M39 Module Datasheet

Document version: 20210511

contents

1 product description

M39 is a low-power embedded Wi-Fi module developed by Huayulian Technology. It consists of a highly integrated radio frequency core
It is composed of BK7231T and a small number of peripheral devices, built-in Wi-Fi network protocol stack and rich library functions. M39 built-in low power consumption
32-bit MCU, 2Mbyte flash memory, 256KB SRAM and abundant peripheral resources. M39 is a function library equipped with RTOS platform that integrates all Wi-Fi MAC and TCP/IP protocols. Users can develop embedded Wi-Fi products that meet their needs based on these
。

1.1characteristic

- Built-in low-power 32-bit CPU, which can double as an application processor
- basic frequency support: 120MHz
- Operating Voltage：3.3±0.3V
- Peripherals：5×GPIOs
- Wi-Fi Connectivity
  - 802.11 b/g/n
  - passageway 1-14@2.4GHz
  - Support WPA/WPA2 security mode
  - Maximum in 802.11b mode +18dBm output power
  - Support STA/AP/STA+AP working mode
  - Supp ort SmartConfig and AP two network configuration methods (inclding Android and IOS devices)
  - PCB onboard antenna, antenna gai 1.2dBi
  - Operati ng temperature：-20℃ to 105℃
- BLE Connectivity
  - Support bluetooth（V4.2）
  - Maximum output p ower +4dBm
  - PCB onboard antenna, antenna gain 1.2dBi

1.2Application field

- Smart building
- Smart Home/Home Appliances
- Smart sockets, smart lights

- Industrial wireless control
- Baby Monitor
- Webcam
- Smart bus

1.3 Version update instructions

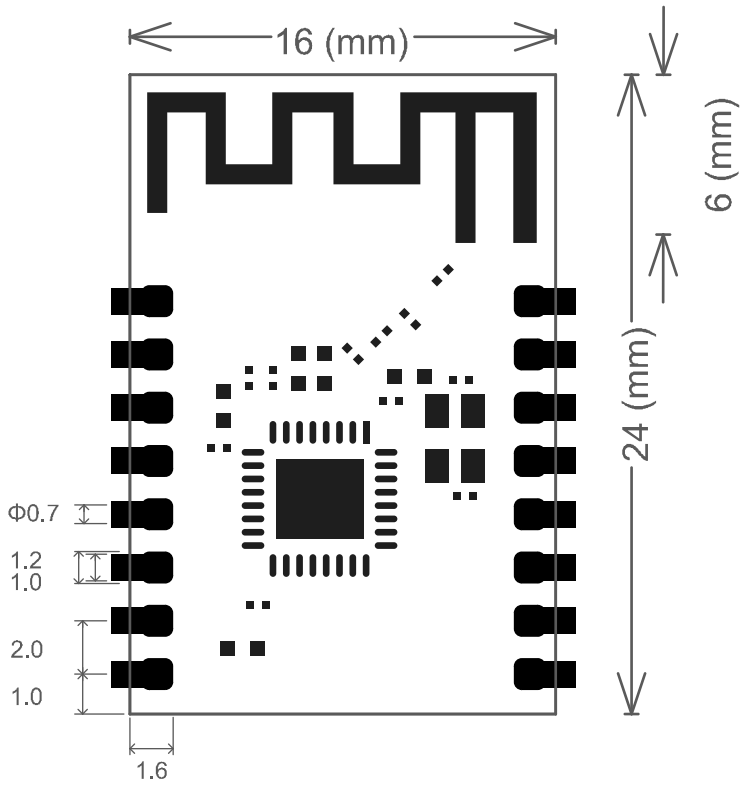
Serial number	Update date	Update content	Updated version
1	2021-05-11	New document	V1.0.0

