

# ABLUE TECHNOLOGY

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## WCM-02

*Ultra-low power Bluetooth 5 ready  
Multi-protocol System on Module  
Embedded Cortex™ M4F 32 bit processor*

The WCM-02 ultra-low power Bluetooth Low Energy/ANT/2.4GHz Proprietary Multi-protocol modules based on the nRF52832 from Nordic Semiconductor. The module with an ARM® Cortex™ M4F 32 bit processor, embedded 2.4GHz transceiver, and integrated antenna, provide a complete solution with no additional RF design, allowing faster time to market, while simplifying designs, reducing BOM costs, also reduce the burden of Regulatory approvals to enter the world market. Making you more quickly into the Bluetooth smart application and remove the worries.

## Features

- System on Module(SOM) base on Nordic nRF52832
- Bluetooth Low Energy/ANT/2.4GHz Proprietary Multi-protocol support
- Complete Bluetooth Low Energy stack/profiles solution (Bluetooth 5.0 and Higher)
- ARM® Cortex™-M4F 32 bit processor, 512 kB flash memory, 64 kB RAM
- 32 General Purpose I/O, Configurable mapping Pins, Simple layout of external application
- 12-bit/200KSPS ADC
- Three SPI Master/Slave (8 Mbps)
- Low power comparator, Temperature sensor, Random Number Generator
- Two 2-wire Master/Slave (I2C compatible)
- I2S audio interface, PDM audio interface
- UART (w/ CTS/RTS and DMA)
- 3x4-channel PWMs
- 20 channel CPU independent Programmable Peripheral Interconnect (PPI)
- Quadrature Demodulator (QDEC)
- 128-bit AES HW encryption
- 5 x 32bit Timers, 3 x 24bit Real Timer Counters (RTC), Watchdog Timer
- NFC-A tag interface for OOB pairing
- LF 32.768 KHz Crystal Oscillator
- No external components required
- Over-the-Air (OTA) firmware updates available
- Dimensions: 22.7mmx17.5mm x1.8mm with Antenna, 1.27mm pin pitch.

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## Typical Applications:

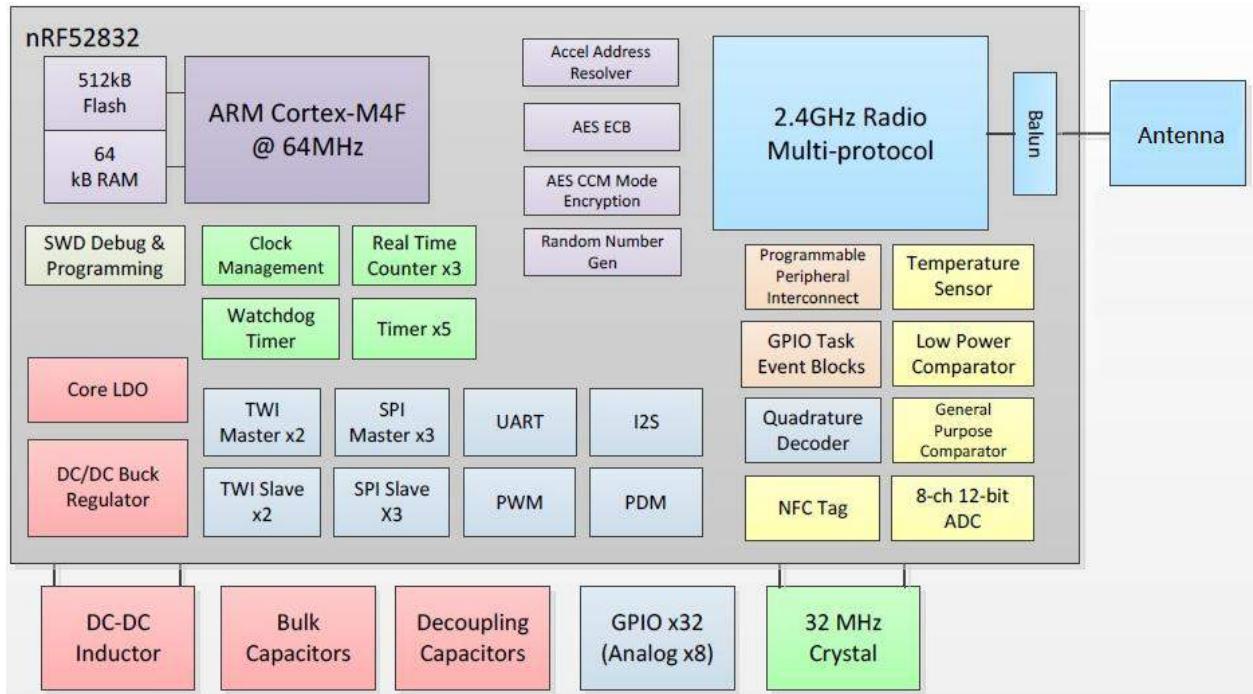
- - 2.4 GHz Bluetooth low energy systems
- - Proprietary 2.4 GHz systems
- - Sports and leisure equipment
- - Mobile phone accessories, Connected Appliances
- - Health Care and Medical
- - Consumer Electronics, Game pads
- - Human Interface Devices, Remote control
- - Building environment control / monitoring
- - RFID, Security Applications, Low-Power Sensors
- - Bluetooth Low Energy GateWay
- - iBeacons™, Eddystone™, Indoor navigation
- - Lighting Products
- - Fitness devices, Wearables

