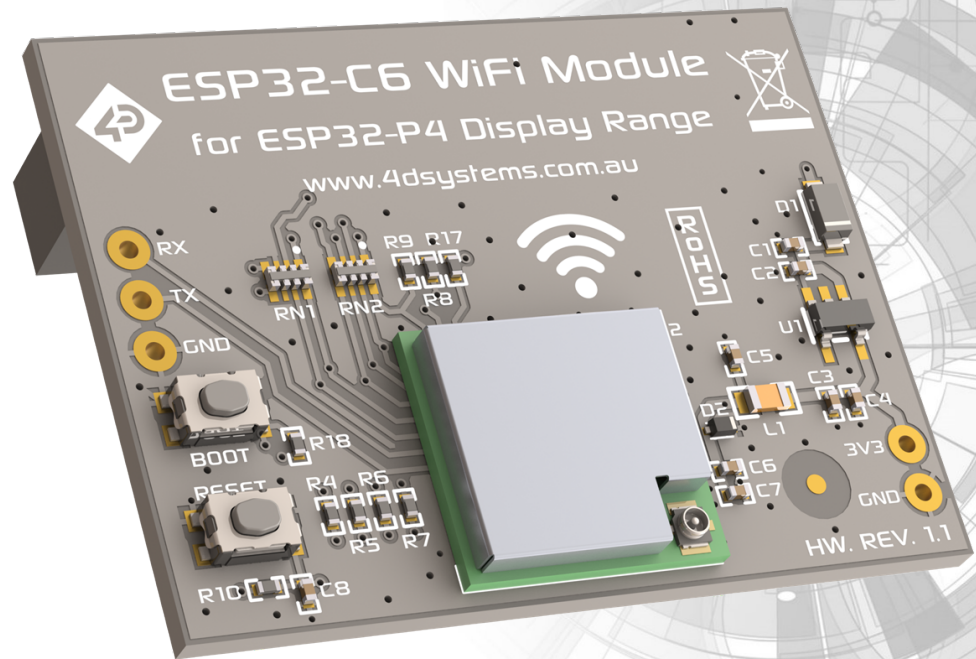


ESP32-C6 WiFi Module



SKU: ESP32-P4-C6-WiFi

(ESP32-C6 WiFi Add-on Module for 4D Systems ESP32-P4 Display Series)

Datasheet

Revision 1.0

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Content may change at any time. Please refer to the resource centre for latest documentation.

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1. Description

The ESP32-P4-C6-WiFi is an ESP32-C6 WiFi add-on module for the 4D Systems ESP32-P4 display range, and is designed and manufactured by 4D Systems.

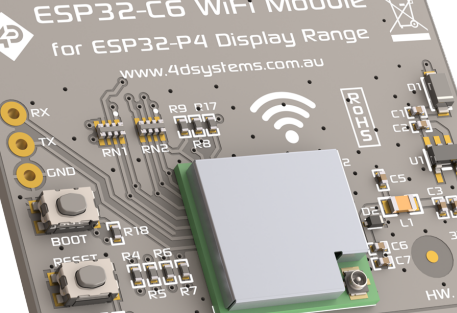
This WiFi add-on module is designed specifically to directly plug on the back of the ESP32-P4 and ESP32-P4-Round series of display modules from 4D Systems, providing WiFi and BT connectivity to the ESP32-P4 SoC.

At the time of writing, this module is directly compatible with the following modules:

- ESP32-P4-70
- ESP32-P4-70CT-CLB
- ESP32-P4-70CT
- ESP32-P4-80
- ESP32-P4-80CT-CLB
- ESP32-P4-80CT
- ESP32-P4-90
- ESP32-P4-90CT-CLB
- ESP32-P4-90CT
- ESP32-P4-101
- ESP32-P4-101CT-CLB
- ESP32-P4-101CT
- ESP32-P4-34R-CLB
- ESP32-P4-34RCT-CLB
- ESP32-P4-40R-CLB
- ESP32-P4-40RCT-CLB

This WiFi add-on module features the Espressif ESP32-C6-MINI-1U-N4 canned WiFi module, which features the Espressif ESP32-C6 SoC. It features 802.11ax-compliant WiFi, and Bluetooth LE 5.3 certified Bluetooth communications.

