (TX) and D19 (RX) can be used as UART2 with 5kB Receive buffer



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ADC Input Ports

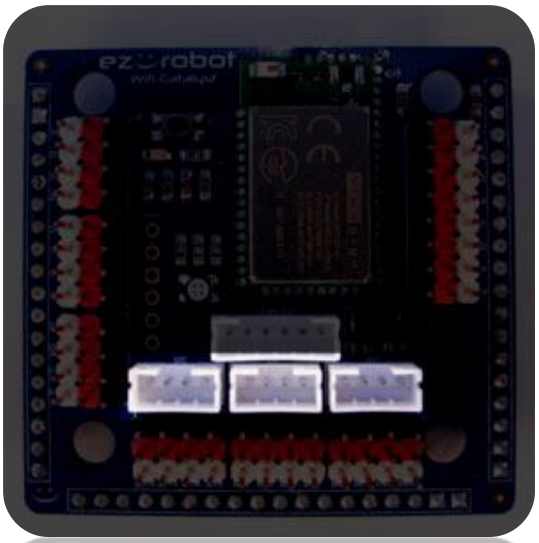
- 8 ADC (Analog-to-Digital) ports: A0-A7.
- 0-3.3VDC Range (5V Tolerant).
- Configurable 8-bit (0-255) or 12-bit (0-4095) return values in software.



I2C Ports

- 3 x I2C ports (a single bus with 3 ports connected in parallel)
- Software configurable to speeds up to 1000 kHz (default: 100kHz)
- 4-pin JST-PH 2.0mm pitch connector
- Pin outs from left to right: GND, 3.3VDC, SDA, SCL

Note: Do not combine 5V and 3.3VDC powered devices as the 3.3VDC SDA and SCL lines may be pulled up to 5V and damage the lower voltage devices.



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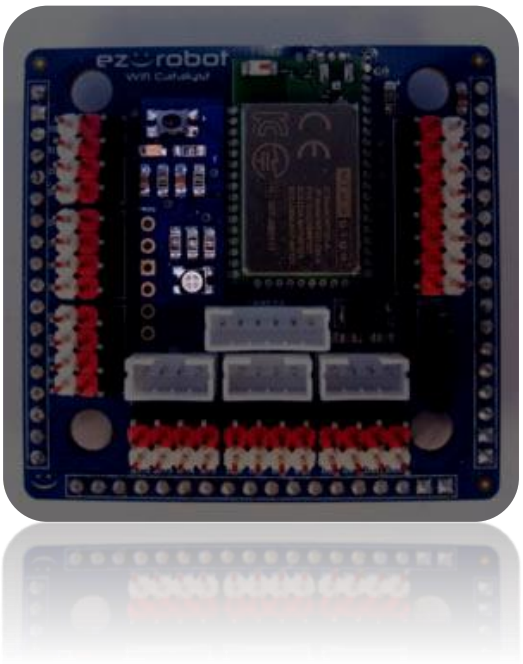
EZ-Robot Camera Port

- 6-pin JST-PH 2.0mm pitch connector.
- This port is proprietary for the EZ-Robot Camera.



Reset Button and LED Feedback

- RGB Wi-Fi Status LED will be white on boot up and blink blue when ready for an Adhoc connection. Will be green when connected to a client network. Will be red when unable to make a connection to client network.
- Reset button – resets network settings to default pressed.
- Red Communication LED (below button) flashes with client communication activity.



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Wi-Fi

The EZ-B v4's integrated Wi-Fi has an embedded webserver, DHCP server (for access point mode) and configurable connection modes. The Wi-Fi connection will also use B/G/N modes with WPA, WPA2 and WEB security. When the Reset Button is pressed, the network settings will be reset to the default configuration.

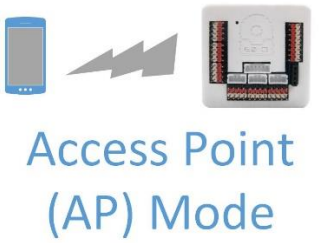
Web Server

To configure the Wi-Fi settings, the EZ-B v4 webserver can be accessed by your web browser. If the EZ-B v4 is in Access Point Mode, the default web address will be http://192.168.1.1. If the EZ-B is in Client Mode, you will use the IP Address that EZ-Builder has detected (i.e. http://<*ip address*>).

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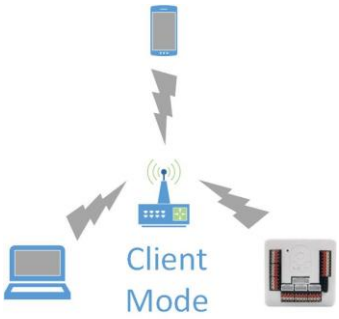
Wi-Fi Access Point (AP) Mode

The EZ-B v4 becomes a Wi-Fi Server which allows your device to connect to it. This is the default setting for the EZ-B v4. In this mode, your device (i.e. Computer, iPad, iPhone, etc.) will connect directly to the EZ-B v4 over its Wi-Fi network. You will lose access to the internet if connected this way, unless your device has two network adapters.



