



SumoBot WX Board (#32132)

The SumoBot WX board sports a socket for the Propeller FLiP Multicore Microcontroller Module (#32123), providing power and I/O and connections to the wide array of on-board peripheral sockets and headers. Clear labelling, status indicator LEDs, and on-board piezospeaker support successful project building and operation.

Designed specifically for the SumoBot WX Robot Competition Kit (#32134), the board's corner mounting holes align with the SumoBot chassis. 3-pin servo ports and an onboard boost regulator support robot locomotion. Additional headers and sockets accommodate sensors included in the Competition Kit, as well as optional accessories.

The WX socket accepts a Parallax WX ESP8266 WiFi - DIP module (#32420D) for optional wireless programming and communication.

Features and Specifications

- Socket for the Propeller FLiP multicore microcontroller module
- Powerful onboard 5 V, 350 mA boost regulator with short-circuit and overcurrent fault protection
- WX Socket for optional wireless programming and communication with a Parallax WX ESP8266 WiFi - DIP module
- LEDs on the board for power switch position, WiFi ASC, DO and DI, and low-battery warning
- Reset button PCB resets the Propeller FLiP module
- 2.1mm ID center-positive DC Jack for 4.8–8.4 VDC input
- Headers for 3.3V and 5V sensors, including AUX, QTI, PING, Memsic MX2125 and IR emitters/receivers
- Onboard piezospeaker
- Operating temperature: -4 to +185 °F (-20 to +85 °C)
- PCB Dimensions: 3.07 x 3.15 in (78 x 80 mm)

