

PRODUCT SPECIFICATION

FG89FTSM13-W7

Wi-Fi Single-band 1T1R module Datasheet

Version:v1.8

Customer: _____

Customer P/N: _____

Signature: _____

Date: _____

FCC ID: 2AATL-89FTSM13W7

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F89FTSM13 Module Datasheet

Ordering Information	Part NO.	Description
	FG89FTSM13-W7	RTL8189FTV-VC,802.11b/g/n,1T1R,12.0*12.0 ,SDIO2.0,with shielding.PCB V6.0

CONTENTS

1. General Description	5
1.1 Introduction	5
1.2 Description	5
2. Features	6
3. Block Diagram	6
4. General Specification	7
4.1 WI-FI Specification	7
5. ID setting information	7
6. Pin Definition	8
6.1 Pin Outline	8
6.2 Pin Definition details	9
7. Electrical Specifications	10
7.1 Power Supply DC Characteristics	10
7.2 Power Consumption	10
7.3 SDIO interface Timing Diagram	10
7.3.1 SDIO Power-on sequence	11
7.3.2 Power off by chip_en sequence	13
7.3.4 UART interafce	13
7.3.5 GPIO Interface	14
8. Size reference	14
8.1 Module Picture	14
8.2 Marking Description	15
8.3 List of certified information	15
8.4 Physical Dimensions	15
8.5 Layout Recommendation	17
9. The Key Material List	17
10. Reference Design	18
11. Recommended Reflow Profile	18
12. Package	19
12.1 Blister packaging	19
12.2 Reel	20
12.3 Carrier Tape Detail	21
12.4 Packaging Detail	22
13. Moisture sensitivity	23

Revision History

FN-LINK TECHNOLOGY LIMITED

1. General Description

1.1 Introduction

FG89FTSM13 is a highly integrated and excellent performance Wireless LAN (WLAN) SDIO network interface device. High-speed wireless connection up to 150 Mbps.

The general hardware for the module is shown in Figure 1. This WLAN Module design is based on Realtek RTL8189FTV. It is a highly integrated single-chip 1*1 SISO Wireless LAN (WLAN) SDIO network interface controller complying with the 802.11n specification. It combines a MAC, a 1T1R capable baseband, and RF in a single chip. It is designed to provide excellent performance with low power Consumption and enhance the advantages of robust system and cost-effective.

1.2 Description

Model Name	FG89FTSM13
Product Description	Support Wi-Fi functionalities
Dimension	L x W x H: 12 x 12 x 1.8 mm
Wi-Fi Interface	Support SDIO/GPIO
OS supported	Android /Linux
Operating temperature	0°C to 70°C
Storage temperature	-40°C to 80°C

1. Chip spec recommended at 0°C, but module actually test passed at -10°C.

2. Features

General

- Support HT20/HT40 bandwidth
- Enterprise level security which can apply WPA/WPA2 certification for WiFi

PHY Features

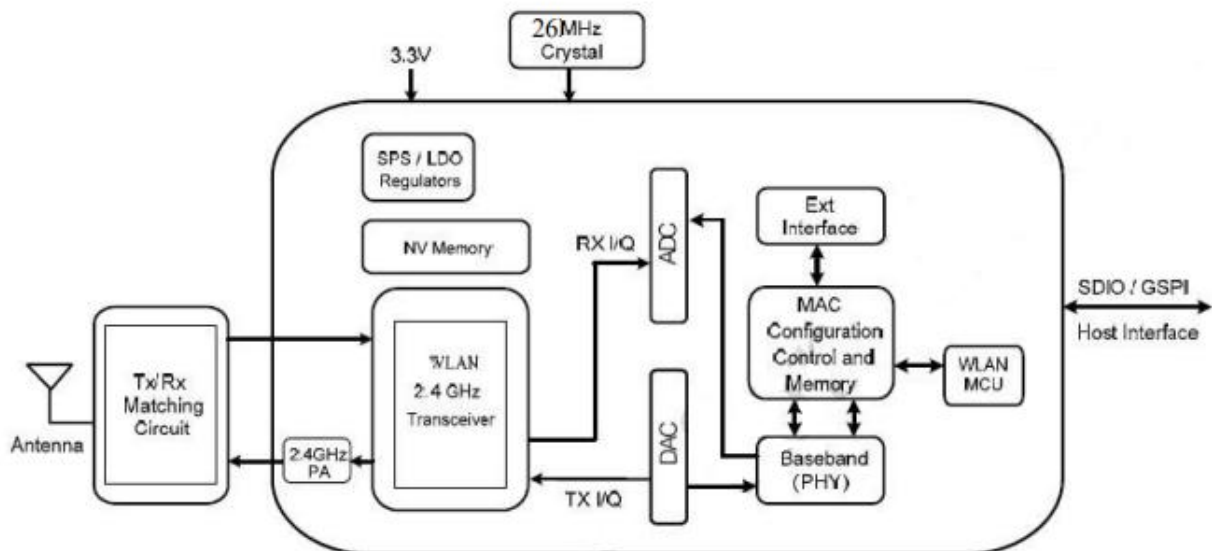
- Operate at ISM frequency bands (2.4GHz)
- IEEE standards support: IEEE 802.11b, IEEE 802.11g, IEEE 802.11n
- WiFi 1 T 1 R allow data rates supporting up to 150Mbps downstream and upstream PHY rates