## Quick Specifications:

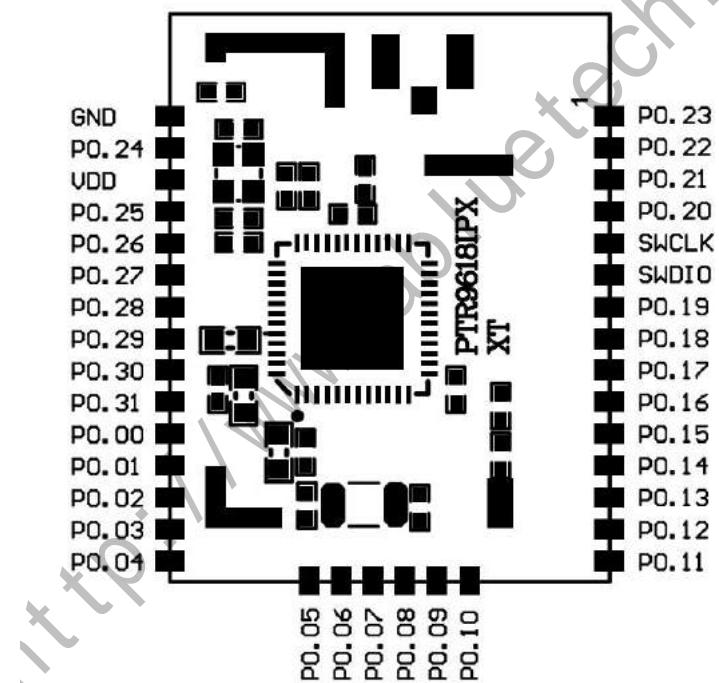
| Multi-protocol                         |   |
|--|---|
| Version                                | Bluetooth 5.0 and Higher/ANT/2.4GHz Proprietary |
| Security                               | AES-128   |
| Radio                                  |   |
| Frequency                              | 2402MHz-2480MHz                                 |
| Modulations                            | GFSK at 1 Mbps, 2 Mbps data rates               |
| Transmit power                         | 1.16dBm   |
| Receiver sensitivity                   | -96dBm (BLE mode)                               |
| Antenna                                | Integrated                                      |
| Current Consumption                    |   |
| TX only @ 0 dBm, @ 3V, DC/DC enabled   | 5.3 mA  |
| RX only @ 1 Mbps @ 3V, DC/DC enabled   | 5.4 mA  |
| CPU @ 64MHz from flash @ 3V, DC/DC     | 3.7 mA  |
| CPU @ 64MHz from flash RAM @ 3V, DC/DC | 3.3 mA  |
| System On                              | 1.2 $\mu$ A                                     |
| System Off                             | 0.7 $\mu$ A                                     |
| Additional current for RAM retention   | 20 nA / 4K block                                |
| Operating conditions                   |   |
| Power supply                           | 1.7~3.6V  |
| Operating temperature                  | -25~+85 °C                                      |