2 Module interface

2.1 size-package

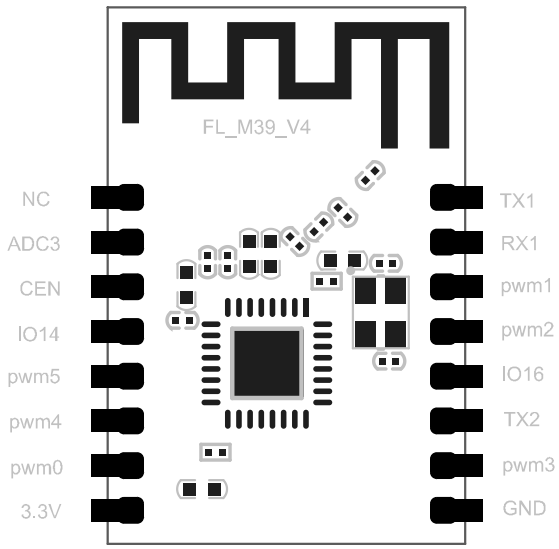
M39 has 2 rows of pins，The pin spacing is 2.0 ± 0.1mm。M39 size：24.0±

0.35mm (W)×16.0±0.35mm (L) ×0.8±0.15mm (H)。
M39 Dimensions：



2 Module interface

2.2 Pin definition



2 Module interface

Pin number	symbol	IO type	function
1	RST		Reset pin, currently floating
2	ADC	I	ADC, corresponding to P23 of IC
3	CEM		valid, pull up by default, Corresponding to CEN of IC
4	P14	I/O	Normal IO pin corresponds to IC, P14
5	PWM5	I/O	Support hardware PWM, corresponding to P26 of IC
6	PWM4	I/O	Support hardware PWM, corresponding to P24 of IC
7	PWM0	I/O	Support hardware PWM Corresponding to P6 of IC
8	VCC	P	Power pin of the module (3.3V)
9	GND	P	Ground wire, negative pin of the module
10	PWM3	I/O	Support hardware PWM Corresponding to P9 of IC
11	TXD2	I/O	Serial port 2, Corresponding to P9 of IC
12	P16	I/O	Ordinary IO pin Corresponding to P9 of IC
13	PWM2	I/O	Support hardware PWM, Corresponding to P9 of IC
14	PWM1	I/O	Support hardware PWM, Corresponding to P7of IC
15	RXD1	I/O	Serial port 1, Corresponding to P10 of IC
16	TXD1	I/O	Serial port 1, Corresponding to P11 of IC

Note: P stands for power pin, and I/O stands for input and output pins.

3 Electrical parameters

3.1 Absolute electrical parameters

parameter	description	Minimum	Maximum	unit
Ts	Storage temperature	-20	105	℃
VBAT	Supply voltage	3.0	3.6	V
Electrostatic discharge voltage （Mannequin）	TAMB-25℃	-	2	KV
Electrostatic discharge voltage （Machine model）	TAMB-25℃	-	0.5	KV

3.2Normal working conditions

parameter	description	Minimum	Typical value	Maximum	unit
Ta	working temperature	-20	-	105	℃
VBAT	Supply voltage	3.0	3.3	3.6	V
VIL	IO Low-level output	-0.3	-	VCC*0.25	V
VIH	IO High level input	VCC*0.75	-	VCC	V
VOL	IO Low-level output		-	VCC*0.1	V
VoH	IOHigh level input	VCC*0.8	-	VCC	V
Imax	IODrive current		-	12	mA

3.3 Power consumption for continuous transmission and reception

Electrical parameters

Working status	mode	rate	Transmit power /receive	average value	Peak (typical value)	unit
Launch	11b	11Mbps	+17dBm	292	354	mA
Launch	11g	54Mbps	+13.5dBm	256	307	mA
Launch	11n	MCS7	+13dBm	257	286	mA
receive	11b	11Mbps	Continuous reception	95	102	mA
receive	11g	54Mbps	Continuous reception	98	100	mA
receive	11n	MCS7	Continuous reception	98	100	mA

3.4 Working current

Operating mode	Working status, Ta=25℃	average value	Maximum (typical value)	unit
Quick Connect Network Status（Bluetooth distribution network	83 module is in the state of fast connection networkWi-Fi The indicator light flashes quickly		376	mA
Quick Connect Network Status（AP distribution network）	The module is in a hotspot distribution network state 98, Wi-Fi The indicator light flashes slowly		405	mA
Quick Connect Network Status（EZ distribution network）	The module is in the state of fast connection network The indicator light flashes quickly		106	mA
Idle network connection Network connection operation status	The module is in the state of networking, WiFi The indicator light is always on 40 The module is in the state of networkingWiFi The indicator light is always on		138 210	mA mA