Host Interface

- SDIO V1.1/2.0 Interface for WiFi

3. Block Diagram

Single-Band 11n (1x1) Solution



4. General Specification

4.1 WI-FI Specification

Feature	Description	
WLAN Standard	IEEE 802.11 b/g/n Wi-Fi compliant	
Frequency Range	2.412 GHz ~ 2.4835 GHz (2.4 GHz ISM Band)	
Number of Channels	2.4GHz: Ch1 ~ Ch14	
Test Items	Typical Value	EVM
Output Power	802.11b /11Mbps : 16dBm $\pm$ 2 dB	EVM $\leq$ -10dB
	802.11g /54Mbps : 14dBm $\pm$ 2 dB	EVM $\leq$ -25dB
	802.11n /MCS7 : 13dBm $\pm$ 2 dB	EVM $\leq$ -28dB
Spectrum Mask	Meet with IEEE standard	
Freq. Tolerance	$\pm$ 20ppm	
SISO Receive Sensitivity (11b,20MHz) @8% PER	- 11Mbps PER @ -84 dBm	$\leq$ -76
SISO Receive Sensitivity (11g,20MHz) @10% PER	- 54Mbps PER @ -72 dBm	$\leq$ -68
SISO Receive Sensitivity (11n,20MHz) @10% PER	- MCS=7 PER @ -69 dBm	$\leq$ -67
SISO Receive Sensitivity (11n,40MHz) @10% PER	- MCS=7 PER @ -67 dBm	$\leq$ -64