This WiFi add-on module supports only an external antenna, which is simply connected to the w.FL connector on the ESP32-C6-MINI-1U module directly. A suitable w.FL (IPX-3) to SMA cable and screw on SMA Antenna is supplied with this module. Alternative IPX-3 cables and antennas are freely available on the market if the supplied one is not suitable.



ESP32-C6 WiFi Module
for ESP32-P4 Display Range
www.4dsystems.com.au

Hardware revision: HW. REV. 1.1

Key components and labels visible on the module include:

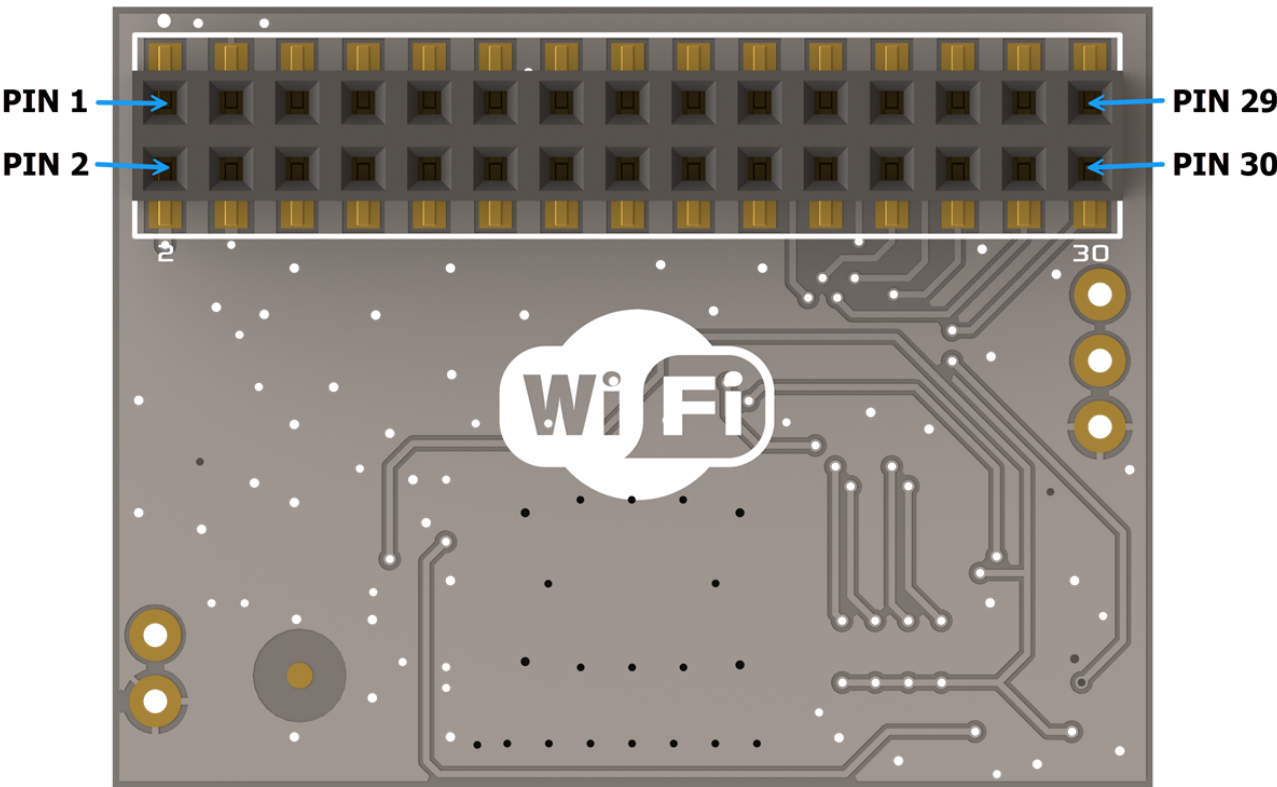
- Antennas: RX, TX, GND
- Buttons: BOOT, RESET
- Resistors: R1, R2, R3, R4, R5, R6, R7, R8, R9, R10, R11, R12, R13, R14, R15, R16, R17, R18, R19, R20, R21, R22, R23, R24, R25, R26, R27, R28, R29, R30, R31, R32, R33, R34, R35, R36, R37, R38, R39, R40, R41, R42, R43, R44, R45, R46, R47, R48, R49, R50, R51, R52, R53, R54, R55, R56, R57, R58, R59, R60, R61, R62, R63, R64, R65, R66, R67, R68, R69, R70, R71, R72, R73, R74, R75, R76, R77, R78, R79, R80, R81, R82, R83, R84, R85, R86, R87, R88, R89, R90, R91, R92, R93, R94, R95, R96, R97, R98, R99, R100
- Capacitors: C1, C2, C3, C4, C5, C6, C7, C8, C9, C10, C11, C12, C13, C14, C15, C16, C17, C18, C19, C20, C21, C22, C23, C24, C25, C26, C27, C28, C29, C30, C31, C32, C33, C34, C35, C36, C37, C38, C39, C40, C41, C42, C43, C44, C45, C46, C47, C48, C49, C50, C51, C52, C53, C54, C55, C56, C57, C58, C59, C60, C61, C62, C63, C64, C65, C66, C67, C68, C69, C70, C71, C72, C73, C74, C75, C76, C77, C78, C79, C80, C81, C82, C83, C84, C85, C86, C87, C88, C89, C90, C91, C92, C93, C94, C95, C96, C97, C98, C99, C100
- Other components: U1, U2, U3, U4, U5, U6, U7, U8, U9, U10, U11, U12, U13, U14, U15, U16, U17, U18, U19, U20, U21, U22, U23, U24, U25, U26, U27, U28, U29, U30, U31, U32, U33, U34, U35, U36, U37, U38, U39, U40, U41, U42, U43, U44, U45, U46, U47, U48, U49, U50, U51, U52, U53, U54, U55, U56, U57, U58, U59, U60, U61, U62, U63, U64, U65, U66, U67, U68, U69, U70, U71, U72, U73, U74, U75, U76, U77, U78, U79, U80, U81, U82, U83, U84, U85, U86, U87, U88, U89, U90, U91, U92, U93, U94, U95, U96, U97, U98, U99, U100

