芯海科技
CHIPSEA

CSM64F02 User Manual

802.11 b/g/n IoT WiFi Module

REV 1.1

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Revision History

Revision	History	Revision Date
REV 1.0	Initially issued	April 28, 2017
REV 1.1	Add Electrostatic Discharge in chapter 5.1	May 25, 2017
REV 1.2	Add FCC note at page 9 Modify lable to reduce the FCC/CE Logo	June 1, 2017

Contents

1 Product Description

1.1 Functional Description

CSM64F02 is a 802.11b/g/n Wi-Fi module developed by CHIPSEA in allusion to Internet of Things. The module integrates 32-bit high-speed CPU, TCP/IP protocol stack, RTOS, WiFi RF front end and onboard antenna, supports ADC/ SPI/ UART/ I2C/ PWM and other IO, with small packagee and low power consumption. It can be used widely for Internet of Things such as intelligent household electrical appliance, intelligent outlet, intelligent health device, robot and industrial wireless control etc.

CHIPSEA provides one-stop solution including product design, APP development and IoT cloud etc. on the basis of CSM64F02. Thus, the users may concentrate on their own creativity and application and put the products into market rapidly.

1.2 Features

Basic feations

- Built-in 32-bit ultra-low power CPU
- Supporting real-time operating system (RTOS)
- Integrating 16Mb SPI Flash

WiFi

- Built-in TCP/IP protocol stack
- Supporting 802.11b/g/n
- Networking protocol:
  - IPv4, TCP / UDP / HTTP / FTP
- Wireless working mode:
  - Station / SoftAP / SoftAP + Station
- Security mechanism:
  - WPA / WPA2
- Encryption type:
  - WEP / TKIP / AES
- Supporting Smart Config function
- Onboard 2dBi WiFi antenna

Peripherals

- 11 GPIOs
- 1 UART interface and 1 debug serial port
- 1 × SPI interface
- 1 × I2C interface
- 1× PWM output
- 1 × ADC

Low power features

- Supporting multiple sleep mode; stand-by power consumption is as low as 1mW
- Quick wake-up speed

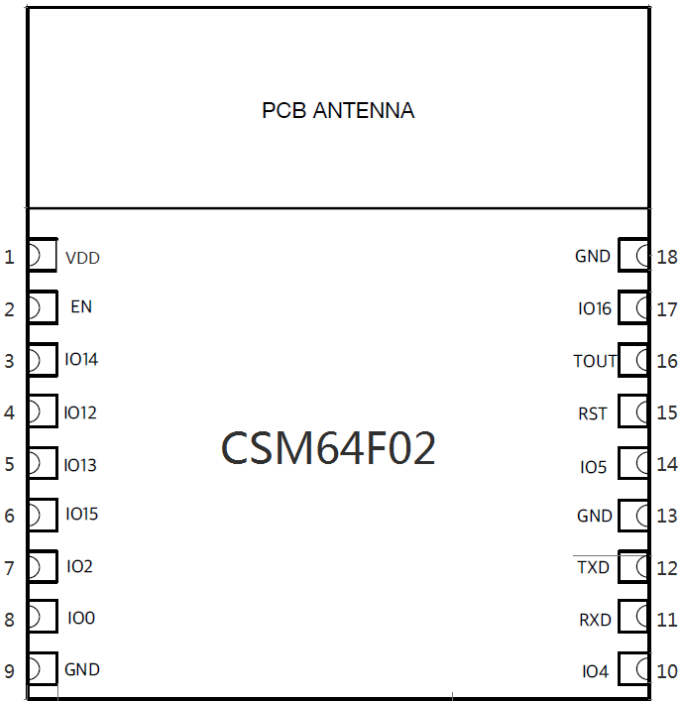
Operating environment

- Scope of operating voltage: 2.7V ~ 3.6V
- Scope of operation temperature: -20℃ ~ 85℃