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## Block diagram:



## Pin Description of Module (Top View) :



# ABLUETECHNOLOGY

| Pin   | Name   | Description                        | Note                       |
|-------|--------|------------------------------------|----------------------------|
| Pin1  | P0.23  | Digital I/O                        |                            |
| Pin2  | P0.22  | Digital I/O                        |                            |
| Pin3  | P0.21  | Digital I/O                        | Configurable as pin reset. |
| Pin4  | P0.20  | Digital I/O                        |                            |
| Pin5  | SWDCLK | HW debug and flash programming I/O |                            |
| Pin6  | SWDIO  | HW debug and flash programming I/O |                            |
| Pin7  | P0.19  | Digital I/O                        |                            |
| Pin8  | P0.18  | Digital I/O                        |                            |
| Pin9  | P0.17  | Digital I/O                        |                            |
| Pin10 | P0.16  | Digital I/O                        |                            |
| Pin11 | P0.15  | Digital I/O                        |                            |
| Pin12 | P0.14  | Digital I/O                        |                            |
| Pin13 | P0.13  | Digital I/O                        |                            |
| Pin14 | P0.12  | Digital I/O                        |                            |
| Pin15 | P0.11  | Digital I/O                        |                            |
| Pin16 | P0.10  | Digital I/O                        | NFC2                       |
| Pin17 | P0.09  | Digital I/O                        | NFC1                       |
| Pin18 | P0.08  | Digital I/O                        |                            |
| Pin19 | P0.07  | Digital I/O                        |                            |
| Pin20 | P0.06  | Digital I/O                        |                            |
| Pin21 | P0.05  | Digital I/O                        | AIN3                       |
| Pin22 | P0.04  | Digital I/O                        | AIN2                       |
| Pin23 | P0.03  | Digital I/O                        | AIN1                       |
| Pin24 | P0.02  | Digital I/O                        | AIN0                       |
| Pin25 | P0.01  | Digital I/O                        |                            |
| Pin26 | P0.00  | Digital I/O                        |                            |
| Pin27 | P0.31  | Digital I/O                        | AIN7                       |
| Pin28 | P0.30  | Digital I/O                        | AIN6                       |
| Pin29 | P0.29  | Digital I/O                        | AIN5                       |
| Pin30 | P0.28  | Digital I/O                        | AIN4                       |
| Pin31 | P0.27  | Digital I/O                        |                            |
| Pin32 | P0.26  | Digital I/O                        |                            |
| Pin33 | P0.25  | Digital I/O                        |                            |
| Pin34 | VCC    | Power Supply                       |                            |
| Pin35 | P0.24  | Digital I/O                        |                            |
| Pin36 | GND    | Ground                             |                            |

Note: An internal 4.7 $\mu$ F bulk capacitor has been included on the module. For those application that with heavy GPIO usage and/or current draw, it is good design practice to add additional bulk capacitance as required for your application.

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## General Purpose I/O:

The general purpose I/O is organized as one port enabling access and control of the 32 available GPIO pins through one port. Each GPIO can be accessed individually with the following user configurable features:

- Input/output direction
- Output drive strength
- Internal pull-up and pull-down resistors
- Wake-up from high or low level triggers on all pins
- Trigger interrupt on all pins
- All pins can be used by the PPI task/event system; the maximum number of pins that can be interfaced through the PPI at the same time is limited by the number of GPIOE channels
- All pins can be individually configured to carry serial interface or quadrature demodulator signals

## Hardware RESET:

There is on-chip power-on reset circuitry, But can still be used in external reset mode, in this case, GPIO pin P0.21 as an external hardware reset pin. In order to utilize P0.21 as a hardware reset, the UICR registers PSELRESET[0] and PSELRESET[1] must be set alike, to the value of 0x7FFFFF15. When P0.21 is programmed as RESET, the internal pull-up is automatically enabled.