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2. Features

- Powerful ESP32-C6 RISC-V 32-bit single-core microprocessor, inside ESP32-C6-MINI-1U-N4 module
- Up to 160Mhz
- 320KB ROM, 512KB HP SRAM, 16KB LP SRAM, 4MB In-Package Flash
- UART programming interface
- 4bit SDIO Bus to ESP32-P4 display modules
- 30pin female pin header, for direct connect to ESP32-P4 display modules, supplying Power and SDIO Comms Bus etc
- 4.0V to 6.0V range operation (single supply), 5V recommended.
- w.FL (IPX-3) Antenna interface
- w.FL (IPX-3) to SMA cable + SMA Antenna, supplied
- RoHS and REACH compliant.
- CE/EMC and UKCA compliance pending.
- PCB is UL 94V-0 Flammability Rated.
- Module dimensions:
 - 40.0mm x 30.0mm x 11.2mm
- Weighing (approximately):
 - 6 g (excluding external antenna)

3. Hardware Overview



Pinout of 30-way Female connector (Rear view)

30-pin Interface Pinout

Pin	Symbol	I/O	Description
1	5V IN	P	Voltage Supply +ve input pin. The range is 4.0V to 6.0V, nominal 5.0V.
2	5V IN	P	Voltage Supply +ve input pin. The range is 4.0V to 6.0V, nominal 5.0V.
3	GND	P	Supply Ground
4	GND	P	Supply Ground
5	N/C	-	Not Connected / Unused
6	N/C	-	Not Connected / Unused
7	N/C	-	Not Connected / Unused
8	N/C	-	Not Connected / Unused
9	N/C	-	Not Connected / Unused
10	N/C	-	Not Connected / Unused
11	N/C	-	Not Connected / Unused
12	N/C	-	Not Connected / Unused
13	N/C	-	Not Connected / Unused
14	N/C	-	Not Connected / Unused
15	N/C	-	Not Connected / Unused
16	N/C	-	Not Connected / Unused