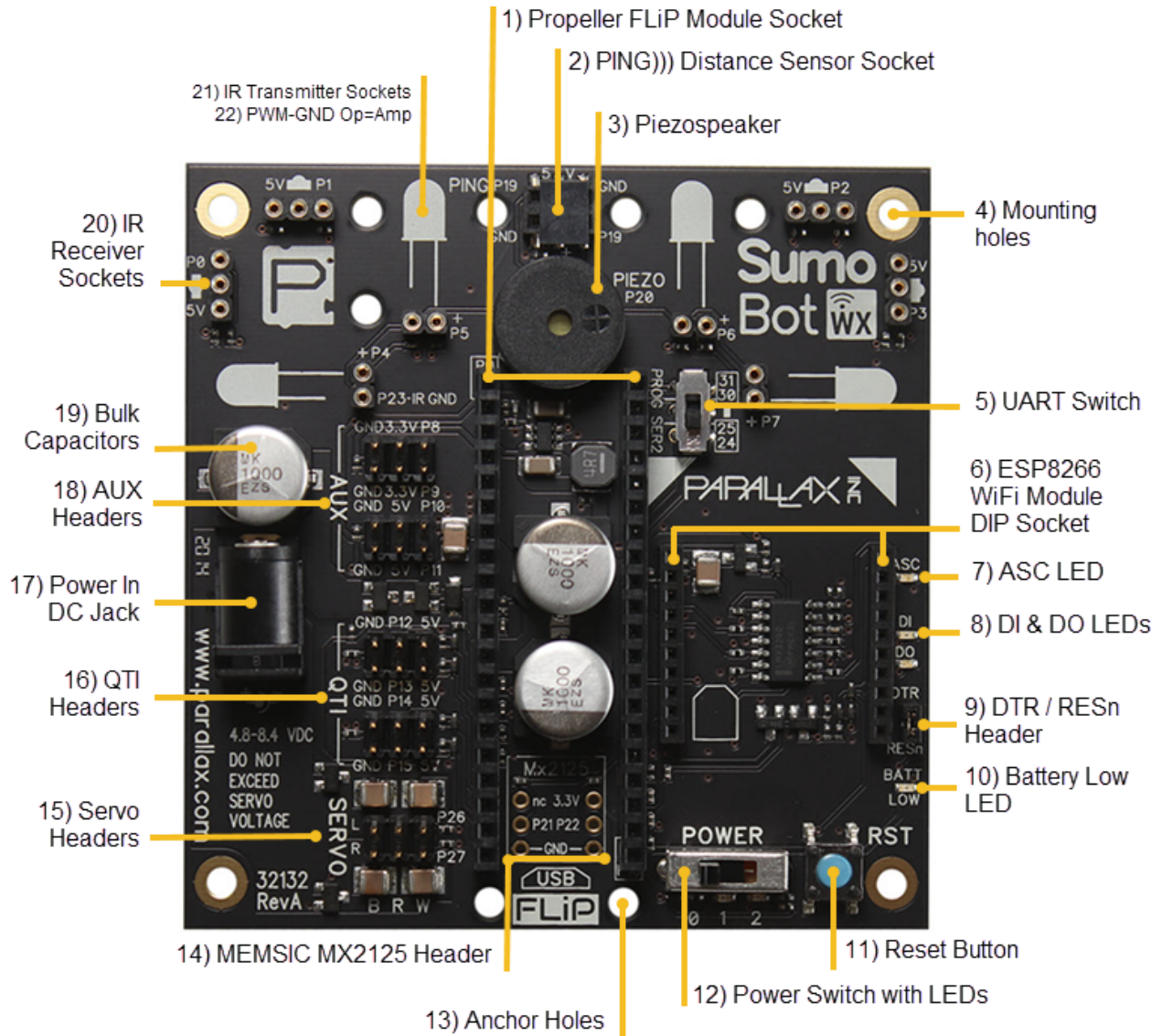
Application Ideas

- Build, program and battle! High-quality SumoBot Robot for the mini-sumo competition ring
- Learning robot building and programming
- Compact SumoBotWX system PCB suitable for custom products

Resources and Downloads

For SumoBot WX Board documentation, software, and example programs, see the product page: go to www.parallax.com and search #32132.

Features & Descriptions



1) Propeller FLiP Module Socket

The Propeller FLiP Multicore Microcontroller Module plugs into this DIP socket, which brings Propeller I/O pin connections P1-P31 to all of the headers and sockets; see the Pin Definitions and Ratings table. For programming, the USB cable plugs directly into the FLiP socket.

2) PING))) Distance Sensor Sockets

This header accepts the 0.1" pins on the PING))) Ultrasonic Distance Sensor (#28015) and LaserPING 2m Rangefinder (#28041) modules.

This header is a two-row socket, with each row the inverse of the other. This configuration allows the sensor module to be plugged in from either the TOP or BOTTOM of the PCB. On the assembled SumoBot WX, the Ping))) Ultrasonic sensor fits best under the board, whereas the LaserPING fits well on the top.



You must only connect one PING module to the socket, either in the TOP or BOTTOM position. You must never connect to both sides (or socket rows) at the same time!

3) Piezospeaker

The piezospeaker is connected to P20; drive with frequency-out signals in the 300 to 5000 Hz range.

4) Mounting Holes

The four plated mounting holes are positioned to attach the SumoBot WX Board to the robot chassis included in the SumoBot WX Competition Kit.

5) UART Switch

The UART slide switch allows the user to change which Propeller I/O pins are connected to the WiFi Module socket's TX/RX serial I/O pins.

With the switch in the top position, pins P30 and P31 are connected to the WiFi module serial pins, which allows for wireless programming of the Propeller on the FLiP module.

With the switch in the bottom, pins P24 and P25 are connected to the WiFi module, which is useful for transmitting serial data in certain situations, such as when the Propeller is being programmed by a USB connection that would interfere with data on P30 and P31.

Another common use for the SER2 connection is when using the FLiP to program the WiFi module network settings.

Switch position	FLiP pin	Radio module pin
PROG (31/30)	P31 (Propeller FLiP RX)	TX (DO)
	P30 (Propeller FLiP TX)	RX (DI)
SER2 (25/24)	P25 (Propeller FLiP RX)	TX (DO)
	P24 (Propeller FLiP TX)	RX (DI)

6) ESP2866 WiFi Module DIP Socket

A Parallax WX ESP8266 WiFi Module - DIP (#32420D) can be plugged into this socket. This equips the SumoBot WX board to wirelessly program the Propeller on the FLiP module, as well as support other radio applications. When installed, the WiFi module interacts with the ASC LED, D1 & D0 LEDs, and DTR / RESn Header.

7) ASC LED

The blue ASC LED indicates the connection status of the attached radio module.

When SumoBot WX has the Parallax WiFi module installed, the blue LED will blink occasionally while the WiFi module is connected to a wireless network, and the blink timing can be used to identify the connection status of the wireless module.

Refer to the Parallax WiFi module product guide for the latest information about the ASC LED behavior, available from the 32420D product page at www.parallax.com.

8) DI and DO LEDs

The DI and DO LEDs are wired from the perspective of the radio module. These can be used to diagnose connection problems or monitor information flow between the radio module and the Propeller microcontroller.