Package

- SMD-16 packaging
- Dimensions: 16mm × 24mm× 3mm

2 Pin Definition



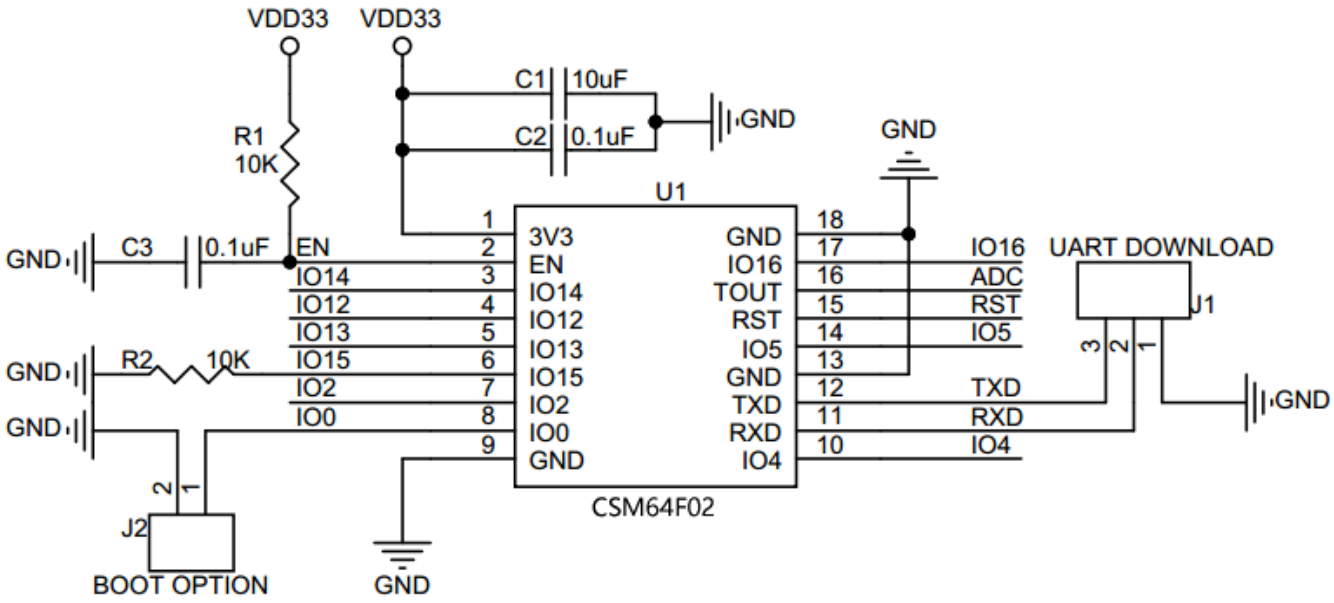
Pin Definition

No.	Name	Functions
1	VDD	3.3V power supply. Recommended power capacity is 500mA.
2	EN	Module enable pin; enable at high level
3	IO14	GPIO14; HSPI_CLK
4	IO12	GPIO12; HSPI_MISO
5	IO13	GPIO13; HSPI_MOSI; UART0_CTS
6	IO15	GPIO15; MTDO; HSPICS; UART0_RTS Pull down from outside
7	IO2	GPIO2; UART1_TXD Floating (pull up from inside) or pull up from outside
8	IO0	GPIO0 Boot mode selection: - Pull down: UART downloading; - Floating or pull up: Boot from Flash
9	GND	Ground
10	IO4	GPIO4
11	RXD	UART0_RXD , GPIO3

12	TXD	UART0_TXD, GPIO1
13	GND	Ground
14	IO5	GPIO5
15	RST	Reset pin
16	TOUT	ADC port, detect VDD or input voltage of TOUT pin
17	IO16	GPIO16, Can be connected to RST to wake up frome deep sleep
18	GND	Ground