Wi-Fi Client Mode

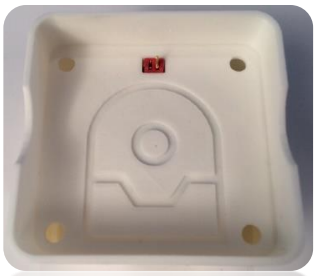
The EZ-B v4 will connect to your existing Wi-Fi network as a client, much like your iPhone, iPad and Computer. When the EZ-B v4 is connected to your Wi-Fi network, you may not know the IP Address that it is assigned. The EZ-Builder software includes a network scan tool which will find all EZ-B v4's on your network.



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Power Base

- Red Micro Deans connector: Positive connection recessed, Negative pin protruding.
- 2.1mm Barrel Jack Center (Tip) positive voltage input.
- 20A ATM automotive fuse protected (pictured).



Note: Use a No. 0 Robertson bit or equivalent flat blade screw driver (diagonally) in order to open the power base to access to the Fuse.

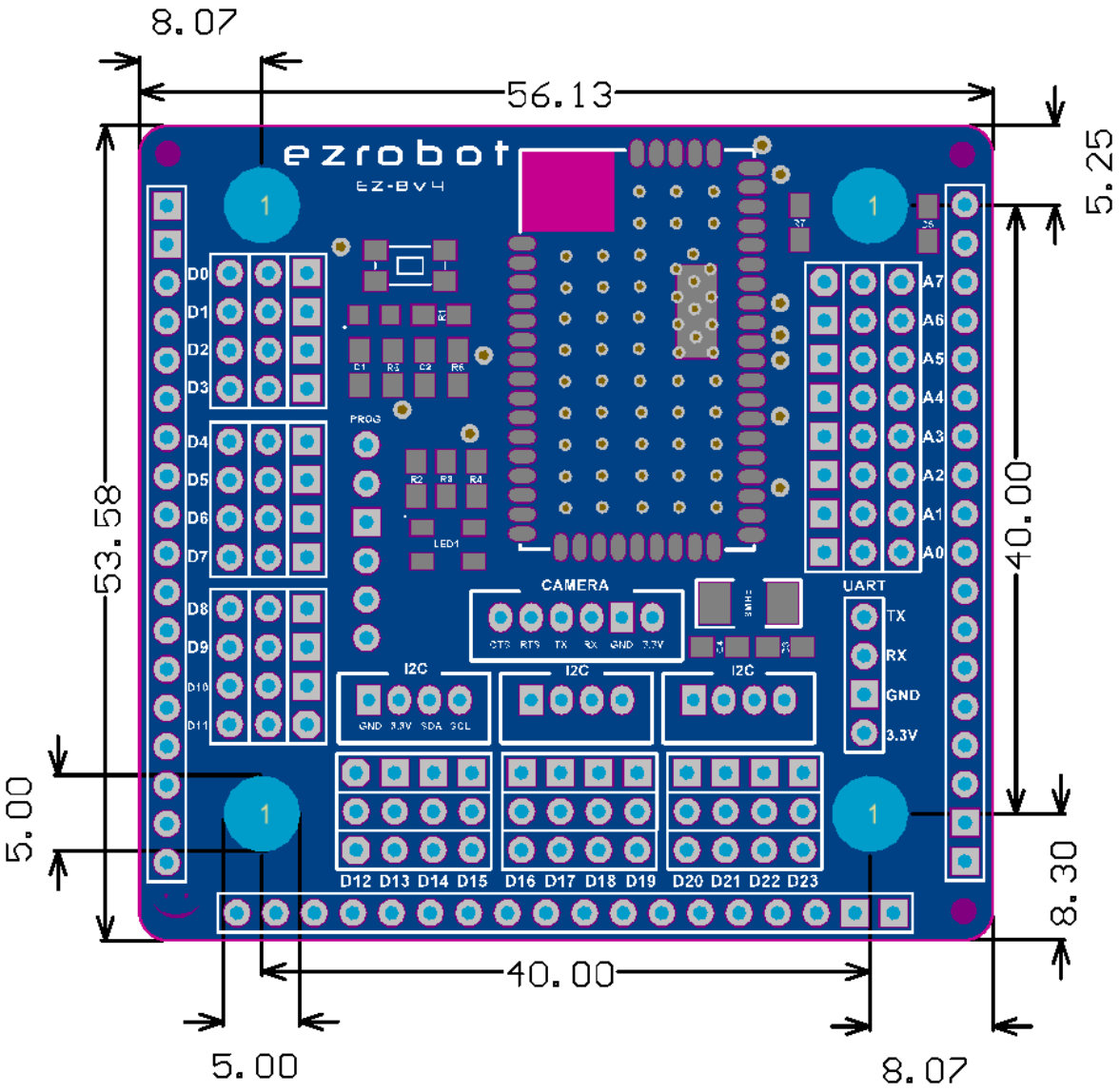




EZ-B Dimensions

All measurements are in millimeters.

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