The red DI LED indicates communication to the radio module RX pin from the Propeller FLiP module's Propeller microcontroller TX pin (P30 or P24).

The blue DO LED indicates communication from the radio module to the Propeller microcontroller's RX pin (P31 or P25).

Note that the Propeller module TX and RX pin selection can be altered by the UART switch.

9) DTR / RESn Header

The DTR to RESn header is pre-fitted with a 2mm shunt jumper which must be kept installed to enable programming of the FLiP module.

The jumper may be removed (and retained!) to prevent the radio module from being able to remotely program or reset the Propeller FLiP module, as a protection against rogue competitors from resetting the robot during battle!

10) Battery Low LED

The battery low LED indicates when the batteries need changing. The LED blinks occasionally as the voltage level nears the end of its capacity, lights solidly with 5-10 minutes runtime left. Timing will vary depending on the battery type and current demands. The battery low LED may flash briefly when power is first connected, this is normal and can be ignored.

The battery low signal is also available at one of the so you could monitor for this condition and reduce current demands for the last stages of battle, or send a message over WiFi to the robot operator.

11) Reset Button

The reset button at the bottom-right corner of the PCB holds the Propeller FLiP microcontroller in reset whilst pressed. When multiple robots are about to battle, it can be convenient for both teams to hold the reset buttons, and release them when it's time to start the robots! This button resets the Propeller microcontroller without affecting power to the rest of the board. The Propeller microcontroller can also be reset using the small RESET button located under the top edge of the FLiP module.

12) Power Switch with LEDs

The power switch in position 0 disconnects the input power supply from the entire SumoBot WX board AND holds the Propeller FLiP in reset if it has an external power source connected to its USB port. Position 1 enables everything except power to the servo ports. Position 2 also enables power to the servo ports.

Two green power LEDs indicate when the switch is in Position 1 (1 on) or 2 (both on).

13) Anchor Holes

There are seven unplated anchor holes around the PCB, useful for mounting additional hardware or securing servo and sensor cables with cable ties.

14) MEMSIC MX2125 Header

The MX2125 designated pads are located under the FLiP module socket, and accept the MEMSIC 2125 Dual-axis Accelerometer (#28017).

Propeller I/O pins P21 and P22 connect to the MX2125 socket via 240-ohm series resistors. These connections could be used as general purpose I/O's instead of the accelerometer function.

15) Servo Headers

The servo headers are labelled L (Left, P26) and R (Right, P27) servo motors, and are configured to match the orientation of the Parallax standard BRW (Black Red White) servo cable colors. Power output is enabled when the Power switch is in position 2, and the voltage level is set by the battery pack voltage connected to the DC Jack.



WARNING! Power In voltage sets the voltage at the servo headers. Use an input voltage that does not exceed the maximum voltage rating of the servo motors.

16) QTI Headers

The four QTI headers with 0.1" pitch pins are compatible with the Parallax QTI Sensors (#555-27401) that are included in the SumoBot WX Competition kit. Note that the Propeller I/O connection (P12–P15) is the center pin on each of these headers, unlike the SERVO and AUX headers.

17) Power In DC Jack

The Power In DC Jack accepts a DC plug with a center-positive 5.5 mm outer diameter, 2mm pin diameter, such as the one on the 4AA battery holder included in the SumoBot WX Competition Kit. Power input voltage range is 4.8-8.4 VDC.



WARNING! Power In voltage sets the voltage at the servo headers. Use an input voltage that does not exceed the maximum voltage rating of the servo motors.

18) AUX Headers

Four AUX 3-pin, 0.1" pitch headers are provided for the user to expand and customize their application with additional accessories.

All four headers are arranged to match the standard Parallax cable color order, Black-Red-White = Ground-Power-Signal. The top two AUX headers have 3.3V output, and the bottom two have 5V output.

19) Bulk Capacitors

The SumoBot WX requires significant power during battle, especially as the servo motors change direction and encounter friction which increases the current draw and reduces voltage levels. The three large capacitors provide a reservoir of power to keep the SumoBot WX powered during the toughest of battles!

20) Infrared Receiver Sockets (IR RX)

There are four 3-pin IR Receiver sockets spaced around the front edges of the SumoBot PCB. Each turned-pin style socket with 0.1" pitch is compatible with the Infrared Receivers (#350-00039) included in the SumoBot WX Competition Kit.