## HW debug and flash programming of Module :

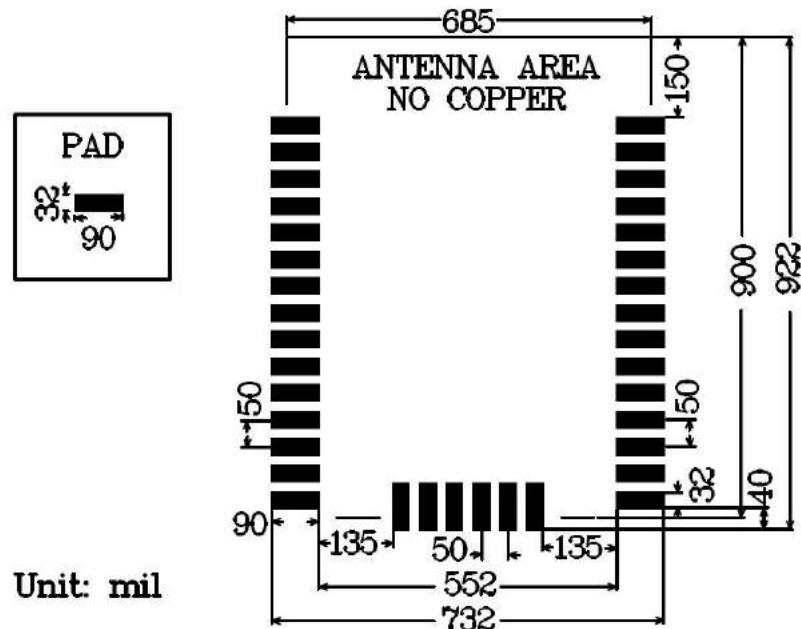
The Module support the two pin Serial Wire Debug (SWD) interface and offers flexible and powerful mechanism for non-intrusive debugging of program code. Breakpoints, single stepping, and instruction trace capture of code execution flow are part of this support.

| Pin   | Flash Program interface         |
|-------|---------------------------------|
| SWDIO | Debug and flash programming I/O |
| SWCLK | Debug and flash programming I/O |

This is the hardware debug and flash programming of module, J-Link Lite support, please refer [www.segger.com](http://www.segger.com).

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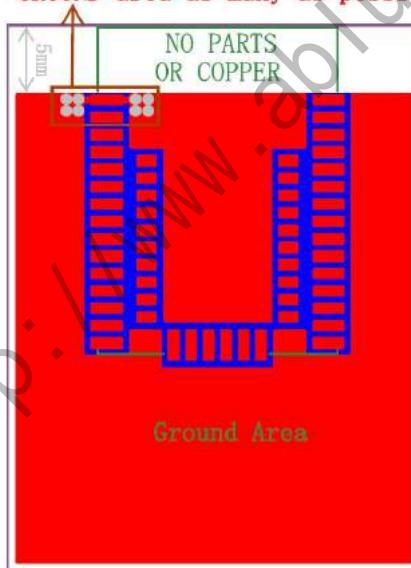
## PCB Footprint (Top View) :



## Recommended RF Layout & Ground Plane:

The module integrated antenna requires a suitable ground plane to radiate effectively. The area under and extending out from the antenna portion of the module should be kept clear of copper and other metal. The module should be placed at the edge of the PCB with the antenna edge facing out. Reducing the ground plane will reduce the effective radiated power. Please add as many via holes as possible on the mother board near the GND pin of module, this will be good for the RF performance of system board.

Please add via holes in  
GROUND area as many as possible.