5. ID setting information

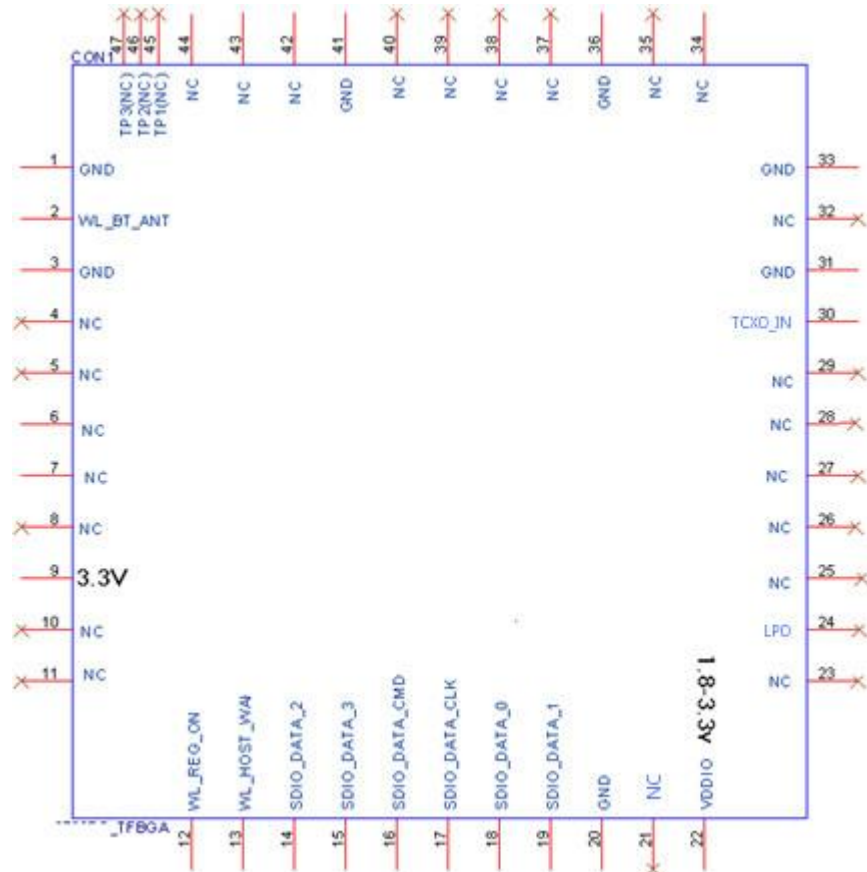
WI-FI

Vendor ID	-
Product ID	-

6. Pin Definition

6.1 Pin Outline

< TOP VIEW >



6.2 Pin Definition details

NO.	Name	Type	Description	Voltage
1	GND		Ground connections	
2	RF	I/O	RF I/O port	
3	GND		Ground connections	
4~8	NC		Floating (NC)	
9	3.3V	P	main power input	3.3V
10	NC		Host to wake up Bluetooth device	
11	NC		Floating (NC)	
12	WL_REG_ON		Chip_EN, external pull low shutdown RTL8189FTV	3.3V
13	WL_HOST_WAKE	O	WLAN WAKE HOST	
14	SDIO_DATA_2	I/O	SDIO_D2	
15	SDIO_DATA_3	I/O	SDIO_D3	
16	SDIO_DATA_CMD	I/O	SDIO_CMD	
17	SDIO_DATA_CLK	I	SDIO_CLK	
18	SDIO_DATA_D0	I/O	SDIO_D0	
19	SDIO_DATA_D1	I/O	SDIO_D1	
20	GND		GND	
21	NC		NC	
22	VDIO	P	1.8 or 3.3V	
23	NC		Floating (NC)	
24	LPO		CLK_REQ, not used please NC.	
25~29	NC		Floating (NC)	
30	TCXO_IN		26MHz_IN, not used please NC.	
31	GND		GND	
32	NC		Floating (NC)	
33	GND		GND	
34~35	NC		Floating (NC)	
36	GND		GND	
37~40	NC		Floating (NC)	
41	GND		GND	
42~44	NC		Floating (NC)	

P:POWER I:INPUT O:OUTPUT

7. Electrical Specifications

7.1 Power Supply DC Characteristics

	MIN	TYP	MAX	Unit
Operating Temperature	0	25	70	deg.C
VCC33	3.0	3.3	3.6	V
VDDIO	1.62	1.8 or 3.3	3.6	V

7.2 Power Consumption

Mode	Status	Power(mA)	Note
OS Windows XP	Link	130	
	RX	130	20M
	TX	190	20M(MCS7)
		175	40M(MCS7)

7.3 SDIO interface Timing Diagram

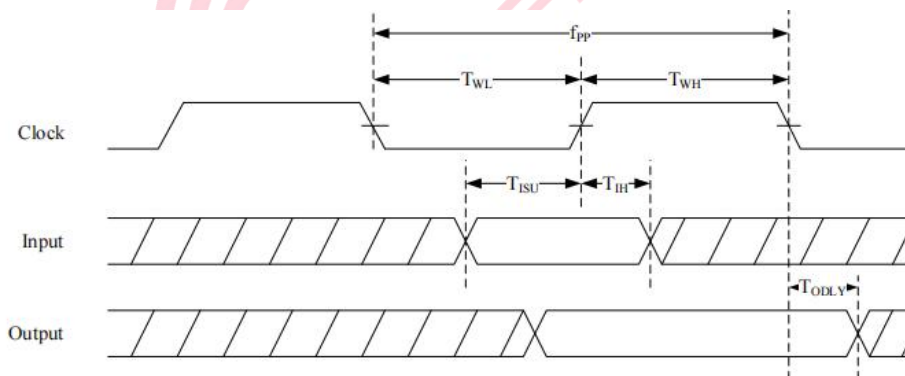


Figure 3. SDIO Interface Timing

Table 10 SDIO Interface Timing Parameters

NO	Parameter	Mode	MIN	MAX	Unit
f_{PP}	Clock frequency	Default	0	25	MHz
		HS	0	50	MHz
T_{WL}	Clock low time	DEF	10		ns
		HS	7		ns
T_{WH}	Clock high time	DEF	10		ns

T_{ISU}	Input setup time	HS	7		
		DEF	5		ns
T_{IH}	Input hold time	HS	6		
		DEF	5		ns
T_{ODLY}	Output delay time	DEF		14	ns
		HS		14	

