ESP32 Dual Core
Microcontroller and
WiFi/Bluetooth 4.2 radio

3V3 Ultra–Low–Noise
switching regulator

RGB heart
beat LED

High performance
SMD antenna

RF switch

Reset switch

32Mbit
flash memory

U.FL connector

Size
42mm x 20mm x 3.5mm
(excluding headers)

Operating temperature:
−40 to 85 degrees celsius

1.0   Overview

Introducing the WiPy 2.0. The tiny MicroPython enabled
Wifi & Bluetooth IoT development platform. With a 1KM
WiFi range, state of the art Espressif ESP32 chipset
and dual processor, the WiPy 2.0 is all about taking the
Internet of Things to the next level. Create and connect
your things everywhere. Fast.

2.0   Features

– Powerful CPU, BLE and state of the art WiFi radio. 1KM
  Wifi Range
– MicroPython enabled
– Fits in a standard breadboard (with headers)
– Ultra−low power usage: a fraction compared to other
  connected micro controllers
– Available with or without pin headers soldered on

3.0 Specifications

3.1 CPU

– Xtensa® dual–core 32–bit LX6 microprocessor(s), up to 600 DMIPS
– Hardware floating point acceleration
– Python multi–threading
– An extra ULP–coprocessor that can monitor GPIOs, the ADC channels and control most of the internal peripherals during deep–sleep mode while only consuming ~25uA.

3.2 Memory

– RAM: 520KB
– External flash: 4MB

3.3 WiFi

– 802.11b/g/n 16mbps

3.4 Bluetooth

– Low energy and classic

3.5 RTC

– Running at 150kHz

3.6 Security

– SSL/TLS support
– WPA Enterprise security
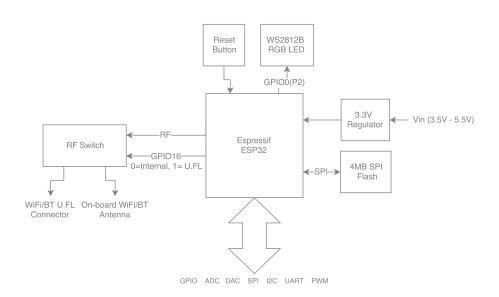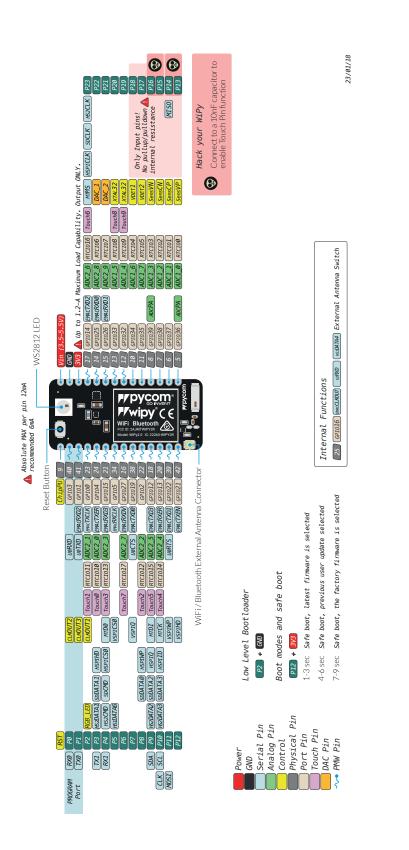
3.7 Hash / encryption

– SHA
– MD5
– DES
– AES

4.0 Block Diagram

Figure 1 – System block diagram

5.0   Pinout

Figure 2 – Module pinout diagram

Note: The ESP32 supports remapping its peripherals to alternative pins. See below for a detailed list.