Pin	Symbol	I/O	Description
17	N/C	-	Not Connected / Unused
18	N/C	-	Not Connected / Unused
19	N/C	-	Not Connected / Unused
20	N/C	-	Not Connected / Unused
21	SDIO_CMD	I/O	SDIO Bus CMD line - Bidirectional
22	N/C	-	Not Connected / Unused
23	SDIO_DATA3	I/O	SDIO Bus DATA 3 line - Bidirectional
24	SDIO_CLK	I	SDIO Bus Clock line
25	SDIO_DATA1	I/O	SDIO Bus DATA 1 line - Bidirectional
26	SDIO_DATA2	I/O	SDIO Bus DATA 2 line - Bidirectional
27	N/C	-	Not Connected / Unused
28	SDIO_DATA0	I/O	SDIO Bus DATA 0 line - Bidirectional
29	N/C	-	Not Connected / Unused
30	EN	I/O	Reset of the ESP32-C6 from ESP32-P4 - Also connected to the RESET Button

**Note**

1. **I** = Input, **O** = Output, **P** = Power
2. Please refer to the Espressif ESP32-C4-MINI-1U datasheet for specific detail on the capability of the ESP32-C6, in conjunction with the schematic of this module.

4. Hardware Interface – Pins

This section describes in detail the hardware interface pins of the module.

4.1. Serial Ports – 3.3V TTL

This WiFi add-on module has a single UART, which is connected only to the solderable TH pads on the module, and is used primarily for the reprogramming of the ESP32-C6 firmware by the end user. This is UART0, and is where the boot and debug messages are sent by default, and is useful when diagnosing issues or troubleshooting your code (if using custom firmware).

Please refer to the [Espressif ESP32-C6-MINI-1U Datasheet](#) for more details.

The module can be programmed over UART utilising the RX/TX pads, in conjunction with the BOOT and RESET buttons. It is recommended to unplug the module from the ESP32-P4 display, and power the module via the 3V3 and GND pins, or via the 5V and GND pins on the 30-way female connector.

For most applications, reprogramming of this module is not required.

4.2. Communications – SDIO

This WiFi add-on module has a dedicated 4-bit SDIO bus, which is the bus used to communicate between the ESP32-C6 and the ESP32-P4 display module. This bus is the highest speed available for the ESP32-C6, and enables high-speed communications to the ESP32-P4, allowing things like streaming Audio and steaming Video to be possible in conjunction with a 4D Systems ESP32-P4 display module.

5. Software Development

While it's recommended to use the default ESP-Hosted slave application which comes preloaded to use it with ESP32-P4 display applications, it is possible to develop custom firmware for this board to either update or change entirely the SDIO-based communication between the two microprocessors. It is up to the user to match both the ESP32-P4 and ESP32-C6 custom communication.