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## Radio Specifications:

| Parameter                        | Min. | Typ. | Max. | Unit |
|----------------------------------|------|------|------|------|
| Frequency Range                  | 2402 |      | 2480 | MHz  |
| Maximum Output Power             |      | 1.16 |      | dBm  |
| Rx Sensitivity Level, @BLE1 Mbps |      | -96  |      | dBm  |
| Data Rate on air                 | 1000 |      | 2000 | kbps |
| Operating Temperature Range      | -40  | 25   | 85   | °C   |

## Radio current consumption (Transmitter):

| Parameter                                  | Min. | Typ. | Max. | Unit |
|--|------|------|------|------|
| TX only current (DC/DC, 3 V) PRF = 1.16dBm |      | 7.5  |      | mA   |
| TX only current (DC/DC, 3 V) PRF = +0 dBm  |      | 5.3  |      | mA   |
| TX only current (DC/DC, 3 V) PRF = 1.16dBm |      | 4.2  |      | mA   |
| TX only current (DC/DC, 3 V) PRF = -8 dBm  |      | 3.8  |      | mA   |
| TX only current (DC/DC, 3 V) PRF = -20 dBm |      | 3.2  |      | mA   |

## Radio current consumption (Receiver):

| Parameter                               | Min. | Typ. | Max. | Unit |
|---|------|------|------|------|
| RX only current (DC/DC, 3 V) 1 Mbps BLE |      | 5.4  |      | mA   |
| RX only current (DC/DC, 3 V) 2 Mbps BLE |      | 5.8  |      | mA   |

## Operating Conditions:

| Parameter                   | Min. | Typ. | Max. | Unit |
|-----------------------------|------|------|------|------|
| Supply voltages             |      |      |      |      |
| VDD                         | 1.7  | 3.0  | +3.6 | V    |
| Operating Temperature Range | -40  | 25   | 85   | °C   |

## Absolute Maximum Ratings:

| Parameter                                   | Min. | Max.           | Unit               |
|---|------|----------------|--------------------|
| Supply voltages                             |      |                |                    |
| VDD   | -0.3 | +3.9           | V                  |
| VSS   | 0    | 0              | V                  |
| I/O pin voltage                             |      |                |                    |
| Voltage on GPIO pins ( $V_{CC} \leq 3.6V$ ) | -0.3 | $V_{DD} + 0.3$ |                    |
| Voltage on GPIO pins ( $V_{CC} > 3.6V$ )    | -0.3 | +3.9           |                    |
| RF input level                              |      | 10             | dBm                |
| Environmental                               |      |                |                    |
| ESD Human Body Model                        |      | 2              | KV                 |
| ESD Human Body Model Class                  |      | 2              |                    |
| ESD Charged Device Model                    |      | 500            | V                  |
| Storage temperature                         | -40  | 125            | °C                 |
| Flash memory Endurance                      |      | 10000          | Write/erase cycles |

Note: Exceeding one or more of the limiting values may cause permanent damage to the module

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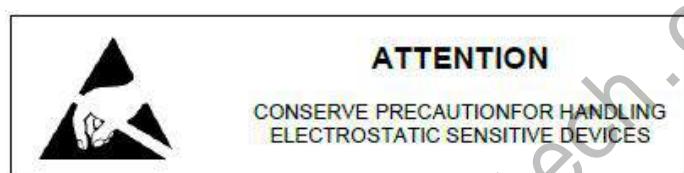
## Notes and Cautions:

### Design Notes

- (1) It is critical to following the recommendations of this document to ensure the module meets the specifications.
- (2) Power supply must be free of AC ripple voltage. If such noise is present, it is critical to provide proper filtering and decoupling.
- (3) The module should not be stressed mechanically after installation.
- (4) Exposing the module to significant temperatures will result in degradation and decreased lifetime.
- (5) Keep module away from other high frequency devices which may interfere with operation such as other transmitters and devices generating high frequencies.
- (6) Avoid static electricity, ESD and high voltage as these may damage the module.

### Handling and Storage

- (1) Keep module away from other high frequency devices which may interfere with operation such as other transmitters and devices generating high frequencies.
- (2) Do not expose the module to the following conditions: Corrosive gasses such as Cl<sub>2</sub>, H<sub>2</sub>S, NH<sub>3</sub>, SO<sub>2</sub>, or NO<sub>x</sub> Extreme humidity or salty air Prolonged exposure to direct Sunlight Temperatures beyond those specified for storage.
- (3) Do not apply mechanical stress.
- (4) Do not drop or shock the module.
- (5) Avoid static electricity, ESD and high voltage as these may damage the module.