6.0 Pin Details

Table 1 – Module pinout

Module Pin	ESP32 GPIO	Pin Name	Default Function	ADC	PWM	RTC†	Notes
1	–	–	Reset				Active Low, connected to on–board button
2	3	P0	RX0 (Programming)		•		Used by the bootloader and to program the module
3	1	P1	TX0 (Programming)		•		Used by the bootloader and to program the module
4	0	P2		2*	•	•	If tied to GND during boot the device will enter bootloader mode, Connected to the on–board RGB LED
5	4	P3	TX1	2*	•	•	
6	15	P4	RX1	2*	•	•	JTAG TDO, SD card CMD
7	5	P5			•		
8	27	P6		2*	•	•	
9	19	P7			•		
10	2	P8		2*	•	•	SD card DAT0
11	12	P9	SDA	2*	•	•	JTAG TDI
12	13	P10	SCL (I2C) / CLK (SPI)	2*	•	•	JTAG TCK
13	22	P11	MOSI		•		
14	21	P12			•		If tied to 3.3V during boot the device enters safe boot mode, JTAG MISO
15	36	P13		1		•	Input only
16	37	P14	MISO	1		•	Input only
17	38	P15		1		•	Input only
18	39	P16		1		•	Input only
19	35	P17		1		•	Input only
20	34	P18		1		•	Input only
21	32	P19		1	•	•	

6.0   Pin Details

Table 1 – Module pinout

Module Pin	ESP32 GPIO	Pin Name	Default Function	ADC	PWM	RTC†	Notes
22	33	P20		1	•	•	
23	26	P21		2*	•	•	DAC
24	25	P22		2*	•	•	DAC
25	14	P23		2*	•	•	JTAG TMS, SD card SCLK
26	–	–	Regulated 3.3V supply				Output only, do not feed 3.3V into this pin or you can damage the regulator
27	–	–	Ground				
28	–	–	Voltage Input				Accepts a voltage between 3.5V and 5.5V
–	16	–					External WiFi/BT antenna switch, Low = on−board, High = U.FL

† The pins on the RTC power domain can be used during deep sleep, specifically GPIO pins will maintain their state while in deep sleep.

* ADC2 is currently not supported in the micropython firmware

6.1   Remapping Pins

The ESP32 features comprehensive pin remapping functionality. This allows peripherals to be mapped onto almost any available GPIO pins. The above table merely shows the default assignments. For example, the default mapping has the SPI and I2C clocks overlapping, meaning both cannot be used simultaneously without remapping one to a different pin. For a detailed guide of what peripheral can be assigned to what pins please read "Appendix A − ESP32 Pin Lists" of the ESP32 datasheet.

7.0   ESP32 Peripherals

Table 2 – Peripherals

Peripheral	Count	Pins
UART	3	Remappable to any GPIO. Up to 5 Mbps†. Note: P13–18 can only be mapped to RX or CTS since they are input only.
I2C	2	Remappable to any GPIO except P13–18 since they are input only and I2C is bi–directional. Up to 5 MHz, constrained by pull–up strength†.
SPI	3	Remappable to any GPIO. Up to 50 MHz†. Note: P13–18 can only be mapped to MISO since they are input only.
CAN*	1	Remappable to any GPIO. Up to 1000Kbps† Note: P13–18 can only be mapped to RX since they are input only.
JTAG	1	TDO = P4, TDI = P9, TCK = P10, TMS = P24
PWM	1	All GPIO except P13–18 which are input only
ADC	18	Fixed mapping, see Table 1, Only ADC 1 is supported in our micropython firmware.
DAC	2	Only available on P21 and P22
SD	1	DAT0 = P8, SCLK = P23, CMD = P4

† These are hardware limits, the micropython firmware may impose its own limits.

* Requires an external CAN bus transceiver, we recommend the SN65HVD230 from Texas Instruments.

For a more detailed description of the ESP32 peripherals along with peripherals not currently supported by our firmware, please check the ESP32 datasheet.

7.1   RTC
Our modules by default all use the internal RC oscillator at 150kHz for the RTC. If you require better accuracy/stability you can connect a 32.768 kHz crystal (or TCXO) externally on pins P19 and P20 (or P19 for a TXCO)
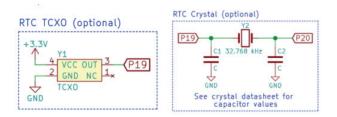

Figure 2 – External RTC crystal circuits

8.0   Programming the device

8.1   UART

By default, the modules run an interactive python REPL on UART0 which is connected to P0 (RX) and P1 (TX) running at 115200 baud. The easiest way to connect to the WiPy is via our expansion board, but any USB UART adapter will suffice. Code can be run via this interactive REPL or you can use our PyMakr plugin for Atom or Visual Studio Code to upload code to the board.

8.2   Wi-Fi

By default, the WiPy also acts as a Wi-Fi access point.
SSID: wipy-wlan-XXXX
Password: www.pycom.io
Once connected to the WiPy's Wi-Fi network you can access it in two ways.