3 Reference Design

3.1 Schematic



Schematic of Peripheral Design

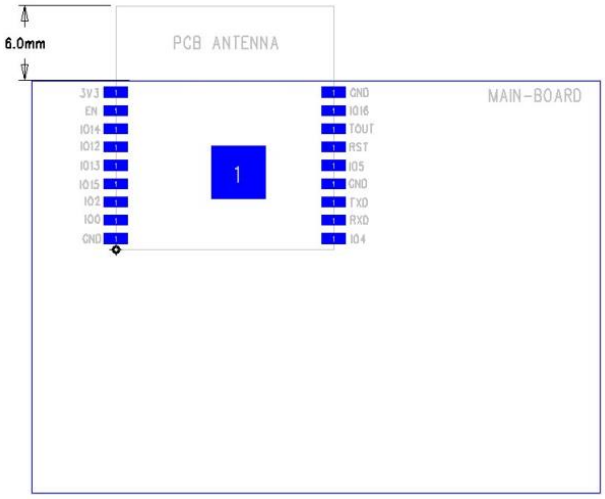
Note: GPIO0 / 2 / 15 also serves as boot mode selection pin and should be paid special attention when being used.

	External Connection	Normal Start-up	UART Downloading Mode
GPIO15	Pull down 10K to the ground	Low	Low
GPIO0	Pull up or floating	High	Low
GPIO2	Pull up or floating	High	High

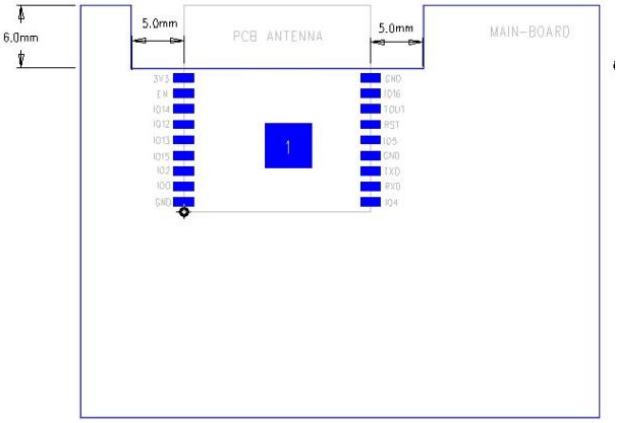
3.2 Placement of Antenna

CSM64F02 module uses 2.4G Wi-Fi MIFA onboard antenna with 2dBi gain. When placing the antenna, please refer to recommended scheme 1 or scheme 2; the effect of schemes 3, 4 and 5 is bad, so please avoid those schemes when designing the product.

3.2.1 Recommended Scheme



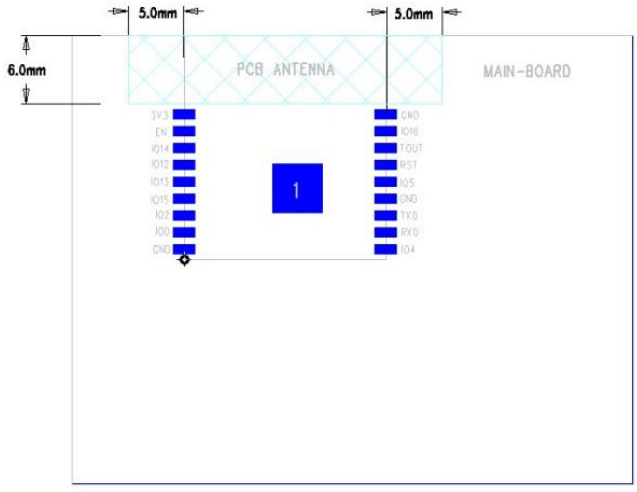
Scheme 1: Antenna is out of the Board



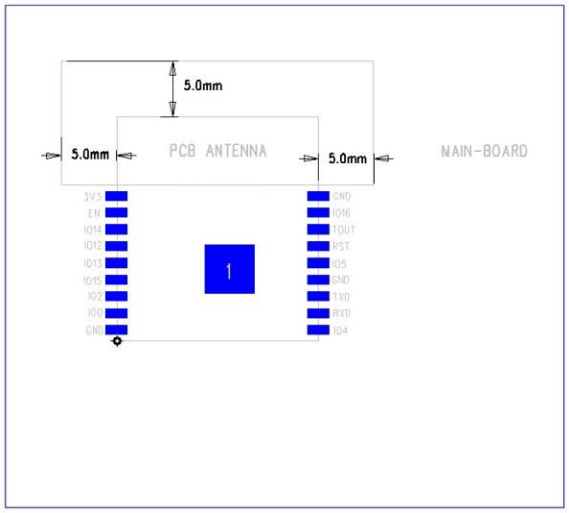
Scheme 2: Antenna is at Board Edges with Keep-Space