### Moisture Sensitivity

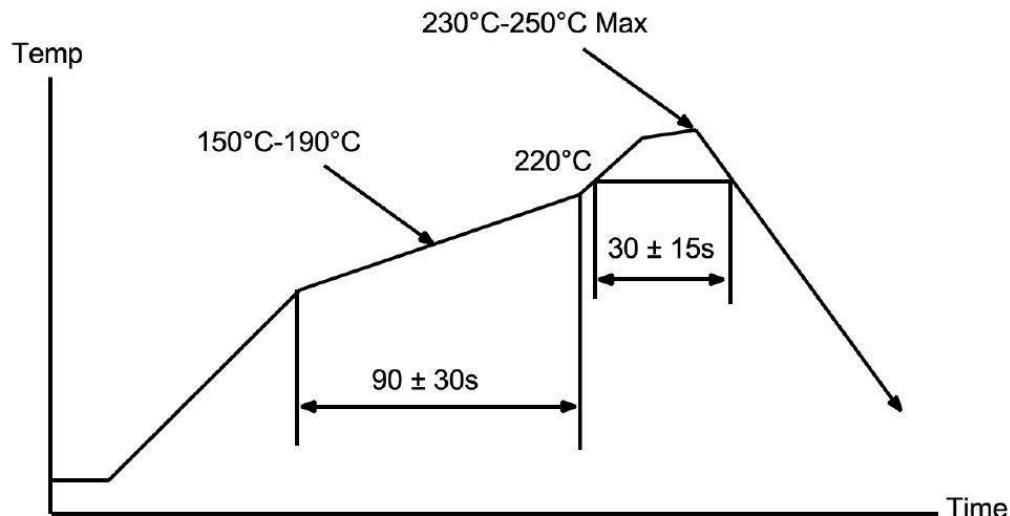
All plastic packages absorb moisture. During typical solder reflow operations when SMDs are mounted onto a PCB, the entire PCB and device population are exposed to a rapid change in ambient temperature. Any absorbed moisture is quickly turned into superheated steam. This sudden change in vapor pressure can cause the package to swell. If the pressure exerted exceeds the flexural strength of the plastic mold compound, then it is possible to crack the package. Even if the package does not crack, interfacial delamination can occur.

Since the device package is sensitive to moisture absorption, it is recommended to bake the product before assembly.



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## Solder Reflow Temperature-Time Profile



## Life Support Applications

Products are not designed for use in life support appliances, devices, or systems where malfunction of these products can reasonably be expected to result in personal injury. Customers using or selling these products for use in such applications do so at their own risk.

## Additional Customization

We provide extensive customization, design and manufacturing services to ensure the perfect fit for your product. Our wide selection of modules allows developers to create any number of products. Should you need more information and assistance in integrating this module or developing your product, please contact us.

- Custom Hardware design including Modules, RF and Antenna Design
- Bluetooth Low Energy and Firmware Development
- Mobile Apps for iOS and Android
- Cloud Platform

## Trademarks

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- Reserves the right to make corrections, modifications, and/or improvements to the product and/or its specifications at any time without notice.
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- We have a strict and careful check and collation, but can not guarantee this manual without any errors and omissions.
- The contents of this manual by copyright protection laws and regulations, without our prior written authorization of any person shall, in any way to copy the copy or manual, this manual will all or any part of any form in any cable or wireless network transmission, or be compiled and translated into any other format, text or code.

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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.

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

## ORIGINAL EQUIPMENT MANUFACTURER (OEM) NOTES

The OEM must certify the final end product to comply with unintentional radiators (FCC Sections 15.107 and 15.109) before declaring compliance of the final product to Part 15 of the FCC rules and regulations. Integration into devices that are directly or indirectly connected to AC lines must add with Class II Permissive Change.

The OEM must comply with the FCC labeling requirements. If the module's label is not visible when installed, then an additional permanent label must be applied on the outside of the finished product which states: "Contains transmitter module FCC ID: ZZOWCM-02".