8.2.1   Telnet

Running on port 23 is a telnet server. This acts in a very similar way to the UART. It presents you with an interactive REPL and can also be used to upload code via PyMakr.

8.2.2   FTP

The WiPy also runs a FTP server that allows you to copy files to and from the device, include an SD card if one is connected. To connect to this FTP server, you need to use plain FTP (un-encrypted) with the following credentials:
User: micro
Password: python

9.0   Boot modes

9.1   Bootloader mode

In order to update the firmware of the WiPy device, it needs to be placed into bootloader mode. In order to do this, P2 needs to be connected to ground when the device reboots. Once in bootloader mode you can use the Pycom firmware update tool to update to the latest official firmware. If you are developing your own firmware based on our open-source firmware, a flashing script is provided with the source code.

9.2   Safe boot

The micropython firmware features a safe boot feature that skips the boot.py and main.py scripts and goes straight to the REPL. This is useful if the device is programmed with code that causes the device to crash or become inaccessible. To access this mode, you need to connect P12 to 3.3V and reset the device. Upon entering safe boot mode, the on-board LED will begin to blink orange. Depending on the duration the pin is held at 3.3V, a different firmware will be run.

Table 3 – Boot modes

0-3 Seconds	3-6 Seconds
Current firmware without running boot.py or main.py	Previous firmware if the firmware was uploaded via OTA (without running boot.py and main.py)

10.0 Power

The WiPy features an on−board voltage regulator that takes 3.5V − 5.5V from the VIN pin and regulates it to 3.3V. It is important to only use the 3.3V as an output and not try to feed 3.3V into this pin as this could damage the regulator.

10.1 Current consumption by power modes/features running at 5V

Table 4 − Power consumption by feature

Mode	Min	Avg.	Max	Units
Idle (no radios)	−	34.8	−	mA
WiFi AP	−	94.4	−	mA
WiFi client	−	107	−	mA
Bluetooth	−	91.6	−	mA
Deep sleep*	−	14.7	−	mA
Deep sleep with shield	−	533	−	µA

† More details can be found in section 14.2

*See section 10.2

10.2 Deep sleep

Due to a couple issues with the SiPy design the module draws more current than it should while in deep sleep. The DC−DC switching regulator always stays in high performance mode which is used to provide the lowest possible output ripple when the modules is in use. In this mode, it draws a quiescent current of 10mA. When the regulator is put into ECO mode, the quiescent current goes down to 10uA. Unfortunately, the pin used to control this mode is out of the RTC domain, and therefore not usable during deep sleep. This causes the regulator to always stay in PWM mode, keeping its quiescent current at 10mA. Alongside this the flash chip doesn't enter power down mode because the CS pin is floating during deep sleep. This causes the flash chip to consume around 2mA of current. Only the WiPY 2.0, LoPy 1.0 and SiPy 1.0 are affected by these issues. To work around this issue a "deep sleep shield" is available that attaches to the module and allows power to be cut off from the device. The device can then be re−enabled either on a timer or via pin interrupt. With the deep sleep shield the current consumption during deep sleep is between 7uA and 10uA depending on the wake sources configured.

11.0 Memory Map

11.1 Flash

Table 5 – Flash memory map

Name	Description	Start address	Size
NVS	Non−volatile RAM area. Used by the NVS API	0x9000	0x7000
Firmware Slot 0	First firmware slot. Factory firmware is flashed here	0x10000	0x180000
OTA info	Information about the current active firmware	0x190000	0x1000
Firmware Slot 1	Second firmware slot	0x1A0000	0x180000
File system	504KB file system on devices with 4MB flash	0x380000	0x7F000
Config	Config area for LoRa, Sigfox and LTE	0x3FF000	0x1000

11.2 RAM

Table 6 – RAM memory map

Name	Description	Size
On−chip SRAM	Internal RAM memory used by the 2 xtensa CPUs	520KB
Fast RTC RAM	Fast RAM area accessible by the xtensa cores during boot and sleep modes	8KB
Slow RTC RAM	Slow RAM area accessible by the Ultra−Low Power Coprocessor during deep sleep	8KB

11.3 ROM and eFuses

Table 7 – Miscellaneous memory

Name	Description	Size
On−chip ROM	Contains core functions and boot code.	448KB
eFuse	256 bits are used for the system (MAC address and chip configuration) and the remaining 768 bits are reserved for customer applications, including Flash−Encryption and Chip−ID	1kbit

