

C6 Module User Manual

1. Introduction

The C6 is a Wi-Fi module designed for wireless communication applications, developed and manufactured by Xthings. This manual provides essential information on the module's components, connections, and basic usage to assist users in proper installation and operation. The module's drawing size follows the A3 standard, and the design revision is marked as V1.3 .

2. Module Overview & Key Components

2.1 Component List

The module integrates various electronic components to ensure stable Wi-Fi functionality. Below is a list of key components with their specifications (where provided in the design documentation):

Component Label	Model/Specification	Type	Purpose
L1	Not specified	Inductor	Filtering and signal stabilization
L2	2.0NH	Inductor	Power supply filtering to reduce noise
C1, C2, C4, C7, C15	0.1uF	Capacitor	Decoupling capacitors for power rails, preventing voltage

			fluctuations
C6	10UF	Capacitor	Bulk capacitor for power storage, ensuring stable power delivery
D2	105	Diode	Protection diode, preventing reverse current damage to the module
MM5829-2700	MM5829-2700	Oscillator	Provides a stable 40MHz clock signal for timing functions
U1	ESP32-C6	Main Chip	Core processor for Wi-Fi communication, controlling data transmission and reception
R1	Not specified	Resistor	Current-limiting or pull-up/down resistor for circuit protection

2.2 Power Supply Requirements

The module relies on multiple power rails to operate, with key specifications as follows:

- **Main Power Rail (VDD33):** Supplies 3.3V DC power to the main chip and most components; ensure the power source can provide sufficient current (recommended $\geq 500\text{mA}$) to avoid performance issues.
- **Auxiliary Power Rails (VDDPST1, VDDPST2):** Provide dedicated power to specific circuits (e.g., clock oscillator, interface modules); follow the 3.3V standard unless otherwise specified in the detailed schematic.

3. Pin Configuration & Interface Usage

3.1 Core Interfaces

The module supports common communication and control interfaces, with pin assignments based on the design documentation:

- **SDIO Interface:** Used for high-speed data transfer between the module and a host controller (e.g., a microcontroller). Key pins include:
 - SDIO_DATA0 (Pin 32), SDIO_DATA1 (Pin 31), SDIO_DATA2 (Pin 30), SDIO_DATA3 (Pin 29): 4-bit data bus for bidirectional data transmission.
 - SDIO_CLK (Pin 24): Clock signal pin, synchronizing data transfer between the module and host.
 - SDIO_CMD (Pin 23): Command pin for sending control commands (e.g., initialization, data read/write requests) from the host to the module.
- **UART Interface:** Used for serial communication (e.g., debugging, configuration). Pins include:
 - U0TXD (Pin 21): Transmit pin (module sends data to the host).
 - U0RXD (Pin 22): Receive pin (module receives data from the host).
- **Clock Oscillator Pins:**
 - XTAL_P (Pin 6) and XTAL_N (Pin 7): Connect to the 40MHz oscillator (MM5829-2700) to provide a stable clock signal for low-power timing functions.

3.2 Control & GPIO Pins

- **CHIP_EN:** Chip enable pin; set to high (3.3V) to activate the module, low (0V) to put it in standby mode.
- **CHIP_PU:** Chip power-up pin; used to initialize the module's power sequence (follow the timing requirements in the schematic to avoid damage).
- **GPIO Pins:** General-purpose input/output pins for custom control (e.g., external sensor connection, status indication). Available pins include GPIO2 (Pin 8), GPIO3, GPIO4, GPIO5, GPIO6, GPIO7, GPIO8, GPIO9, GPIO18, and GPIO19. Configure these pins via the main chip (S9202) based on application needs.

4. Test Points & Troubleshooting

4.1 Test Points

The module includes 9 test points (TP1–TP9) for debugging and performance verification. These points can be used to measure key signals (e.g., power voltage, clock frequency, data transmission) during development or maintenance. Ensure test equipment (e.g., multimeter, oscilloscope) is properly calibrated before use to avoid measurement errors.

4.2 Basic Troubleshooting

- **No Power/Module Not Responding:** Check if VDD33, VDDPST1, and VDDPST2 are correctly connected to a 3.3V power source; verify CHIP_EN and CHIP_PU are set to the correct levels.
- **UART Communication Failure:** Confirm U0TXD/U0RXD pins are cross-connected (module TX to host RX, module RX to host TX) and the baud rate matches the module's default setting.
- **SDIO Data Transfer Errors:** Inspect the SDIO_CLK, SDIO_CMD, and SDIO_DATA pins for loose connections; ensure the host controller's SDIO driver is compatible with the module.

5. Document Control

- **Drawn By:** Scott
- **Drawn Date:** Refer to the original design records
- **Checked By:** To be filled (per quality control procedures)
- **Checked Date:** To be filled (per quality control procedures)
- **Quality Control (QC) By:** To be filled (per quality control procedures)
- **QC Date:** To be filled (per quality control procedures)
- **Released By:** To be filled (per product release procedures)
- **Release Date:** To be filled (per product release procedures)

FCC Caution.

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.

Any 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.

*RF warning for Mobile device:

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.

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: 2BKHH-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 v01

2.2 List of applicable FCC rules

CFR 47 FCC PART 15 SUBPART C 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

The device has been evaluated to meet general RF exposure requirement. The device can be used in mobile or fixed exposure condition with minimum distance 20 cm between the radiator & user's body.

2.7 Antennas

This radio transmitter 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	Model No. of antenna:	Type of antenna:	Gain of the antenna (Max.)	Frequency range:
WIFI/BLE	/	FPC Antenna	3.80dBi	2400-2500MHz

2.8 Label and compliance information

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

2.9 Information on test modes and additional testing requirements

Host manufacturer which install this modular with limit modular approval should perform the test of radiated emission and spurious emission according to FCC part 15C:15.247 and 15.209 requirement, only if the test result comply with FCC part 15.247 and 15.209 requirement, then the host can be sold legally.

2.10 Additional testing, Part 15 Subpart B disclaimer

This transmitter module is tested as a subsystem and its certification does not cover the FCC Part 15 Subpart B (unintentional radiator) rule requirement applicable to the final host. The final host will still need to be reassessed for compliance to this portion of rule requirements if applicable.

2.11 Note EMI Considerations

We recommend to use "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. 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.

2.12 How to Make Changes - 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, OEM integrator contact Grantees to make permissive changes or the OEM integrator will be responsible for re-evaluating the end product (including the transmitter) and obtaining a separate FCC authorization.

As long as all 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.