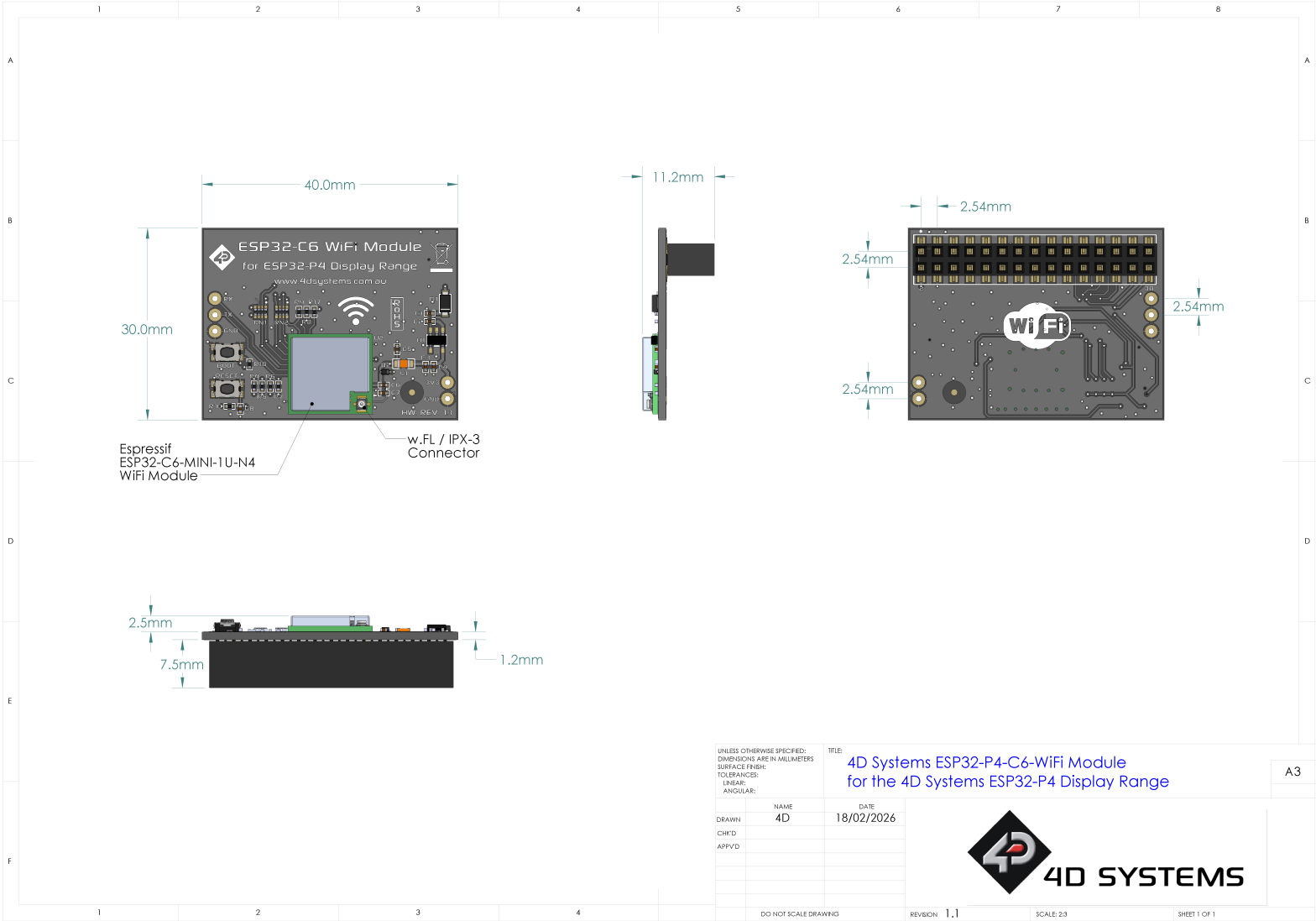
Several options are made available to users from Espressif, including:

- Arduino IDE using Arduino-ESP32 core
- ESP-IDF

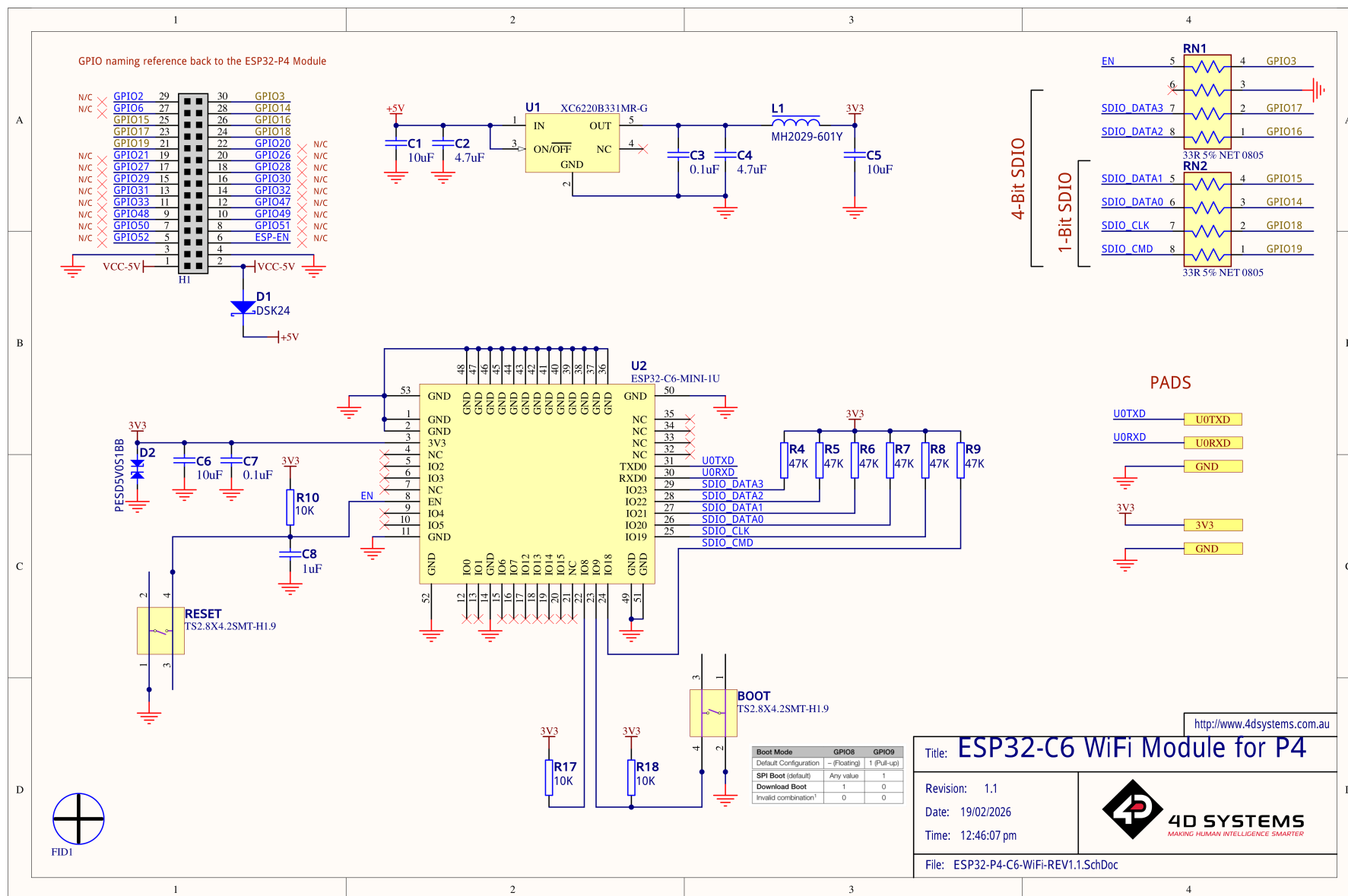
Please refer to the ESP-Hosted documentation for detailed information on the default firmware.

6. Mechanical Details

6.1. ESP32-P4-C6-WiFi Module



7. Schematic Circuit Details REV 1.1



8. Specifications

Absolute Maximum Ratings	
Operating ambient temperature	-20°C to +70°C (see note 1)
Storage temperature	-30°C to +80°C
Voltage on any digital input pin (ESP32) with respect to GND	-0.3V to 3.6V
Voltage on module VCC with respect to GND	-0.3V to 6.5V

Note

1. Temperature range for Ambient and Storage, are determined by a combination of components used on these modules. While some components may be capable of exceeding these temperatures, some are not, so the minimums/maximums are determined by the weakest device on the modules. The 'weakest' component where this module will be uses, is the TFT LCD of the ESP32-P4 module, which is capable of -20°C to 70°C Operating Temp.

2. Stresses above those listed here may cause permanent damage to the device. This is for stress rating only and functional operation of the device at those or any other conditions above those indicated in the recommended operation listings of this specification is not implied. Exposure to maximum rating conditions for extended periods may affect device reliability.

Recommended Operating Conditions					
Parameter	Conditions	Min	Typ	Max	Units
Supply Voltage (VCC)	Stable external supply required	4.0	5.0	6.0	V
Processor voltage (VP)		—	3.3	—	V
Input Low Voltage (VIL)	all pins	0	—	0.25VP	V
Input High Voltage (VIH)	non 5V tolerant pins	0.75VP	—	VP+0.3	V

Global Characteristics Based on Operating Conditions					
Parameter	Conditions	Min	Typ	Max	Units
Supply Current (ICC) ***	ESP32-P4-C6-WiFi @ 5V	—	300	—	mA

Note

Typical Supply Current (ICC) are a Typical figure only, not a Maximum. A better breakdown is available in the ESP32-C6-MINI-1U Datasheet from Espressif, regarding Peak TX/RX current usage

9. Revision History

Datasheet Revision		
Revision Number	Date	Description
0.1	19/02/2026	Internal Use Only
1.0	20/02/2026	Initial Public Release Version

Hardware Revision		
Revision Number	Date	Description
1.0	24/11/2025	Initial Internal Version
1.1	20/02/2026	Public Release Version

10. Legal Notice

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FCC 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, and (2) this device must accept any interference received, including interference that may cause undesired operation.