12.0 WiFi

12.1 Supported features

- Compliant with Bluetooth v4.2 BR/EDR and BLE specification
- Class−1, class−2 and class−3 transmitter without external power amplifier
- Enhanced power control
- +12 dBm transmitting power
- NZIF receiver with −97 dBm sensitivity
- Adaptive Frequency Hopping (AFH)
- Standard HCI based on SDIO/SPI/UART
- High−speed UART HCI, up to 4 Mbps
- BT 4.2 controller and host stack
- Service Discover Protocol (SDP)
- General Access Profile (GAP)
- Security Manage Protocol (SMP)
- ATT/GATT
- HID
- All GATT−based profile supported
- SPP−like GATT−based profile
- BLE Beacon
- A2DP/AVRCP/SPP, HSP/HFP, RFCOMM
- CVSD and SBC for audio codec
- Bluetooth Piconet and Scatternet

12.2 Specifications

12.2.1 Receiver − Basic Data Rate

Table 9 − Receiver (basic data rate) specifications

Parameter		Min	Typ.	Max	Unit
Sensitivity @0.1% BER		−	−94	−	dBm
Maximum received signal @0.1% BER		0	−	−	dBm
Co−channel C/I		−	+7	−	dB
Adjacent channel selectivity C/I	F = F0 + 1 MHz	−	−	−6	dB
	F = F0 − 1 MHz	−	−	−6	dB
	F = F0 + 2 MHz	−	−	−25	dB
	F = F0 − 2 MHz	−	−	−33	dB
	F = F0 + 3 MHz	−	−	−25	dB
	F = F0 − 3 MHz	−	−	−45	dB
Out−of−band blocking performance	30Mhz ~ 2000MHz	−10	−	−	dBm
	2000MHz ~ 2400MHz	−27	−	−	dBm
	2500MHz ~ 3000MHz	−27	−	−	dBm
	3000MHz ~ 12.5GHz	−10	−	−	dBm
Intermodulation		−36	−	−	dBm

12.2.2 Receiver − Enhanced Data Rate

Table 10 − Receiver (basic data rate) specifications

Parameter		Min	Typ.	Max	Unit
π/4 DQPSK					
Sensitivity @0.1% BER		−	−90	−	dBm
Maximum received signal @0.1% BER		−	0	−	dBm
Co−channel C/I		−	11	−	dB
Adjacent channel selectivity C/I	F = F0 + 1 MHz	−	−7	−	dB
	F = F0 − 1 MHz	−	−7	−	dB
	F = F0 + 2 MHz	−	−25	−	dB
	F = F0 − 2 MHz	−	−35	−	dB
	F = F0 + 3 MHz	−	−25	−	dB
	F = F0 − 3 MHz	−	−45	−	dB
8DPSK					
Sensitivity @0.1% BER		−	−84	−	dBm
Maximum received signal @0.1% BER		−	−5	−	dBm
C/I c−channel		−	18	−	dB
Adjacent channel selectivity C/I	F = F0 + 1 MHz	−	2	−	dB
	F = F0 − 1 MHz	−	2	−	dB
	F = F0 + 2 MHz	−	−25	−	dB
	F = F0 − 2 MHz	−	−25	−	dB
	F = F0 + 3 MHz	−	−25	−	dB
	F = F0 − 3 MHz	−	−38	−	dB

12.2.3 Receiver – Bluetooth LE

Table 11 – Receiver (BLE) specifications

Parameter		Min	Typ.	Max	Unit
Sensitivity @30.8% PER		–	−97	–	dBm
Maximum received signal @30.8% PER		0	–	–	dBm
Co−channel C/I		–	+10	–	dB
Adjacent channel selectivity C/I	F = F0 + 1MHz	–	−5	–	dB
	F = F0 − 1MHz	–	−5	–	dB
	F = F0 + 2MHz	–	−25	–	dB
	F = F0 − 2MHz	–	−35	–	dB
	F = F0 + 3MHz	–	−35	–	dB
	F = F0 − 3MHz	–	−45	–	dB
Out−of−band blocking performance	30MHz ~ 2000MHz	−10	–	–	dB
	2000MHz ~ 2400MHz	−27	–	–	dBm
	2500MHz ~ 3000MHz	−27	–	–	dBm
	3000MHz ~ 12.5GHZ	−10	–	–	dBm
Intermodulation		−36	–	–	dBm

