D5-45 User Manual

FCC ID：2BC3H2316C

General

AL017-Power supply: The radio module use the LDO N4 to provide power for radio chip.

AL017-Transmitting: During the transmitting stage, the CPU of main board sends the data to the AT86RF215

through the SPI interface. When the AT86RF215 gets emission instruction from CPU, it will go into transmitting mode and modulate data up to radio band, The modulated RF signal passes through the filter and is radiated by the chip antenna.

AL017-Receiving: During the receiving stage, the AT86RF215 gets a receipt instruction from CPU, it will go into receiving mode. The RF signal is received from antenna, And then it goes through the filter into the AT86RF215.The demodulation of AT86RF215 is responsible for retrieving the sent data from the received signal, after demodulated the data will send to CPU through SPI interface.

AL017-Frequency band: 2400-2483.5MHz.

AL017-Modulation: O-QPSK.

AL017-Antenna: Chip antenna, 4dBi

AL018-Power supply: The radio module use the DC-DC N5 to provide power for radio chip and RFID chip.

AL018-Transmitting: The ESP32-c3-MINI-1 module is a low-power and high-performance radio transceiver that operates in the 2.4GHz frequency band. In the transmission phase, the mainboard CPU sends the data to ESP-C3-MINI-1 through the UART interface. When ESP32-C3-MINI-1 receives the transmission command from the CPU, it enters the transmission mode to modulate the data in the RF band. After the modulation phase, the modulated RF signal will pass through the filter circuit inside the module, and finally the RF signal will radiate outward through the on-board antenna. And the ESP32 module is connected to the TRF7970ARHB through the SPI interface, and the CPU can control the TRF7970ARHB to open and perform RFID card (13.56MHz) reading operations through the ESP32 module .

AL018-Receiving: Establishing a connection with other Bluetooth devices, the ESP32-c3-MINI-1 module will receive data sent by other Bluetooth devices. The RF signal is received from the antenna, and the ESP32-c3-MINI-1 module demodulator is responsible for extracting data from the received signal. The

demodulated data is sent to the CPU through the UART interface. The data read by TRF7970ARHB can also be transmitted to the CPU through the ESP32 module or to the Bluetooth device connected to it.

AL018-Frequency band: 13.553MHz ~ 13.567MHz,2400-2483.5MHz.

AL018-Modulation: GFSK.

AL018-Antenna port: PCB Antenna 3.96dBi

The compliance of KDB 996369 D02 Module Q&A v02 Question 11:

Only internal chip antenna, so this requirement does not apply to this product.

The requirement for KDB 996369 D03:

1 List of applicable FCC rules
FCC Part 15. 247 and FCC Part 15. 225

2 Summarize the specific operational use conditions
None.

3 Limited module procedures
When the limited module is installed in the host product, a C2PC is required on the module grant to register the additional host as a specific host also approved with the module. Please refer to the C2PC test plan for details.

4 Trace antenna designs
Only internal chip antenna and internal PCB antenna, so this requirement does not apply to this product.

5 RF exposure considerations
The SAR requirement is deemed to be satisfied without test

6 Antennas
For 2.4G Band:
Ant1: Chip Antenna, 4dBi, for 2.4GHz O-QPSK
Ant2: PCB Antenna, 3.96dBi, for 2.4GHz GFSK

7 Label and compliance information
If this certified module is installed inside the host device, then the outside of the host must be labeled with “Contains FCC ID: 2BC3H2316C and IC: 31388-2316C”.

8 Information on test modes and additional testing requirements
The host manufacturer can use software to make the transmit continuously.

9 Additional testing, Part 15 Subpart B disclaimer
The module complies with the FCC Part 15.247 and FCC Part 15.225. If the module is installed in the host device, the host manufacturer is responsible for the compliance to any other FCC rules that apply to the host not covered by the modular transmitter grant of certification. For example, if the host manufacturer markets their product as being Part 15 Subpart B compliant (when it also contains unintentional-radiator digital circuity), then the host manufacturer shall provide a notice stating that the final host product still requires Part 15 Subpart B compliance testing with the modular transmitter installed.

FCC & IC application:

This device complies with Part 15 of the FCC Rules / Industry Canada licence-exempt RSS standard(s). 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.

Le présentappareilestconforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitationestautorisée aux deux conditions suivantes: (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareildoit accepter tout brouillageradioélectriquesubi, mêmesi le brouillageest susceptible d'encompromettre le fonctionnement.

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

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.

Information for the use by the grantee in their own products

This device is intended for grantee only. Please see the full grant of equipment document for restrictions.

Label Information to the End User by the grantee

If the FCC ID of this module is not visible when it is installed inside another device, then the outside of the device into which the module is installed must be label with “Contains FCC ID: 2BC3H2316C and IC: 31388-2316C”.

Antenna caution

This radio module IC:31388-2316C has been approved by Innovation, Science and Economic Development Canada 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.

Gain of antenna1: 4dBi, for 2.4GHz O-QPSK
Type of antenna1: 50ohm, Chip antenna.

Gain of antenna2: 3.96dBi, for 2.4GHz GFSK
Type of antenna: 50ohm, PCB antenna.

Le présentémetteur radio IC:31388-2316C étéapprouvé par Innovation, Sciences et Développementéconomique Canada pour fonctionner avec les types d'antenneénumérés ci dessous et ayant un gain admissible maximal. Les types d'antenne non inclus dans cetteliste, et dont le gain estsupérieur au gain maximal indiqué pour tout type figurant sur la liste, sontstrictementinterdits pour l'exploitation de l'émetteur.

Gain d’antenna1:4dBi, pour 2.4GHz O-QPSK
Type d’antenne1:50ohm, antenne à puce.

Gain d’antenna2:3.96dBi, pour 2.4GHz GFSK
Type d’antenne: 50ohm, antenne PCB.

C2PC test plan

The modular has no RF shielding as required in §15.212(a) (1)(i) and it cannot be tested in a stand-alone configuration as required in §15.212(a)(1)(v), as required in KDB 996369 D01 V03, C2PC is required for every different specific host using the module.

The complete tests will be performed according to FCC Part 15.225 on the host which installed this LMA.

The following tests will be performed according to FCC Part 15.247 on the host which installed this LMA:

Check the operation frequency range

For 802.15.1: Verify 2402MHz and 2480MHz channels to ensure the OFR falls within 2400-2483.5MHz.

For 802.15.4: Verify 2405MHz and 2480MHz channels to ensure the OFR falls within 2400-2483.5MHz.

Conducted RF output power

For 802.15.1:

Original module report: Max. peak power: -1.23dBm@2402MHz.

Verify the 2402MHz, 2440MHz and 2480MHz channels to ensure that the Conducted RF output power is not greater than -1.23dBm.

For 802.15.4:

Original module report: Max. peak power: 15.76dBm@2480MHz.

Verify the 2405MHz, 2440MHz and 2480MHz channels to ensure that the Conducted RF output power is not greater than 15.76dBm.

Radiated Emissions (band edge)

For 802.15.1: Verify 2402MHz and 2480MHz channels to ensure that the host also meets band edge requirements.

For 802.15.4: Verify 2405MHz and 2480MHz channels to ensure that the host also meets band edge requirements.

Radiated Spurious Emissions

For 802.15.1: Verify the 2402MHz, 2440MHz and 2480MHz channels to ensure that the host also meets Radiated Spurious Emissions requirements.

For 802.15.4: Verify the 2405MHz, 2440MHz and 2480MHz channels to ensure that the host also meets Radiated Spurious Emissions requirements.

Power Line Conducted Emission(FCC Part 15.207)