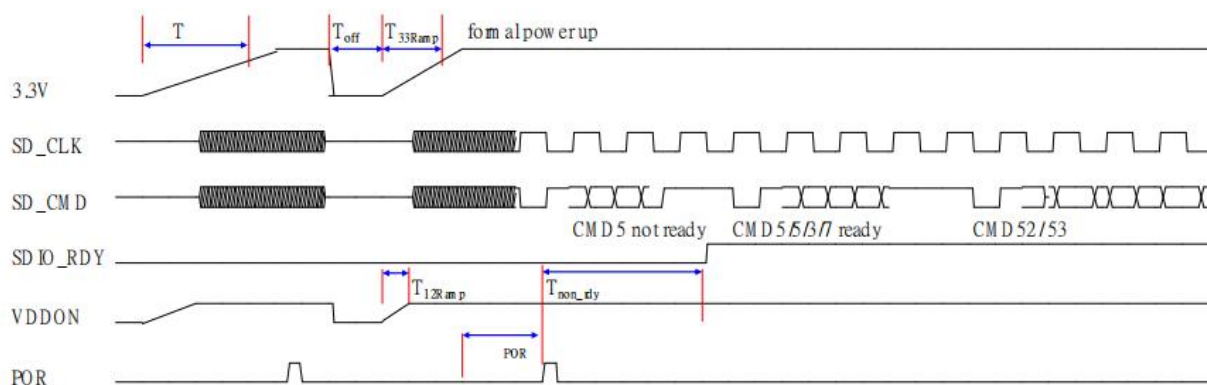
SDIO Interface Signal Level

The SDIO signal level ranges from 1.8V to 3.3V. The host shall provide the power source with targeting power level to RTL8189FTV-VQ1 SDIO interface via VDIO_SDIO pin (pin19).

The DC characteristics of typical signal level, 3.3V/ 2.8V/ 1.8V are shown in section 6.2.2.

7.3.1 SDIO Power-on sequence

After power on, the SDIO interface is selected by RTL8189FTV-VQ1 automatically when a valid SDIO command is received. To attain better SDIO host compatibility, the following power on sequence is recommended:



Variable definition:

T_{33Ramp} : The 3.3V power pre-charge ramp up duration before formal power up. It is recommended that a 3.3V power on and then power off sequence is executed by host controller before the formal power on sequence. This procedure can eliminate the host card detection issue when power ramp up duration is too long or the system warm reboot failure issue.

T_{off} : The duration the 3.3V is cut off before formal power up.

T_{33ramp}: The 3.3V main power ramp up duration

T_{12ramp}: The internal 1.2V ramp up duration.

T_{POR}: The duration the power on reset releases and power management unit executes power on tasks. The power on reset will detect both 3.3V and 1.2V power ramp up and after a predetermined duration.

T_{non_rdy}: SDIO not ready duration, in this state, RTL8723AS may respond command without ready bit set. After ready bit set, host will initiate complete card detection procedure.

The power on flow description:

It is recommended that the card detection procedures are divided into two phases: a 3.3V power pre-charge phase and a formal power up phase.

For the 3.3V power pre-charge phase, the power ramp up duration is not limited. The 3.3V is then cut off and is turned on after T_{off} period. The ramp up time is specified by T_{33ramp} duration.

After main 3.3V ramp up and 1.2V ramp up, the power management unit will be enabled by power ready detection circuit, and enables SDIO block. Efuse is then autoloading to SDIO circuits during T_{non_rdy} duration. After autoload done, the SDIO responds command with ready bit set. After CMD5/ 5/ 3/ 7 procedures, the card detection is then executed. After driver loaded, normal command 52 and 53 are then used.

The typical timing spec is shown as follows:

Table 11 SDIO Interface Power On Timing Parameters

	Min	Typical	Max	Unit
T _{33ramp}	0.2	0.5	2.5	ms
T _{off}	250	500	1000	ms
T _{33ramp}	0.2	0.5	2.5	ms
T _{12ramp}	0.1	0.5	1.5	ms
T _{por}	2	2	8	ms
T _{non-rdy}	1	2	10	ms



7.3.2 Power off by chip_en sequence

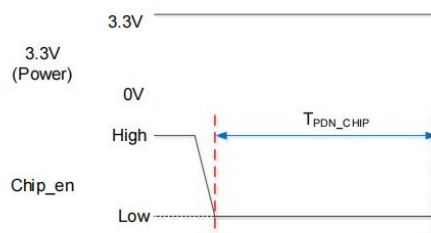


Figure 4. Power Off by chip_en Sequence

Table 12. Power Off by WL# and BT_DIS# Timing Parameters

	Min	Typical	Max	Unit	Description
T_{PDN_CHIP}	10	100	--	ms	Chip_en keep low duration