12.2.4 Transmitter – Basic Data Rate

Table 12 – Transmitter (basic data rate) specifications

Parameter		Min	Typ.	Max	Unit
RF transmit power		–	0	–	dBm
Gain control step		–	±3	–	dBm
RF power control range		−12	–	+12	dBm
+20 dB bandwidth		–	0.9	–	MHz
Adjacent channel transmit power	F = F0 + 1 MHz	–	−24	–	dBm
	F = F0 − 1 MHz	–	−16.1	–	dBm
	F = F0 + 2 MHz	–	−40.8	–	dBm
	F = F0 − 2 MHz	–	−35.6	–	dBm
	F = F0 + 3 MHz	–	−45.7	–	dBm
	F = F0 − 3 MHz	–	−40.2	–	dBm
	F = F0 + >3 MHz	–	45.6	–	dBm
	F = F0 − >3 MHz	–	44.6	–	dBm
$\Delta f1_{avg}$		–	–	155	KHz
$\Delta f2_{max}$		133.7			KHz
$\Delta f2_{avg}/\Delta f1_{avg}$		–	0.92	–	–
ICFT		–	−7	–	KHz
Drift rate		–	0.7	–	KHz/50µs
Drift (1 slot packet)		–	6	–	KHz
Drift (5 slot packet)		–	6	–	KHz

12.2.5 Transmitter – Enhanced Data Rate

Table 13 – Transmitter (enhanced data rate) specifications

Parameter		Min	Typ.	Max	Unit
RF transmit power		–	0	–	dBm
Gain control step		–	±3	–	dBm
RF power control range		−12	–	+12	dBm
π/4 DQPSK max w0		–	−0.72	–	KHz
π/4 DQPSK max wi		–	−6	–	KHz
π/4 DQPSK max |wi + w0|		–	−7.42	–	KHz
8DPSK max w0		–	0.7	–	KHz
8DPSK max wi		–	−9.6	–	KHz
8DPSK max |wi + w0|			−10		KHz
π/4 DQPSK modulation accuracy	RMS DEVM	–	4.28	–	%
	99% DEVM	–	–	30	%
	Peak DEVM	–	13.3	–	%
8 DPSK modulation accuracy	RMS DEVM	–	5.8	–	%
	99% DEVM	–		20	%
	Peak DEVM	–	14	–	%
In−band spurious emissions	F = F0 + 1MHz	–	−34	–	dBm
	F = F0 − 1MHz	–	−40.2	–	dBm
	F = F0 + 2MHz	–	−34	–	dBm
	F = F0 − 2MHz	–	−36	–	dBm
	F = F0 + 3MHz	–	−38	–	dBm
	F = F0 − 3MHz	–	−40.3	–	dBm
	F = F0 ± >3MHz	–	–	−41.5	dBm
EDR differential phase coding		–	100	–	%

12.2.6 Transmitter – Bluetooth LE

Table 14 – Transmitter (BLE) specifications

Parameter		Min	Typ.	Max	Unit
RF transmit power		–	0	–	dBm
Gain control step		–	±3	–	dBm
RF power control range		−12	–	+12	dBm
Adjacent channel transmit power	F = F0 + 1MHz	–	−14.6	–	dBm
	F = F0 − 1MHz	–	−12.7	–	dBm
	F = F0 + 2MHz	–	−44.3	–	dBm
	F = F0 − 2MHz	–	−38.7	–	dBm
	F = F0 + 3MHz	–	−49.2	–	dBm
	F = F0 − 3MHz	–	−44.7	–	dBm
	F = F0 + >3MHz	–	−50	–	dBm
	F = F0 − >3MHz	–	−50	–	dBm
$\Delta f1_{avg}$		–	–	265	KHz
$\Delta f2_{max}$		247	–	–	KHz
$\Delta f2_{avg}/\Delta f1_{avg}$		–	−0.92	–	–
ICFT		–	−10	–	KHz
Drift rate		–	0.7	–	KHz/50µs
Drift		–	2	–	KHz