4 RF parameters

4.1Basic RF characteristics

Parameter item	Detailed description
working frequency	2.412~2.462GHz
Wi-Fi standard	IEEE 802.11b/g/n(passageway 1-14)
BT standard	Bluetooth 4.2
Data transfer rate	11b:1,2,5.5, 11 (Mbps)； 11g:6,9,12,18,24,36,48,54(Mbps); 11n: HT20 MCS0~7; HT40 MCS0~7

4.2 Emission performance

TX Continuous transmission performance

Parameter item	Minimum	典型值	Typical value	unit
RF Average output power，802.11b CCK Mode 11M	16	-		dBm
RF Average output power，802.11g OFDM Mode 54M	14	-		dBm
RF Average output power，802.11n OFDM Mode MCS7	12	-		dBm
Frequency error	-10	-	10	ppm

4.3 Receiving performance

RXSensitivity

Parameter item	Minimum	Typical value	Max	unit
PER<8%，RX Sensitivity，802.11b DSSS Mode 11M	-	-85	-	dBm
PER<10%，RX Sensitivity，802.11g OFDM Mode 54M	-	-72	-	dBm
PER<10%，RX Sensitivity，802.11n OFDM Mode MCS7	-	-68	-	dBm
PER<10%，RX Sensitivity，BT1M MCS7	-	-95	-	dBm

5 Antenna information5.

1Antenna type

Use PCB onboard antenna.

5.2 Reduce antenna interference

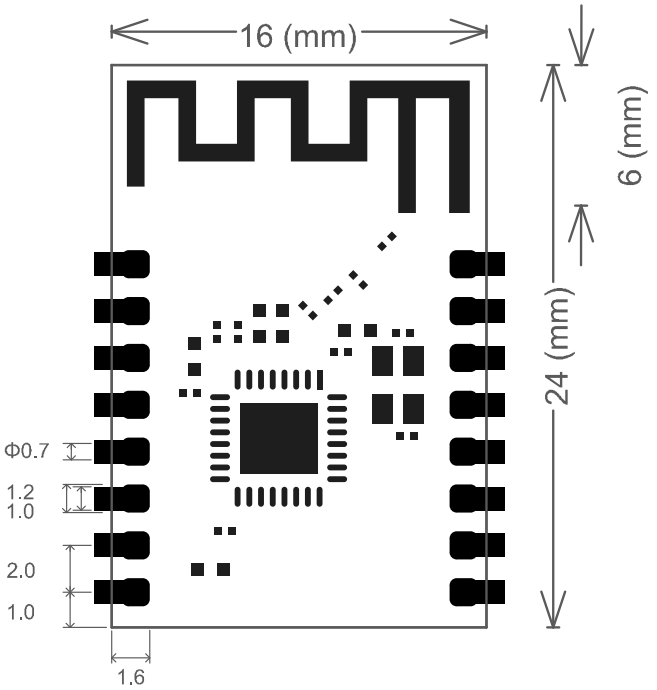
Try to keep the antenna away from

large components.。

6 Packaging information and production guidance

6.1 Mechanical Dimensions

PCB Size：16.0±0.35mm (W)×24.0±0.35mm (L) ×0.8±0.15mm (H)。



6 Packaging information and production guidance

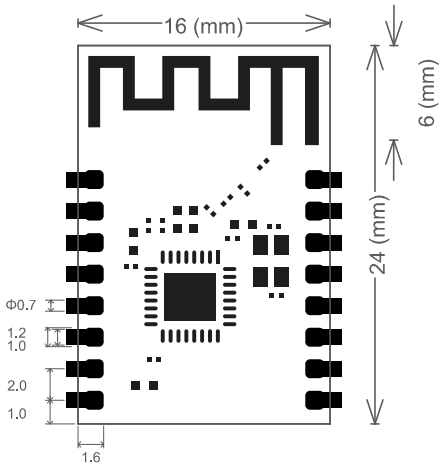
6.2 PCB Package drawing - pins

M39 SMD soldering for module selection。

The size of the patch is shown in the

figure below:

6 Packaging information and production guidance



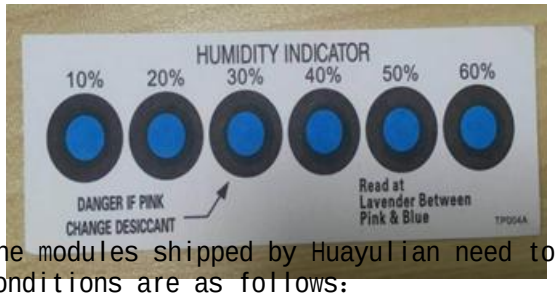
6.3Production guide

1. The stamp port package module delivered by Huayu Lian must be mounted by SMT machine, and the mounting must be completed within 24 hours after unpacking and burning the firmware

Otherwise, vacuum packaging must be re-evacuated, and the module must be baked before placement. A. Equipment or equipment required for SMT placement: a) Reflow soldering placement machine; b) AOI detector; c) 6-8mm nozzle; B. Baking equipment or equipment: a) Cabinet baking Box; b) Anti-static high temperature resistant tray; c) Anti-static high temperature resistant gloves;

2. The storage conditions of the modules shipped by Huayu Lian are as follows: A. The moisture-proof bag must be stored in an environment where the temperature is less than 30℃ and the humidity is less than 70%RH.

B. For dry-packaged products, the shelf life is 6 months from the date the package is sealed. C. There is a humidity indicator card in the sealed package:



3The modules shipped by Huayulian need to be baked. The humidity indicator card and the baking conditions are as follows:

A. When unpacking, if the reading value of humidity indicator card is 30%, 40% and 50% and the color ring is blue, the module needs to be continuously baked for 2 hours; B. When unpacking, if the humidity indicator card reads that 30% color ring turns pink, the module needs to be continuously baked for 4 hours; C. When unpacking, if the humidity indicator card reads 30% and 40% of the color ring turns pink, the module needs to be continuously baked for 6 hours; D. When unpacking, if the humidity indicator card reads that 30%, 40% and 50% color rings turn pink, the module needs to be continuously baked for 12 hours

Baking parameters are as follows: A. Baking temperature: 125±5°C; B. Alarm temperature setting: 130°C; C. After cooling under natural conditions <36°C SMT patch can be performed; D. Drying times: 1 time; E. If there is no soldering after baking for more than 12 hours, please bake again;

5. If the unpacking time exceeds 3 months, it is forbidden to use SMT process to solder this batch of modules, because this PCB is an immersion gold process,

After more than 3 months, the pad oxidizes severely, and it is very likely to cause false soldering and missing soldering during SMT placement. Our company does not bear the corresponding responsibility for the various problems caused by this.

6. Before SMT mounting, please carry out ESD (electrostatic discharge, electrostatic discharge) protection to the module;

7. In order to ensure the pass rate of reflow soldering, please sample 10% of the products for the first patch for visual inspection and AOI inspection to ensure the reasonableness of the adsorption method and placement method of the furnace temperature control device; subsequent mass production is recommended to sample 5-10 per hour Visual inspection and AOI inspection of the film