3.2.2 Not Recommended Schemes

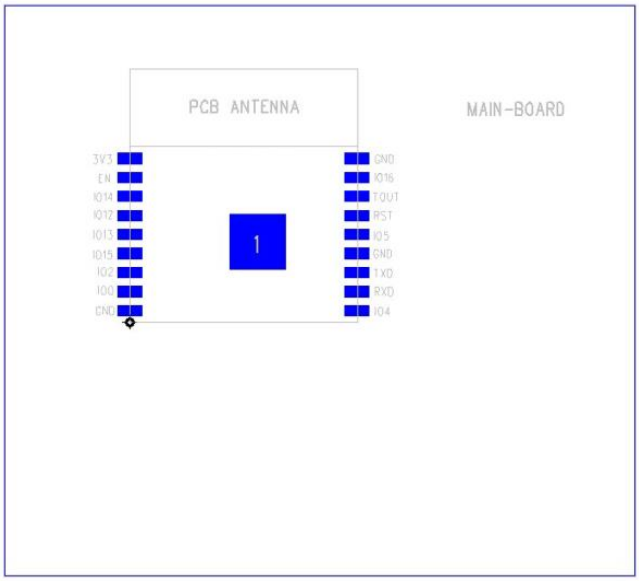
Actually measured effects of schemes 3, 4 and 5 are bad. Please do not use those three schemes when designing product.



Scheme 3: Antenna is at Board Edges with Cleared Space below



Scheme 4: Antenna is in Board Frame with Cleared Space below



Scheme 5: Antenna is Placed in Board Frame with Uncleared Space below

5 Electrical Characteristics

5.1 Absolute Maximum Rationgs

Name	Conditions	Values	Unit
Storage temperature		-40 ~ 85	℃
Max. welding temperature		260	℃
Power supply voltage	IPC/JEDEC J-STD-020	+2.7 ~ +3.6	V
Electrostatic Dsicharge (HBM)	T_{AMP}=25℃	≤2	KV
Electrostatic Dsicharge (CDM)	T_{AMP}=25℃	≤0.5	KV

5.2 Recommended Operating Environment

Name	Symbol	Min. Value	Typical Value	Max. Value	Unit
Operating temperature	T_{OP}	-20	20	+85	℃
Power supply voltage	VDD	2.7	3.3	3.6	V

5.3 RF Performance

Name		Min. Value	Typical Value	Max. Value	Unit
Operating frequency		2412		2484	MHz
Transmitted power	802.11b @11Mbps		19		dBm
	802.11g @54Mbps		14		dBm
	802.11n @HT20, MCS7		13		dBm
Receiving sensitivity	802.11b @11Mbps		-85		dBm
	802.11g @54Mbps		-75		dBm
	802.11n @HT20, MCS7		-72		dBm

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.

This device complies with part 15 of the FCC rules. Operation is subject to the following twoconditions:

(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 to this unit not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

5.4 Power Consumption

Name	Min. Value	Typical Value	Max. Value	Unit
Transmit 802.11b @11 Mbps P_{OUT} = +17 dBm		170		mA
Transmit 802.11g @54 Mbps P_{OUT} = +15 dBm		140		mA
Transmit 802.11n @MCS7 P_{OUT} = +13 dBm		120		mA
Receive 802.11b; package length 1024 bytes, -80 dBm		50		mA
Receive 802.11g; package length 1024 bytes, -70 dBm		56		mA
Receive 802.11n; package length 1024 bytes, -65 dBm		56		mA
Modem-Sleep①		15		mA
Light-Sleep②		0.9		mA
Deep-Sleep③		20		μA
Shut-down		0.5		μA

Attention:

① Modem-Sleep is used for the application requiring CPU always in operating state such as PWM or I2S applications etc. When maintaining Wi-Fi connection, it is allowed to turn off Wi-Fi Modem circuit to save power consumption according to 802.11 standard (such as U-APSD) when there is no data transmission. For example, in the configuration of DTIM3, it will wake up for 3ms to receive Beacon packet from AP after sleeping every 300ms, and the averange current is about 15mA.