13.0   Electrical Characteristics

13.1   Absolute maximum ratings

Table 15 – Absolute maximum ratings

Parameter	Symbol	Min	Typ.	Max	Unit
Supply Input Voltage	V_{IN}	3.5	–	5.5	V
Supply Output Current	I_{OUT}	–	–	1.2	A
Supply Output Voltage	V_{3V3}	–	3.3	–	V
Storage Temperature	T_{STR}	–	–	–	°C
Operating Temperature	T_{OPR}	−40	–	85	°C
Moisture Sensitivity Level	MSL	–	1	–	–

13.2   Input/Output characteristics

Table 16 – Input/Output characteristics

Parameter	Symbol	Min	Typ.	Max	Unit
Input low voltage	V_{IL}	−0.3	–	$0.25 \times V_{3V3}$	V
Input high voltage	V_{IH}	$0.75 \times V_{3V3}$	–	$V_{3V3}+0.3$	V
Max Input sink current	I_{SINK}	–	6	12	mA
Input leakage current	I_{IL}	–	–	50	nA
Input pin capacitance	C_{pin}	–	–	2	pF
Output low voltage	V_{OL}	$0.1 \times V_{3V3}$	–	–	V
Output high voltage	V_{OH}	$0.8 \times V_{3V3}$	–	–	V
Max Output source current	I_{SOURCE}	–	6	12	mA

14.0 Minimum Recommended Circuit

Figure 4 – Minimum required circuit
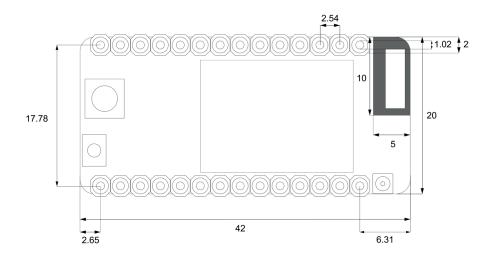
15.0   Mechanical Specifications

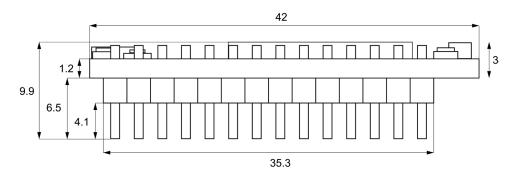*Figure 5 – Mechanical drawing (top down view) – Units: mm*

Figure 6 – Mechanical drawing (side view) – Units: mm

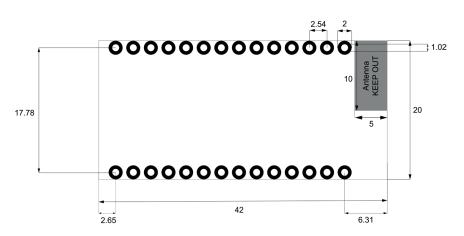## 16.0   Recommended Land Patterns

16.1   Through hole

Figure 7 – Recommended land pattern (through hole) – Units: mm

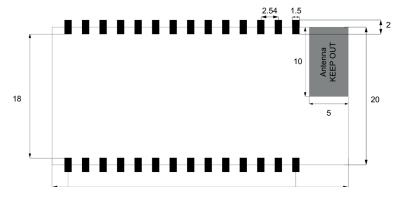### 16.2   Surface mount (WiPy without headers only)

Figure 8 – Recommended land pattern (surface mount) – Units: mm

17.0   Soldering Profile

17.1   With headers

This device is not recommended for reflow soldering. The plastic of the pin headers will melt, instead please hand solder the module or use sockets.
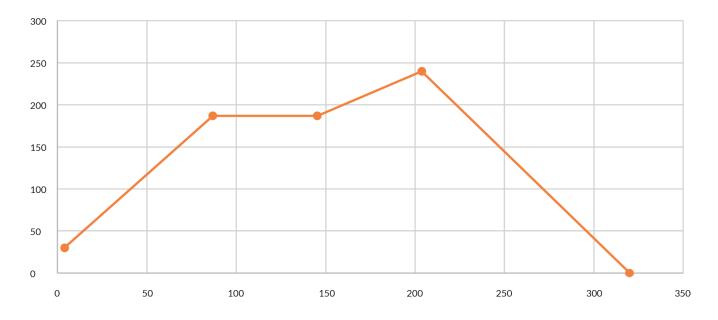
17.2   Without headers

Figure 9 – Reflow soldering temperature profile

Table 17 – Soldering profile temperatures

Stage	Duration/Rate	Temperature
Ramp to soak	2°C/s	Ambient – 185°C
Soak	60s	185°C
Ramp to peak	1°C/s	240°C
Reflow	45s	>225°C
Cool down	2°C/s	

The above profile is based on Alpha CVP–390 solder paste, which has been successfully tested with our devices.