Chip_en can externally shutdown the RTL8189FTV –VQ1 when chip_en is pulled low. The keeping low duration must be more than T_{PDN_CHIP}

7.3.3 Power off by 3.3V power sequence

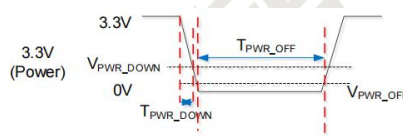


Figure 5. Power Off by 3.3V power Sequence

Table 13. Power Off by 3.3V power Timing Parameters

	Min	Typical	Max	Unit	Description
T_{PWR_OFF}	10	100	--	ms	3.3V power off time
V_{PWR_OFF}	--	--	0.4	V	3.3V power off voltage
V_{PWR_DOWN}	--	--	0.7	V	3.3V power down voltage
T_{PWR_DOWN}	--	--	10	ms	3.3V power down time

When 3.3V power off and on afterward, the voltage of 3.3V power must keep lower than V_{PWR_OFF} , and the 3.3V power keeping off duration must be more than T_{PWR_OFF}

7.3.4 UART interafce

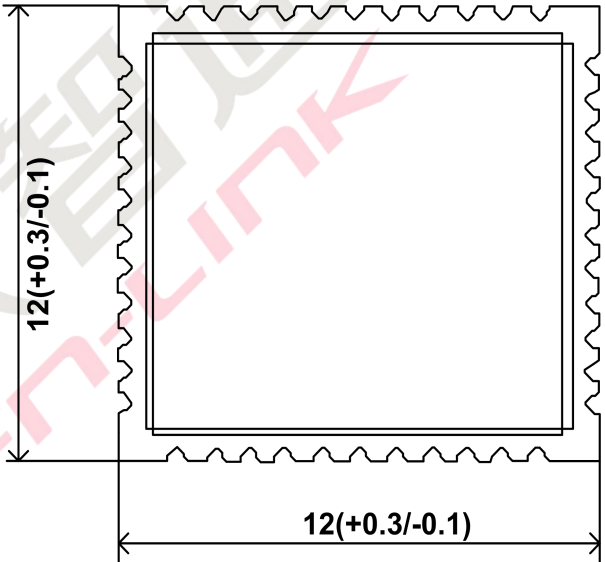
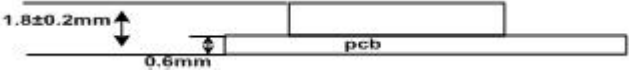
Symbol	Type	Pin	Description
SD_CLK	I	17	SDIO Clock Input
SD_CMD	I/O	16	SDIO Command Input
SD_D0	I/O	18	SDIO Data Line 0
SD_D1	I/O	19	SDIO Data Line 1
SD_D2	I/O	14	SDIO Data Line 2
SD_D3	I/O	15	SDIO Data Line 3

7.3.5 GPIO Interface

Symbol	Type	Pin	Description
GSPI_CLK	I	17	GSPI Clock Input
GSPI_MOSI	I	16	GSPI Data Input
GSPI_MISO	O	18	GSPI Data Out
GSPI_SIRO	O	19	GSPI Interrupt
GSPI_SCSn	I	15	GSPI Chip Select Bar