Each socket has 5V, GND, and an I/O pin connection for the IR receiver to send data to the Propeller. The center GND pin is identified by a logo representing the IR receiver, which shows the correct orientation for the receiver.

21) Infrared Transmitter Sockets (IR TX)

There are four 2-pin Infrared transmitter sockets spaced around the front edges of the SumoBot PCB. Each is a turned-pin style socket with 0.1" pitch, compatible with the Parallax IR Transmitter LEDs (#350-00003) included in the SumoBot WX Competition Kit.

Each socket has a PWM-GND and an I/O pin connection for the Propeller to supply a voltage signal to the IR Transmitter LED.

The PWM-GND pin is a special feature of the SumoBot WX, and enables fine control over the IR TX LED brightness. Refer to the PWM-GND Op-Amp description below and the schematic download at the SumoBot WX product page for more details.

22) PWM-GND Op-Amp

The four IR TX LEDs have a common GND connection controlled by an onboard Op-Amp to allow fine control over the LED brightness and therefore IR receiver range. To use the LEDs you must either set P23 low (for maximum brightness), or use PWM code to set the voltage level higher, which will reduce the LEDs' brightness.

The LEDs have a nominal forward voltage of 1.4 V and the positive side of the LEDs are driven at 3.3V, so you can raise the GND voltage from 0 V up to the difference between the two, 1.9 V, to adjust the brightness. Experimentation is encouraged!

Specifications

Symbol	Description	Minimum	Typical	Maximum	Units
VIN *	Supply Voltage at DC Input Jack	4.8	6	8.4	V
IOUT_3.3V	Total available current output from all headers marked as 3.3V			250	mA
IOUT_5V	Total available current output from all headers marked as 5V			250	mA
VOUT_SERVO	Output voltage at servo headers		VIN - 0.3		V



*** DO NOT exceed the maximum voltage rating of your servo motors!**

Pin Definitions and Ratings

Pin Label	Type	Function
P0-P3	I/O	IR-RX Headers, tolerate 3.3V or 5V signals in, output 3.3V logic level
P4-P7	I/O	IR-TX Headers, output 3.3V logic level
P8-P9	I/O	AUX Headers with 3.3VOUT and 3.3V logic level.
P10-P11	I/O	AUX Headers with 5VOUT, tolerate 3.3V or 5V signals in, output 3.3V logic level
P12-P15	I/O	QTI Headers with 5VOUT, tolerate 3.3V or 5V signals in, output 3.3V logic level
P16	O	5V Enable. Set pin as input to enable regulator (default mode). Output low to disable 5V regulator.
P17	I	Low voltage signal. Normally high, this signal goes low when supply voltage drops low, and is a warning to change the batteries soon and/or to disable power to less crucial (and high power) functions, such as the WiFi module.
P18	I/O	WX_DBG - Connects to the debug output signal from the Parallax WiFi module (if installed).
P19	I/O	Socket for PING))) or LaserPING Distance Sensor
P20	O	Piezospeaker
P21-P22	I/O	Memsic MX2125 expansion pads under the FLiP module
P23	O	Common IR TX LED GND. Set low to operate IR TX LEDs at full brightness, or apply PWM signal to adjust brightness.
P24	O	Serial2 TTL Output (TX) to WiFi module (if installed)
P25	I	Serial2 TTL Input (RX) from WiFi module (if installed)
P26	O	Servo motor LEFT control signal. P26 LED on FLiP module will flash to indicate left motor signal
P27	O	Servo motor RIGHT control signal. P27 LED on FLiP module will flash to indicate right motor signal
P28-P29	I/O	FLiP I2C pins, not used by the SumoBot WX PCB. Refer to the Propeller FLiP product page for the FLiP schematic for details about these pins.
P30	O	Propeller programming pin / Serial1 / TTL Output (TX) to WiFi module (if installed)
P31	I	Propeller programming pin / Serial1 / TTL Input (RX) from WiFi module (if installed)
DTR	O	DTR Signal from WiFi module (if installed), used to reset Propeller FLiP during wireless programming. Disconnect this signal from RESn to disable wireless programming.
RESn	I	RESET input to Propeller FLiP module. Set low to hold Propeller FLiP in reset state.
GND	Power	Ground
DC JACK	Power	Power input to SumoBot WX
NC	-	No connection
5V	Power	5 V power output only when FLiP installed and power switch on. 5V output can be disabled by 5V_Enable pin, P16.
3.3 V	Power	3.3 V power output only when FLiP installed and power switch on.
SERVO V	Power	Servo motor power output only when power switch is set to position 2.