18.0   Ordering Information

Table 18 – Ordering information

Product EAN	Description
DISCONTINUED	WiPy 2.0 with Headers
DISCONTINUED	WiPy 2.0 without headers
0700461341680	External WiFi Antenna
0700461341697	IP67 Antenna Pigtail

For more product accessories like expansion board or cases visit our website: http://www.pycom.io

19.0   Packaging

Figure 10 – Mechanical drawing of packaging – Units: mm

The module will come inside a reusable anti–static bag. If the module has headers it will also be inserted into anti–static foam.

Total weight inc. packaging (with headers): 29g

Total weight inc. packaging (without headers): 26g

20 Certification

FCC   2AJMTWIPY2R
CE   0700
Copies of the certificates can be found on our website.

Regulator Information

20.1 EU Regulatory Conformance

Hereby, Pycom Ltd declares that this device is in compliance with the essential requirements and other relevant provisions of Directive 1999/5/EC

20.2 Federal Communication Commission Interference Statement

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

1. This device may not cause harmful interference.
2. This device must accept any interference received, including interference that may cause undesired operation.

CAUTION: Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

– Reorient or relocate the receiving antenna.
– Increase the separation between the equipment and receiver.
– Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
– Consult the dealer or an experienced radio/TV technician for help.

20.2.1 RF Warning Statement

To comply with FCC RF exposure compliance requirements, the antennas used for this transmitter must be installed to provide a separation distance of at least 20 cm from all persons and must not be co–located or operating in conjunction with any other antenna or transmitter.

20.2.2 OEM integrator conditions

This device is intended only for OEM integrators under the following conditions:

1. The antenna must be installed such that 20 cm is maintained between the antenna and users, and
2. The transmitter module may not be co–located with any other transmitter or antenna.

As long as the two conditions above are met, further transmitter test will not be required. However, the OEM integrator is still responsible for testing their end–product for any additional compliance requirements required with this module installed. To ensure compliance with all non–transmitter functions the host manufacturer is responsible for ensuring compliance with the module(s) installed and fully operational. For example, if a host was previously authorized as an unintentional radiator under the Declaration of Conformity procedure without a transmitter certified module and a module is added, the host manufacturer is responsible for ensuring that the after the module is installed and operational the host continues to be compliant with the Part 15B unintentional radiator requirements.

The module is limited to OEM installation ONLY. The module is limited to installation in mobile or fixed application. We hereby acknowledge our responsibility to provide guidance to the host manufacturer in the event that they require assistance for ensuring compliance with the Part 15 Subpart B requirements.

IMPORTANT NOTE: In the event that these conditions cannot be met (for example certain laptop configurations or co−location with another transmitter), then the FCC authorization is no longer considered valid and the FCC ID cannot be used on the final product. In these circumstances, the OEM integrator will be responsible for re−evaluating the end product (including the transmitter) and obtaining a separate FCC authorization.

20.2.3 End Product Labelling

This transmitter module is authorized only for use in device where the antenna may be installed such that 20 cm may be maintained between the antenna and users. The final end product must be labelled in a visible area with the following: "Contains FCC ID: 2AJMTWIPY2R". The grantee's FCC ID can be used only when all FCC compliance requirements are met.

The following FCC part 15.19 statement has to also be available on the label:

This device complies with Part 15 of FCC rules. Operation is subject to the following two conditions:

1. this device may not cause harmful interference and
2. this device must accept any interference received, including interference that may cause undesired operation.

20.2.4 Manual Information to the End User

The OEM integrator has to be aware not to provide information to the end user regarding how to install or remove this RF module in the user's manual of the end product which integrates this module.

In the user manual of the end product, the end user has to beinformed that the equipment complies with FCC radio−frequency exposure guidelines set forth for an uncontrolled environment.

The end user has to also be informed that any changes or modifications not expressly approved by the manufacturer could void the user's authority to operate this equipment.

The end user manual shall include all required regulatory information/warning as show in this manual.

The maximum operating ambient temperature of the equipment declared by the manufacturer is −40~+85C

Receiver category 3

21.0   Revision History

Table 19 − Document revision history

Version 1.0	Initial Release