② Light-Sleep is used for the application with CPU suspendable such as Wi-Fi switch. When maintaining Wi-Fi connection, it is allowed to turn off Wi-Fi Modem circuit and suspend CPU to save power consumption according to 802.11 standard (such as U-APSD) when there is no data transmission. For example, in the event of DTIM3, it will wake up for 3ms to receive Beacon packet from AP after sleeping every 300ms, and the averange current will be about 9mA.

③ Deep-Sleep is used for the application without the need to always maintain Wi-Fi connection and transmitting one data packet for a long time such as the sensor measuring temperature every 100s. For example, it will wake up for 0.3s - 1s every 300s and connect to AP to transmit data, and the averange current may be far smaller than 1mA.

5.5 Ramp up

Indexes	Values
Ramp up rate (T_S Max to T_L)	≤3℃/s
Preheating Min. temperature value (T_S Min) Typical temperature value (T_S Typ) Max. temperature value (T_S Max) Time	 150℃ 175℃ 200℃ 60 ~ 180s
Ramp up rate (T_L to T_P)	≤3℃/s
Above time of duration: temperature (T_L)/ time (T_L)	217℃/ 60~150s
Peak value of temperature (T_P)	Max. temperature value is 260℃ and duration is 10s
Target peak value of temperature (T_P target value)	260℃ +0/-5℃
Time of duration within actual peak value (T_P) 5℃	20~40s
Ramp down rate (T_S Max to T_L)	≤6℃/s
Time adjusting from 25℃ to peak value of temperature	Max. 8min.