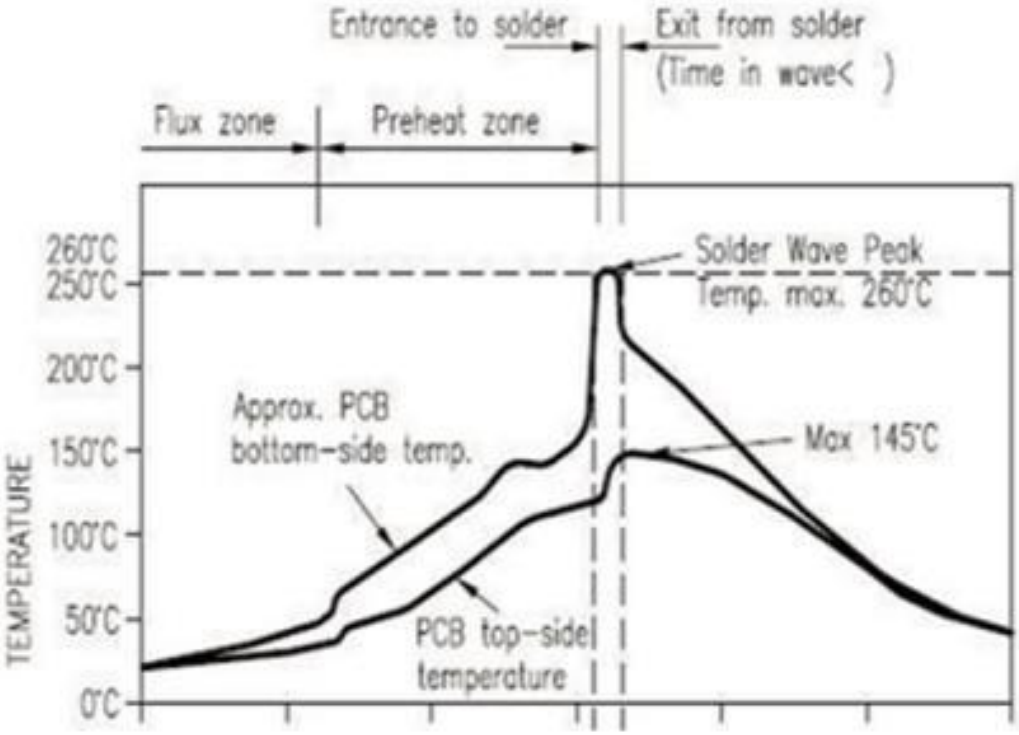
6.4 Recommended furnace temperature curve

Please insert the parts directly according to the reflow soldering curve,

the peak temperature is 245°C, and the reflow soldering temperature curve is

shown in the figure below:

DIP Type Product Pass Wavesolder Graph



6.5 Storage conditions

CAUTION

This bag contains MOISTURE-SENSITIVE DEVICES

LEVEL 3

If Blank, see adjacent bar code label

1. Calculated shelf life in sealed bag: 12 months at < 40°C and < 90% relative humidity (RH)
2. Peak package body temperature: 260 °C
   If Blank, see adjacent bar code label
3. After bag is opened, devices that will be subjected to reflow solder or other high temperature process must
   a) Mounted within: 168 hrs. of factory conditions
      If Blank, see adjacent bar code label
      ≤ 30°C/60%RH, OR
   b) Stored at <10% RH
4. Devices require bake, before mounting, if:
   a) Humidity Indicator Card is > 10% when read at 23 ± 5°C
   b) 3a or 3b not met.
5. If baking is required, devices may be baked for 48 hrs. at 125 ± 5°C

   Note: If device containers cannot be subjected to high temperature or shorter bake times are desired, reference IPC/JEDEC J-STD-033 for bake procedure

Bag Seal Date: _____
If Blank, see adjacent bar code label

Note: Level and body temperature defined by IPC/JEDEC J-STD-020

7 Module MOQ and packaging information

Product number	MOQ（pcs）	Shipping packaging method	Number of storage modules per reel （pcs）	Number of coils per box
M39		Carrier tape reel		

8 Appendix: Statement

FCC Caution: Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equip-ment.

This device complies with Part 15 of the FCC Rules.Operation is subject to the fol-lowing 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.

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 installa-tion. 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 interfer-ence 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.

Radiation Exposure Statement

This equipment complies with FCC radiation exposure limits set forth for an uncon-trolled rolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator and your body.

Important Note

This radio module must not installed to co-locate and operating simultaneously with other radios in host system except in accordance with FCC multi-transmitter product procedures. Additional testing and equipment authorization may be required to operating simultaneously with other radio.

The availability of some specific channels and/or operational frequency bands are country dependent and are firmware programmed at the factory to match the in-tended destination. The firmware setting is not accessible by the end user.

8 APPENDIX: STATEMENT

The host product manufacturer is responsible for compliance to any other FCC rules that apply to the host not covered by the modular transmitter grant of certification. The final host product still requires Part 15 Subpart B compliance testing with the modular transmitter installed. The end user manual shall include all required reg-ulatory information/warning as shown in this manual, including: This product must be installed and operated with a minimum distance of 20 cm between the radiator and user body.

