

# VTX-WBM-N12

USER MANUAL

## REVISION HISTORY

| Version No. | Revised Date | Revised by | Description                      | Notes    |
|-------------|--------------|------------|----------------------------------|----------|
| 1.0         | 2019-03-15   | Sam        | Preliminary User Manual released | Proposal |
| 1.1         | 2021-02-08   | Sam        | Remove BT function               |          |
| 1.2         | 2021-02-22   | Stephen    | Modify warning content           |          |
|             |              |            |                                  |          |
|             |              |            |                                  |          |
|             |              |            |                                  |          |

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## 1 INTRODUCTION

### 1.1 DESCRIPTION

VTX-WBM-N12 is a complete WiFi and MCU module which is designed for embedded wireless solution and a cost-effective, low power capabilities high performance MCU in IOT applications.

The module integrates ARM Cortex™-M4 MCU with FPU, clock, WiFi and front end. It is based on Cypress IEEE802.11 b/g/n single-stream. Thus, it can be used to enable wireless connectivity to the simplest existing sensor product with minimal engineering effort.

### 1.2 FEATURES

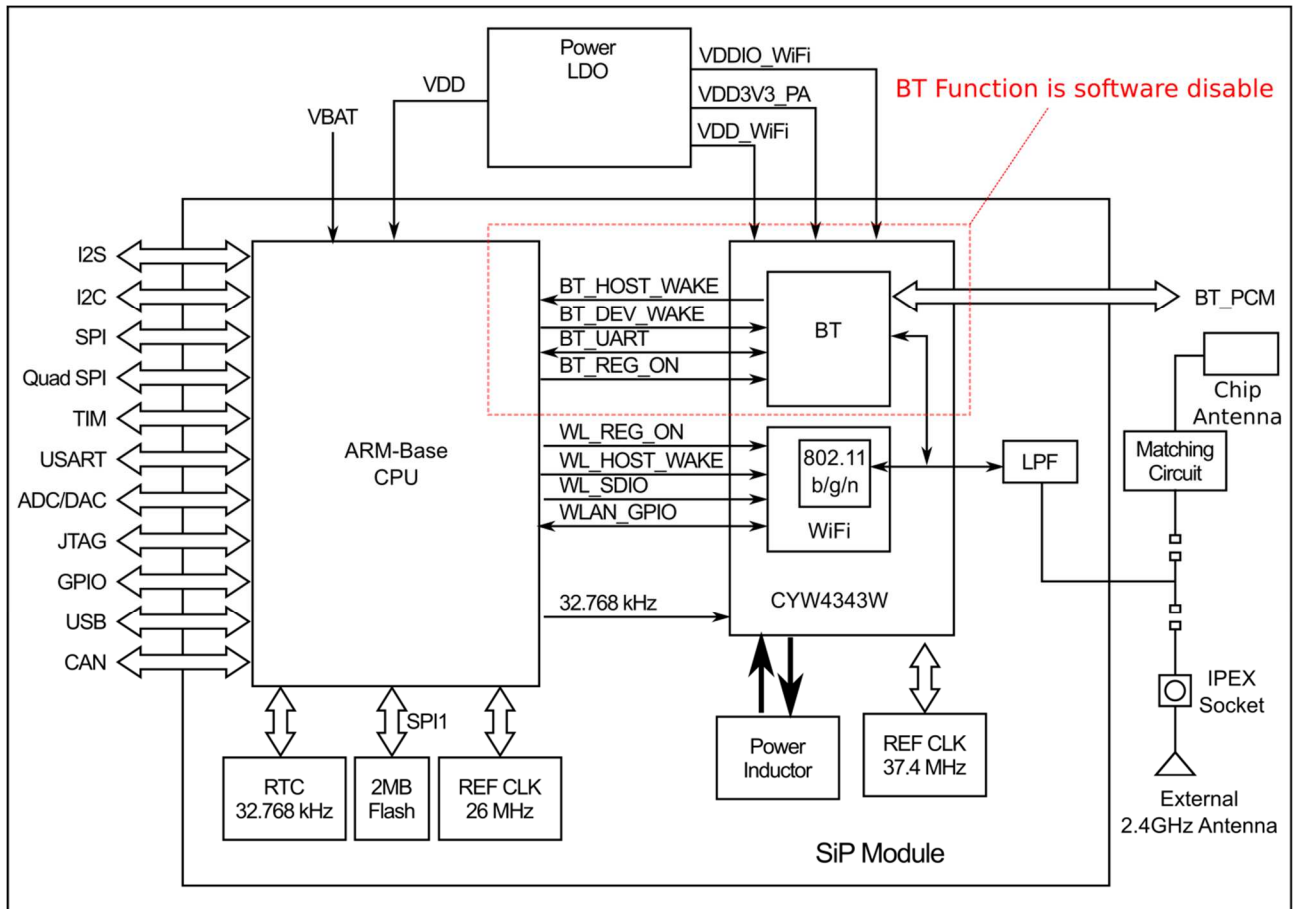
The module comprises the following functions