Additionally, the following statement should be included on the label and in the final product's user manual:

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

The module is limited to installation in mobile or fixed applications. Separate approval is required for all other operating configurations, including portable configuration with respect to Part 2.1093 and different antenna configurations.

A module or modules can only be used without additional authorizations if they have been tested and granted under the same intended end-use operational conditions, including simultaneous transmission operations. When they have not been tested and granted in this manner, additional testing and/or FCC application filing may be required. The most straightforward approach to address additional testing conditions is to have the grantee responsible for the certification of at least one of the modules submit a permissive change application. When having a module grantee file a permissive change is not practical or feasible, the following guidance provides some additional options for host manufacturers. Integrations using modules where additional testing and/or FCC application filing(s) may be required are: (A) a module used in devices requiring additional RF exposure compliance information (e.g., MPE evaluation or SAR testing); (B) limited and/or split modules not meeting all of the module requirements; and (C) simultaneous transmissions for independent collocated transmitters not previously granted together.

This Module is full modular approval, it is limited to OEM installation ONLY.

Integration into devices that are directly or indirectly connected to AC lines must add with Class II Permissive Change. (OEM) Integrator has to assure compliance of the entire end product include the integrated Module. Additional measurements (15B) and/or equipment authorizations (e.g. Verification) may need to be addressed depending on co-location or simultaneous transmission issues if applicable. (OEM) Integrator is reminded to assure that these installation instructions will not be made available to the end user

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## Ordering Information:

| Part Number | Description   |
|-------------|---|
| WCM-02      | Coin-size Ultra-low power Bluetooth 5 ready<br>Multi-protocol System on Module          |
| PTR9618-EVB | Evaluation boards for module, with key, LED, I/O extend, sock<br>for coin cell battery. |