The RF module is considered as a limited modular transmitter according to FCC rules.Even though the RF module get a FCC ID, the host product manufacturer can not use the FCC ID on the final product directly.In these circumstances, the host product manufacturer integrator will be responsible for re-evaluating the end prod-uct (including the transmitter) and obtaining the FCC authorization by a Class II permissive change application or a new application.

Declaration of Conformity European notice

Hereby, Hangzhou Tuya Information Technology Co., Ltd declares that this module product is in compliance with essential requirements and other relevant provisions of Directive 2014/53/EU,2011/65/EU.A copy of the Declaration of conformity can be found at https://www.tuya.com

This product must not be disposed of as normal household waste, in accordance with EU directive for waste electrical and electronic equipment (WEEE- 2012/19/EU). Instead， it should be disposed of by returning it to the point of sale, or to a municipal recycling collection point.

The device could be used with a separation distance of 20cm to the human body.

Requirement per KDB996369 D03

2.2 List of applicable FCC rules

List the FCC rules that are applicable to the modular transmitter. These are the rules that specifically establish the bands of operation, the power, spurious emissions, and operating fundamental frequencies. DO NOT list compliance to unintentional-radiator rules (Part 15 Subpart B) since that is not a condition of a module grant that is extended to a host manufacturer. See also Section 2.10 below concerning the need to notify host manufacturers that further testing is required.3

Explanation: This module meets the requirements of FCC part 15C(15.247).it specifically establish the 6dB Bandwidth, Peak Output Power, Radiated Spurious Emission, Power Spectral Density, Restricted Band of Operation and Band Edge (Out of Band Emissions)

2.3 Summarize the specific operational use conditions

Describe use conditions that are applicable to the modular transmitter, including for example any limits on antennas, etc. For example, if point-to-point antennas are used that require reduction in power or compensation for cable loss, then this information must be in the instructions. If the use condition limitations extend to professional users, then instructions must state that this information also extends to the host manufacturer's instruction manual. In addition, certain information may also be needed, such as peak gain per frequency band and minimum gain, specifically for master devices in 5 GHz DFS bands.

Explanation: The module has one PCB antenna, The antenna cannot be removed, Unconventional interface

2.4 Limited module procedures

If a modular transmitter is approved as a "limited module," then the module manufacturer is responsible for approving the host environment that the limited module is used with. The manufacturer of a limited module must describe, both in the filing and in the installation instructions, the alternative means that the limited module manufacturer uses to verify that the host meets the necessary requirements to satisfy the module limiting conditions.

A limited module manufacturer has the flexibility to define its alternative method to address the conditions that limit the initial approval, such as: shielding, minimum signaling amplitude, buffered modulation/data inputs, or power supply regulation. The alternative method could include that the limited module manufacturer reviews detailed test data or host designs prior to giving the host manufacturer approval.

This limited module procedure is also applicable for RF exposure evaluation when it is necessary to demonstrate compliance in a specific host. The module manufacturer must state how control of the product into which the modular transmitter will be installed will be maintained such that full compliance of the product is always ensured. For additional hosts other than the specific host originally granted with a limited module, a Class II permissive change is required on the module grant to register the additional host as a specific host also approved with the module.

Explanation: The module is a single module.

2.5 Trace antenna designs

For a modular transmitter with trace antenna designs, see the guidance in Question 11 of KDB Publication 996369 D02 FAQ – Modules for Micro-Strip Antennas and traces. The integration information shall include for the TCB review the integration instructions for the following aspects: layout of trace design, parts list (BOM), antenna, connectors, and isolation requirements.

a) Information that includes permitted variances (e.g., trace boundary limits, thickness, length, width, shape(s), dielectric constant, and impedance as applicable for each type of antenna);

b) Each design shall be considered a different type (e.g., antenna length in multiple(s) of frequency, the wavelength, and antenna shape (traces in phase) can affect antenna gain and must be considered);

c) The parameters shall be provided in a manner permitting host manufacturers to design the printed circuit (PC) board layout;

d) Appropriate parts by manufacturer and specifications;

e) Test procedures for design verification; and

f) Production test procedures for ensuring compliance.