- MCU STM32 ARM 32-bit Cortex™-M4 Frequency up to 100MHz
- Memory capacity 1 Mbyte of MCU internal Flash,  
256KB of SRAM,  
2Mbyte of SPI Flash
- Diverse serial interface SPI, Quad SPI (support Dual mode), USART, PCM
- Sensor applications support ADC, I2C, I2S, GPIO, Timers
- Debug interface support JTAG
- On-chip functionality Single-chip MAC/BB/RF
- Frequency Band 2.4 GHz
- Network Standard 802.11b, 802.11g, 802.11n (single stream)
- Modulation Modes WiFi: CCK and OFDM with BPSK, QPSK, 16QAM, 64QAM, 256QAM
- Hardware Encryption WEP, WPA/WPA2
- Supported Data Rates IEEE 802.11b 1 – 11 Mbps  
IEEE 802.11g 6 – 54 Mbps  
IEEE802.11n (2.4 GHz) 7.2 – 150 Mbps
- Advanced 1x1 802.11n features Full/Half Guard Interval  
Fram Aggregation  
Space Time Block coding (STBC)  
Low Density Parity Check (LDPC) Encoding

- BRCM WICED Fully compatible
- Operating Temperature -40°C to 85°C
- Antenna

| Gain     | Type           | Connector |
|----------|----------------|-----------|
| 5.05 dBi | Chip Antenna   | Fixed     |
| 5.09 dBi | Dipole Antenna | SMA       |

## 2 BLOCK DIAGRAM



- ADC Analog to Digital Converter
- DAC Digital to Analog Converter
- I2C Intelligent Interface Controller
- SPI Serial Peripheral Interface
- Quad SPI Quad Serial Peripheral Interface
- USART Universal synchronous/asynchronous receiver transmitters
- TIM Timers
- I2S Inter-integrated sound
- CAN Controller area network

### 3 MODULE DESCRIPTION

#### 3.1 MODULE APPEARANCE

|   |   |   |
|---|---|---|
|  |  |  |
| Top   | Top (with RF shielding)   | Bottom  |

#### 3.2 COMPONENT DESCRIPTION

- J1 External antenna socket
- ANT1 On board chip antenna
- R3 Jump for external antenna using
- R4 Jump for chip antenna using

#### 3.3 ANTENNA LIST

- Antenna 1

Antenna Gain : 5.05 dBi

Antenna Type : Chip Antenna

Connector Type : Fixed







## 4 ADDITION INFORMATION

### 4.1 I<sup>2</sup>C INTERFACE

#### Characteristics

| Symbol                                     | Parameter   | Standard mode <sup>(1)</sup> |                     | Fast mode <sup>(1)(2)</sup> |                    | Unit |
|--|---|------------------------------|---------------------|-----------------------------|--------------------|------|
|  |   | Min                          | Max                 | Min                         | Max                |      |
| t <sub>w(SCLL)</sub>                       | SCL clock low time  | 4.7                          | -                   | 1.3                         | -                  | μs   |
| t <sub>w(SCLH)</sub>                       | SCL clock high time   | 4.0                          | -                   | 0.6                         | -                  |      |
| t <sub>su(SDA)</sub>                       | SDA setup time  | 250                          | -                   | 100                         | -                  | ns   |
| t <sub>h(SDA)</sub>                        | SDA data hold time  | 0                            | 3450 <sup>(3)</sup> | 0                           | 900 <sup>(4)</sup> |      |
| t <sub>r(SDA)</sub><br>t <sub>r(SDL)</sub> | SDA and SCL rise time   | -                            | 1000                | -                           | 300                |      |
| t <sub>f(SDA)</sub><br>t <sub>f(SDL)</sub> | SDA and SCL fall time   | -                            | 300                 | -                           | 300                |      |
| t <sub>h(STA)</sub>                        | Start condition hold time   | 4.0                          | -                   | 0.6                         | -                  | μs   |
| t <sub>su(STA)</sub>                       | Repeated Start condition setup time   | 4.7                          | -                   | 0.6                         | -                  |      |
| t <sub>su(STO)</sub>                       | Stop condition setup time   | 4.0                          | -                   | 0.6                         | -                  | μs   |
| t <sub>w(STO:STA)</sub>                    | Stop to Start condition time (bus free)   | 4.7                          | -                   | 1.3                         | -                  | μs   |
| t <sub>SP</sub>                            | Pulse width of the spikes that are suppressed by the analog filter for standard fast mode | 0                            | 50 <sup>(5)</sup>   | 0                           | 50 <sup>(5)</sup>  | μs   |
| C <sub>b</sub>                             | Capacitive load for each bus line   | -                            | 400                 | -                           | 400                | pF   |