6 Label and Ordering Information

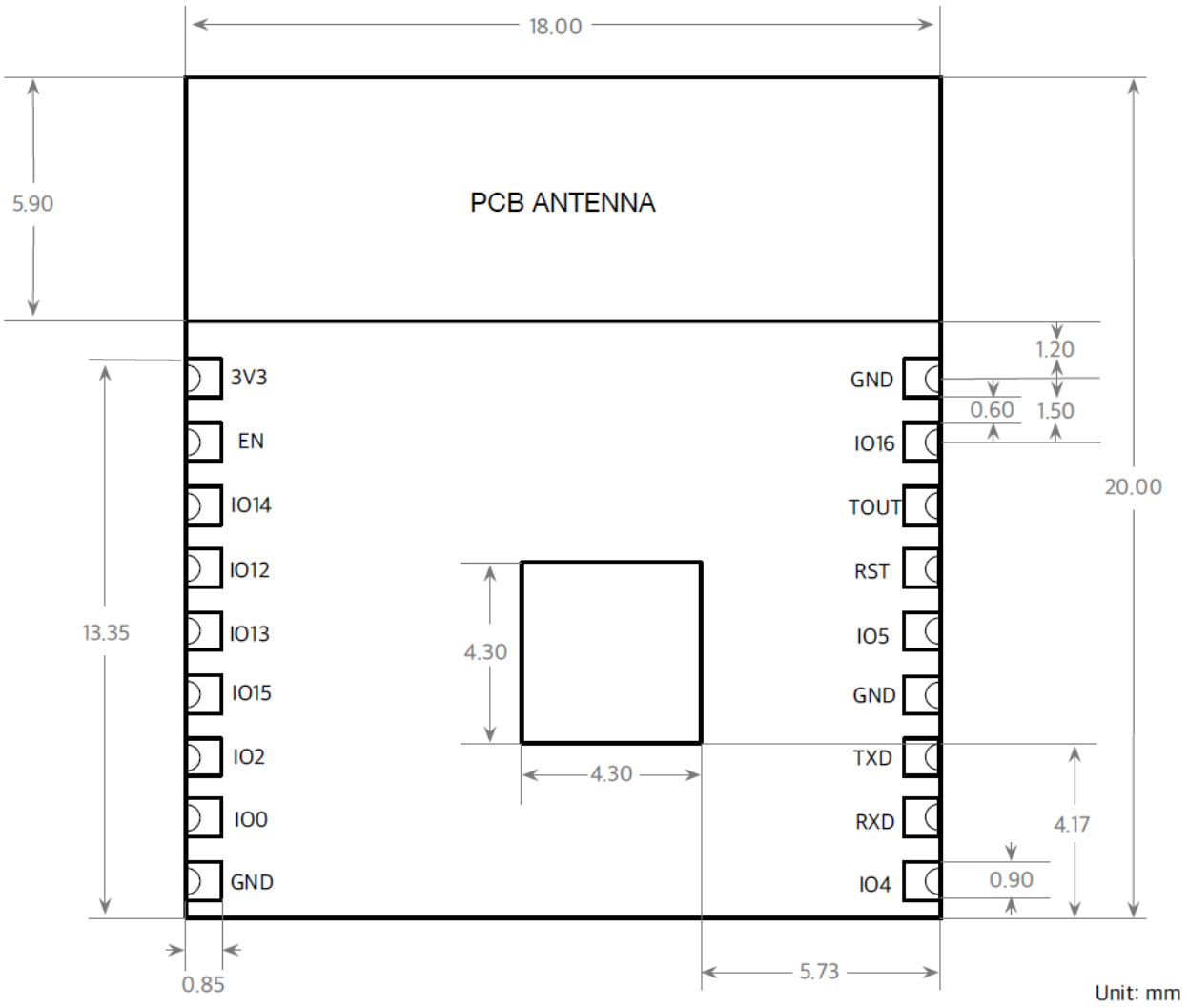
6.1 Label Description

CSM64F02: Part No.
1716: Date Code
MAC: MAC address
QR code: QR code of MAC address

6.2 Ordering Information

Model	Description
CSM64F02	Integrating 16M bit Flash

7 Packaging Infomation



Packaging Dimension
(Top View)

Host 15B and 15C compliance statement

A host product itself is required to comply with all other applicable FCC equipment authorization regulations, requirements, and equipment functions that are not associated with the transmitter module portion. For example, compliance must be demonstrated: to regulations for other transmitter components within a host product; to requirements for unintentional radiators (Part 15 Subpart B), such as digital devices, computer peripherals, radio receivers, etc.; and to additional authorization requirements for the non-transmitter functions on the transmitter module (i.e., Verification or Declaration of Conformity) as appropriate (e.g., Bluetooth and Wi-Fi transmitter modules may also contain digital logic functions).

The OEM integrator or the host manufacturer is responsible for the overall compliance of the host products

FCC statement

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.

RF exposure statement

Human exposure to RF emissions from mobile devices (47 CFR §2.1091) may be evaluated based on the MPE limits adopted by the FCC for electric and magnetic field

strength and/or power density, as appropriate, since exposures are assumed to occur at distances of 20 cm or more from persons.

Module statement

The single-modular transmitter is a self-contained, physically delineated, component for which compliance can be demonstrated independent of the host operating conditions, and which complies with all eight requirements of § 15.212(a)(1) as summarized below.

1) The radio elements have the radio frequency circuitry shielded.

2) The module has buffered modulation/data inputs to ensure that the device will comply with Part 15 requirements with any type of input signal.

3) The module contains power supply regulation on the module.

4) The module contains a permanently attached antenna.

5) The module demonstrates compliance in a stand-alone configuration.

6) The module is labeled with its permanently affixed FCC ID label

7) The module complies with all specific rules applicable to the transmitter, including all the conditions provided in the integration instructions by the grantee.

8) The module complies with RF exposure requirements.

FCC statement

The final host device, into which this RF Module isintegrated" hasto be labelled with an auxilliary lable stating the FCC IDofthe RF Module,such as"

"Contains FCC ID:2AGM5CSM64F02"

This device is acting as slave and operating in the 2.4 GHz (2412 ~2462 MHz) band.

Ad Hoc function is supported but not able to operate on non-US frequencies.

Do not use the device with the environment which below minimum -10 ℃ or maximum over 50℃ .

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

This transmitter/module must not be collocated or operating in conjunction with any other antenna or transmitter except in accordance with the FCC multi-transmitter product procedures.

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