8. Size reference

8.1 Module Picture

L x W : 12 x 12 (+0.3/-0.1) mm	
H: 1.8 (±0.2) mm	
Weight	0.6g

8.2 Marking Description

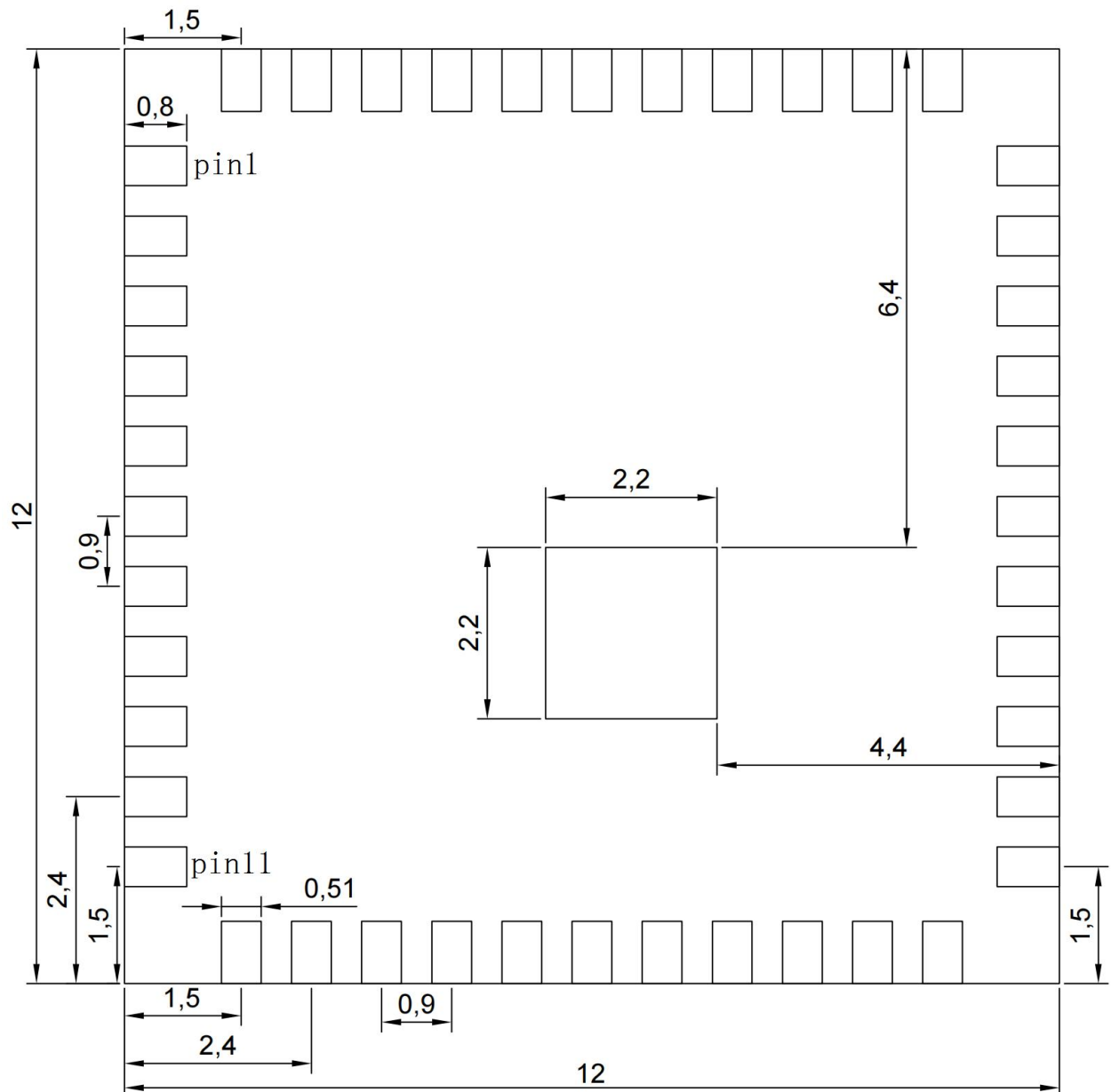


8.3 List of certified information