1. Guaranteed by design, not tested in production.
2. f<sub>PCLK1</sub> must be at least 2MHz to achieve standard mode I<sup>2</sup>C frequencies. It must be at least 4MHz to achieve fast mode I<sup>2</sup>C frequencies, and a multiple of 10MHz to reach the 400kHz maximum I<sup>2</sup>C fast mode clock.
3. The device must internally provide a hold time of at least 300ns for the SDA signal in order to bridge the undefined region of the falling edge of SCL
4. The maximum data hold time has only to be met if the interface does not stretch the low period of SCL signal.

## Federal Communication Commission Interference Statement

### 15.19

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.

### 15.105

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.

### FCC RF Radiation Exposure Statement:

This module is intended for OEM integrator. The OEM integrator is still responsible for the FCC compliance requirement of the end product, which integrates this module. 20cm minimum distance has to be able to be maintained between the antenna and the users for the host this module is integrated into. Under such configuration, the FCC radiation exposure limits set forth for an population/uncontrolled environment can be satisfied.

Any changes or modifications not expressly approved by the manufacturer could void the user's authority to operate this equipment. The module has been tested for compliance to FCC Part 15.247.

### USERS MANUAL OF THE END PRODUCT:

In the users manual of the end product, the end user has to be informed to keep at least 20cm separation with the antenna while this end product is installed and operated. The end user has to be informed that the FCC radio-frequency exposure guidelines for an uncontrolled environment can be satisfied. 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.

If the size of the end product is smaller than 8x10cm, then additional FCC part 15.19 statement is required to be available in the users manual:

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.

### **LABEL OF THE END PRODUCT:**

The final end product must be labeled in a visible area with the following " Contains TX FCC ID: 2AXR2VTC-WM-N12V01 ". If the size of the end product is larger than 8x10cm, then 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.

### **Industry Canada statement:**

This device complies with Industry Canada's licence-exempt RSSs. Operation is subject to the following two conditions:

- (1) This device may not cause interference; and
- (2) This device must accept any interference, including interference that may cause undesired operation of the device.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence.

L'exploitation est autorisée aux deux conditions suivantes :

- 1) l'appareil ne doit pas produire de brouillage;
- 2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

### **Radiation Exposure Statement:**

OEM integrator is still responsible for testing their end product for any additional compliance requirements required with this module installed (for example, digital device emissions, PC peripheral requirements, etc.).

### **IMPORTANT NOTE:**

In the event that these conditions cannot be met (for example certain laptop configurations or co-location with another transmitter), then the IC authorization is no longer considered valid and the IC No. 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 IC authorization.

### **Déclaration d'exposition aux rayonnements:**

L'intégrateur OEM est toujours responsable du test de son produit final pour toutes les exigences de conformité supplémentaires requises avec ce module installé (par exemple, émissions de périphériques numériques, exigences des périphériques PC, etc.).

### **REMARQUE IMPORTANTE:**

Si ces conditions ne peuvent être remplies (par exemple, certaines configurations d'ordinateur portable ou la co-implantation avec un autre émetteur), l'autorisation IC n'est plus considérée comme valide et le numéro IC ne

peut pas être utilisé sur le produit final. Dans ces circonstances, l'intégrateur OEM sera responsable de réévaluer le produit final (y compris l'émetteur) et d'obtenir une autorisation IC distincte.

**USERS MANUAL OF THE END PRODUCT:**

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.

**Manuel d'information à l'utilisateur final**

L'intégrateur OEM doit être conscient de ne pas fournir des informations à l'utilisateur final quant à la façon d'installer ou de supprimer ce module RF dans le manuel de l'utilisateur du produit final qui intègre ce module.

Le manuel de l'utilisateur final doit inclure toutes les informations réglementaires requises et avertissements comme indiqué dans ce manuel.

**LABEL OF THE END PRODUCT:**

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 labeled in a visible area with the following: "Contains transmitter module IC: 26568- VTCWMN12V01 "

**ETIQUETTE DU PRODUIT FINAL:**

Ce module émetteur est autorisé uniquement pour être utilisé dans un appareil où l'antenne peut être installée de telle sorte que 20 cm puissent être maintenus entre l'antenne et les utilisateurs. Le produit final doit être étiqueté dans une zone visible avec les éléments suivants: "Contient le module émetteur IC: 26568-VTCWMN12V01"