http://www.abluetech.com

## EU DECLARATION OF CONFORMITY

in accordance with

Annex VI of Directive 2014/53/EU of the European Parliament and of the Council

1. For the following Radio equipment: **McWong Wireless Control Module**

Product name / Number (s): **McWong Wireless Control Module/WCM-02**

Tradename or Brand: **McWong, TruBlu**

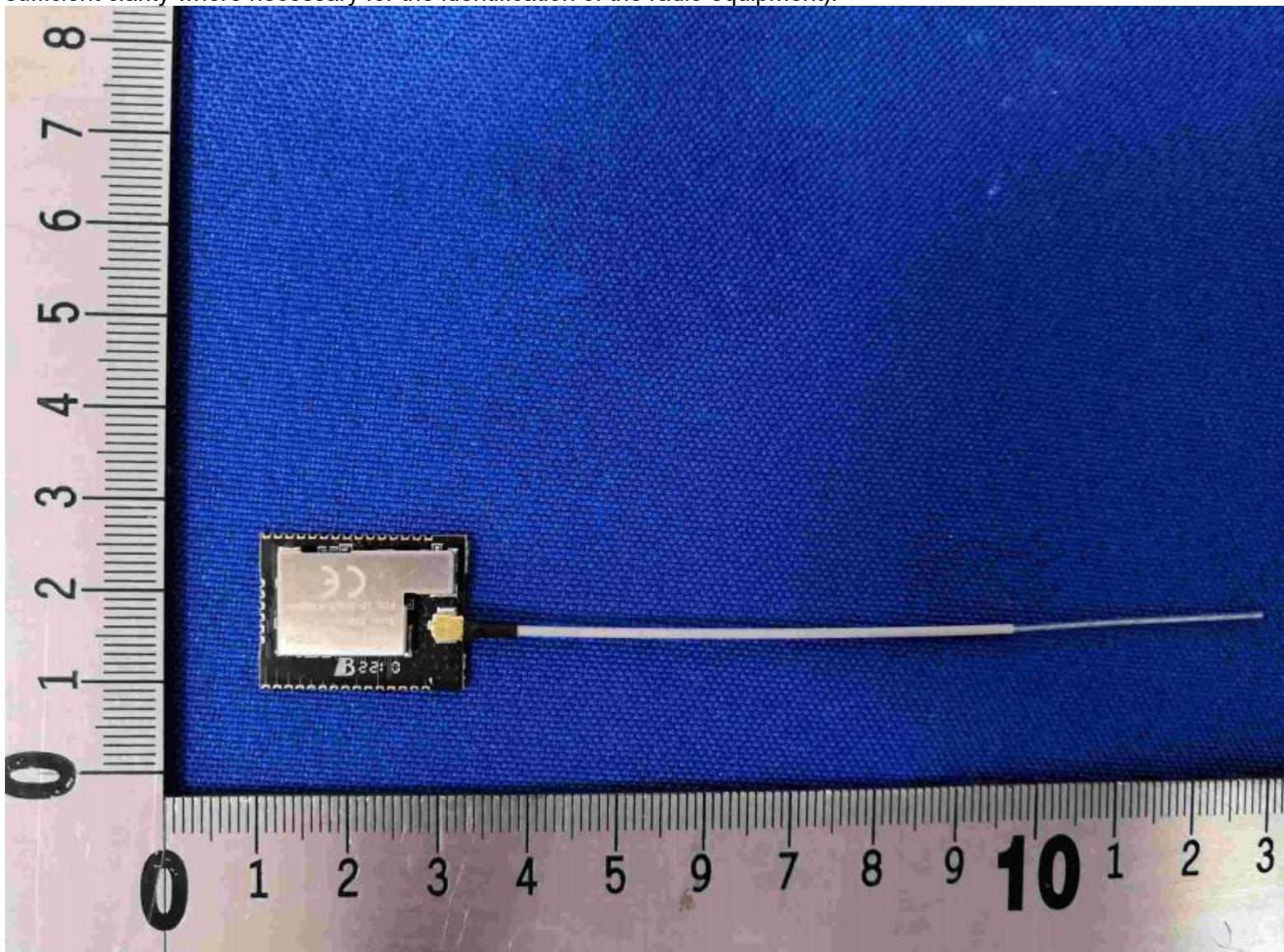
Software / Hardware number:N/A

2. Name and address of the manufacturer: **MW McWong Internatioanl Inc/1921 Arena Blvd, Sacramento, CA 95834, United States**

Manufacturer: **MW McWong Internatioanl Inc**

3. This declaration of conformity is issued under the sole responsibility of the Manufacturer.

4. Object of the declaration (identification of the radio equipment allowing traceability; it may include a colour image of sufficient clarity where necessary for the identification of the radio equipment):



5. The object of the declaration described above is in conformity with the relevant Union harmonization legislation: Directive 2014/53/EU (RED)

6. References to the relevant harmonized standards used or references to the other technical specifications in relation to which conformity is declared:

Article 3.2: ETSI ETSI EN 300 328 V2.2.2 (2019-07)

Article 3.1b: ETSI EN 301 489-1 V2.2.3(2019-11);ETSI EN 301 489-17 V3.2.4(2020-09)

Article 3.1a Health: IEC 62368-1:2018;EN IEC 62368- 1:2020+A11:2020

Article 3.1a Electrical Safety: IEC 62368-1:2018;EN IEC 62368-1:2020+A11:2020

7. Notified Body Name: Eurofins Electrical and Electronic Testing NA, Inc.

Notified Body Number: 0980

Notified Body Assessment Performed: Module B/C on Article 3.1a, 3.1b, 3.2 and 3.3

Technical File Identification Number: N/A

8. Where applicable, description of accessories and components, including software, which allow the radio equipment to operate as intended and covered by the EU declaration of conformity: User instructions are provided in the User Manual. The Software and Hardware versions are specified above.

9. Additional information:

Referring to Article 10.2 of the Directive, this equipment is so constructed that it can be operated in all Member States, without infringing applicable requirements on the use of radio spectrum.

Referring to Article 10.10 of the Directive, there are no restrictions on putting this equipment into service or of requirements for authorisation of use. Please refer to the User Manual for details.

On behalf of:

Manufacturer: **MW McWong Internatioanl Inc**

Add:1921 Arena Blvd, Sacramento, CA 95834, United States

(place and date of issue): USA 2022-6-30

(name, function): Sam, PM

(signature): *Sam*