The module grantee shall provide a notice that any deviation(s) from the defined parameters of the antenna trace, as described by the instructions, require that the host product manufacturer must notify the module grantee that they wish to change the antenna trace design. In this case, a Class II permissive change application is required to be filed by the grantee, or the host manufacturer can take responsibility through the change in FCC ID (new application) procedure followed by a Class II permissive change application.

Explanation: Yes, The module with trace antenna designs, and This manual has been shown the layout of trace design,, antenna, connectors, and isolation requirements.

2.6 RF exposure considerations

It is essential for module grantees to clearly and explicitly state the RF exposure conditions that permit a host product manufacturer to use the module. Two types of instructions are required for RF exposure information: (1) to the host product manufacturer, to define the application conditions (mobile, portable – xx cm from a person's body); and (2) additional text needed for the host product manufacturer to provide to end users in their end-product manuals. If RF exposure statements and use conditions are not provided, then the host product manufacturer is required to take responsibility of the module through a change in FCC ID (new application).

Explanation: This module complies with FCC RF radiation exposure limits set forth for an uncontrolled environment, This equipment should be installed and operated with a minimum distance of 20 centimeters between the radiator and your body." This module is designed

to comply with the FCC statement, FCC ID: 2AWY7GWF-KM26.

2.7 Antennas

A list of antennas included in the application for certification must be provided in the instructions. For modular transmitters approved as limited modules, all applicable professional installer instructions must be included as part of the information to the host product manufacturer. The antenna list shall also identify the antenna types (monopole, PIFA, dipole, etc. (note that for example an "omni-directional antenna" is not considered to be a specific "antenna type")).

For situations where the host product manufacturer is responsible for an external connector, for example with an RF pin and antenna trace design, the integration instructions shall inform the installer that unique antenna connector must be used on the Part 15 authorized transmitters used in the host product. The module manufacturers shall provide a list of acceptable unique connectors.

Explanation: The EUT has one PCB Antenna, The antenna cannot be removed, Unconventional interface

2.8 Label and compliance information

Grantees are responsible for the continued compliance of their modules to the FCC rules. This includes advising host product manufacturers that they need to provide a physical or e-label stating "Contains FCC ID" with their finished product. See Guidelines for Labeling and User Information for RF Devices – KDB Publication 784748.

Explanation: The host system using this module, should have label in a visible area indicated the following texts: Contains FCC ID: 2AW8C-LJCM39

2.9 Information on test modes and additional testing requirements[5]

Additional guidance for testing host products is given in KDB Publication 996369 D04 Module Integration Guide. Test modes should take into consideration different operational conditions for a stand-alone modular transmitter in a host, as well as for multiple simultaneously transmitting modules or other transmitters in a host product.

The grantee should provide information on how to configure test modes for host product evaluation for different operational conditions for a stand-alone modular transmitter in a host, versus with multiple, simultaneously transmitting modules or other transmitters in a host.

Grantees can increase the utility of their modular transmitters by providing special means, modes, or instructions that simulates or characterizes a connection by enabling a transmitter. This can greatly simplify a host manufacturer's determination that a module as installed in a host complies with FCC requirements.

Explanation: WiFi Module can increase the utility of our modular transmitters by providing instructions that simulates or characterizes a connection by enabling a transmitter.

2.10 Additional testing, Part 15 Subpart B disclaimer

The grantee should include a statement that the modular transmitter is only FCC authorized for the specific rule parts (i.e., FCC transmitter rules) listed on the grant, and that the host product manufacturer is responsible for compliance to any other FCC rules that apply to the host not covered by the modular transmitter grant of certification. If the grantee markets their product as being Part 15

Subpart B compliant (when it also contains unintentional-radiator digital circuity), then the grantee shall provide a notice stating that the final host product still requires Part 15 Subpart B compliance testing with the modular transmitter installed.

Explanation: The module without unintentional-radiator digital circuity, so the module does not require an evaluation by FCC Part 15 Subpart B. The host shoule be evaluated by the FCC Subpart B.