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 important announcement

Important Note:

Radiation Exposure Statement

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator and your body.

This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

Country Code selection feature to be disabled for products marketed to the US/Canada.

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,
3. For all products market in US, OEM has to limit the operation channels in CH1 to CH11 for 2.4G band by supplied firmware programming tool. OEM shall not supply any tool or info to the end-user regarding to Regulatory Domain change. (if modular only test Channel 1-11)

As long as the three conditions above are met, further transmitter testing 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.

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.

End Product Labeling

The final end product must be labeled in a visible area with the following"

Contains FCC ID: **2BVVS-ESP32-P4-C6** "

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.

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

Integration instructions for host product manufacturers according to KDB 996369 D03 OEM Manual v01r01

2.2 List of applicable FCC rules

CFR 47 FCC PART 15.247, 15.207, 15.209 has been investigated. It is applicable to the modular transmitter

2.3 Specific operational use conditions

This module is stand-alone modular. If the end product will involve the Multiple simultaneously transmitting condition or different operational conditions for a stand-alone modular transmitter in a host, host manufacturer have to consult with module manufacturer for the installation method in end system.

2.4 Limited module procedures

Not applicable

2.5 Trace antenna designs

Not applicable

2.6 RF exposure considerations

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator & your body.

2.7 Antennas

This radio transmitter **FCC ID:2BVVS-ESP32-P4-C6** has been approved by Federal Communications Commission to operate with the antenna types listed below, with the maximum permissible gain indicated. Antenna types not included in this list that have a gain greater than the maximum gain indicated for any type listed are strictly prohibited for use with this device.

Antenna No.	Model No. of antenna:	Type of antenna:	Gain of the antenna (Max.)	Frequency range:
2.4G Wi-Fi	/	External Antenna	2.0	2400-2450MHz

2.8 Label and compliance information

The final end product must be labeled in a visible area with the following" Contains **FCC ID:2BVVS-ESP32-P4-C6**".

2.9 Information on test modes and additional testing requirements

Operation Frequency: 2412-2462MHz

Number of Channel: 11

Modulation: DSSS/OFDM

Host manufacturer must perform test of radiated & conducted emission and spurious emission, etc. according to the actual test modes for a stand-alone modular transmitter in a host, as well as for multiple simultaneously transmitting modules or other transmitters in a host product. Only when all the test results of test modes comply with FCC requirements, then the end product can be sold legally.

2.10 Additional testing, Part 15 Subpart B disclaimer

Host manufacturer is responsible for compliance of the host system with module installed with all other applicable requirements for the system such as Part 15 B.

2.11 Note EMI Considerations

Host manufacture is recommended to use KDB 996369 D04 Module Integration Guide recommending as "best practice" RF design engineering testing and evaluation in case non-linear interactions generate additional non-compliant limits due to module placement to host components or properties.

2.12 How to make changes

This module is stand-alone modular. If the end product will involve the Multiple simultaneously transmitting condition or different operational conditions for a stand-alone modular transmitter in a host, host manufacturer have to consult with module manufacturer for the installation method in end system. According to the KDB 996369 D02 Q&A Q12, For EMC/radio-parameter compliance purposes, when an evaluation is done by the grantee or host provider and there are no additional emissions generated due to simultaneous-transmission operations compared to single transmitter operations testing (i.e., not transmitting simultaneously), it is not necessary to file the additional simultaneous transmission test data. The host manufacturer is responsible for ensuring compliance with the applicable FCC rules for the transmitters operating individually and simultaneously. This includes compliance for the summation of all emissions from all outputs occupying the same or overlapping frequency ranges, as defined by the applicable rules.