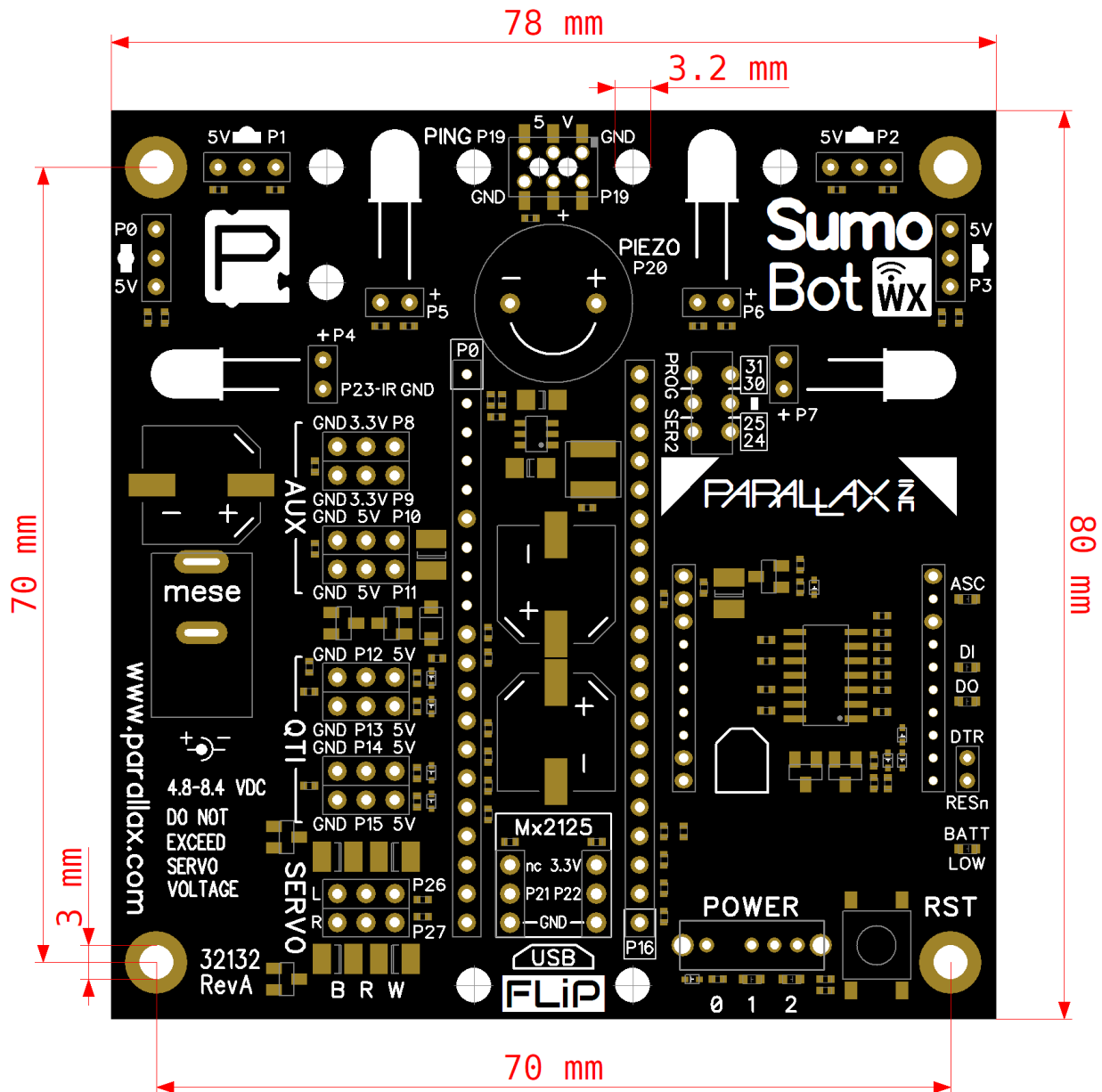
Dimensions

PCB: 3.07 x 3.15 in (78 x 80 mm)

Mounting hole pitch: 2.75 in (70 mm)

Mounting hole diameter: 0.11 in (3 mm)

Cable tie / fixing hole diameter (qty 7): 0.125 in (3.2mm)



Revision History

Version 1.0: original release. V1.1: Corrected label 5 on features diagram.