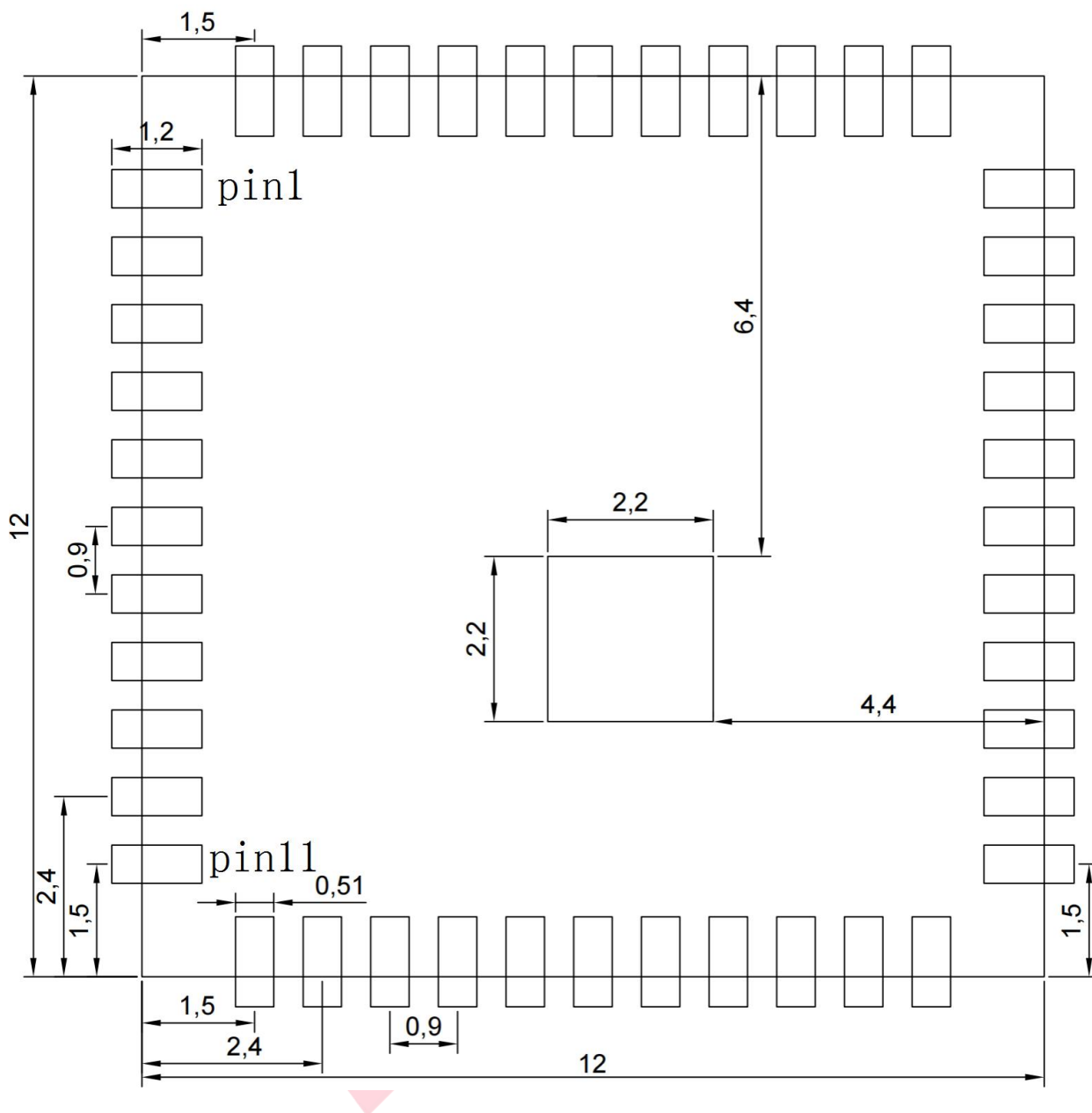
Certification project	Certificate number
SRRC	CMIIT ID:2023DP13675(M)
FCC	2AATL-89FTSM13W7
CE	TBD
IC	12425A-89FTSM13W7
NCC	TBD
KCC	TBD
TELEC	TBD
Brazil	TBD
Argentina	TBD
Japan	TBD

8.4 Physical Dimensions

<TOP View>



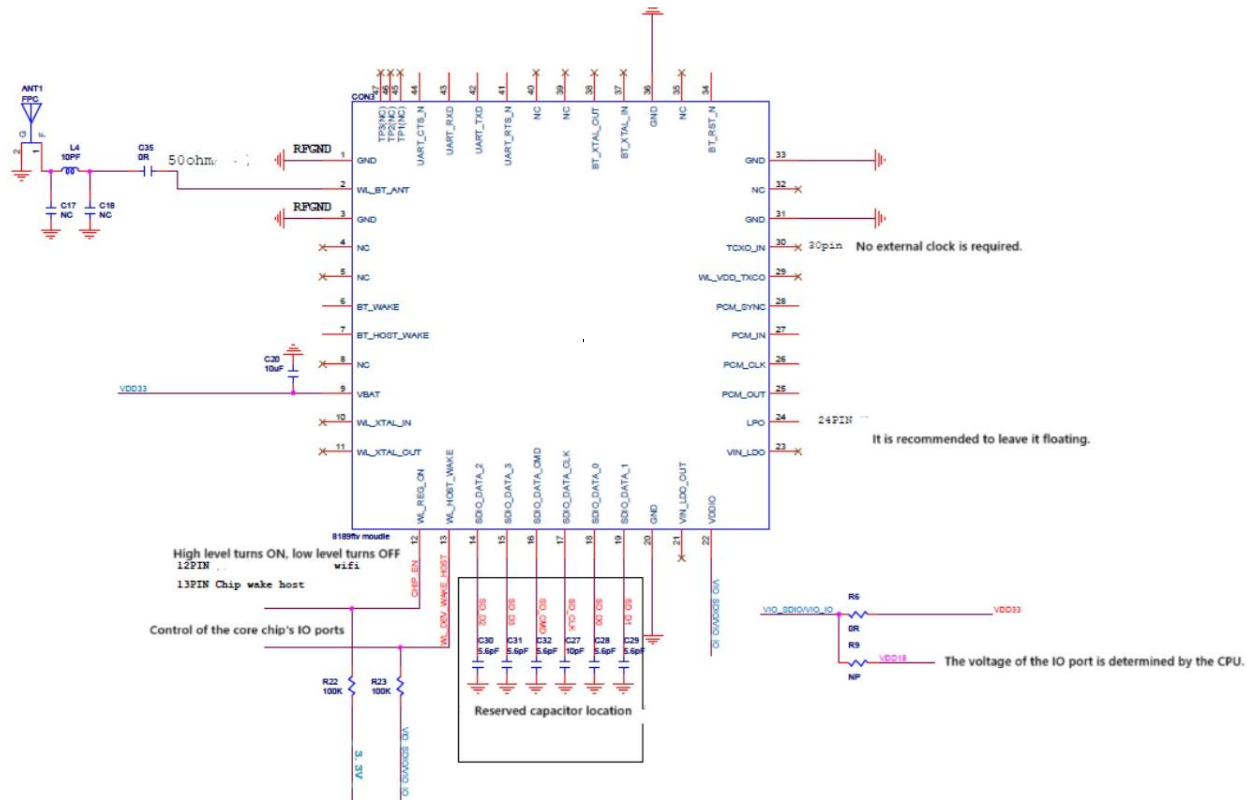
8.5 Layout Recommendation



9. The Key Material List

Item	Part Name	Description	Manufacturer
1	PCB	F89FTSM13 12X12 4L, gerber	XY-PCB, GDKX, Sunlord, SLPCB
2	Crystal	26mhz $\pm$ 10ppm, 10.5pF	ECEC, Hosonic, TKD, JWT
3	Chipset	RTL8189FTV-VC-CG	Realtek
4	Shielding	F1023XM13 Shielding	Xintai, jinglitong
5	TVS	ESD 0402 5.5V 0.1pF	Sunlord, Murata, way-on, JIEJIE

10. Reference Design

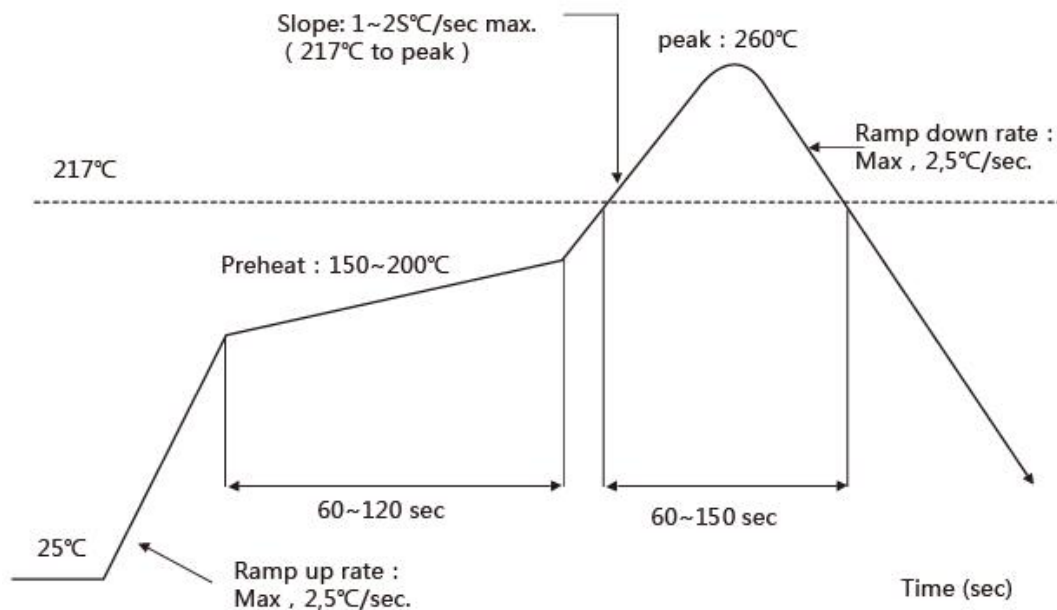


11. Recommended Reflow Profile

Referred to IPC/JEDEC standard.

Peak Temperature : <260°C

Number of Times : ≤2 times



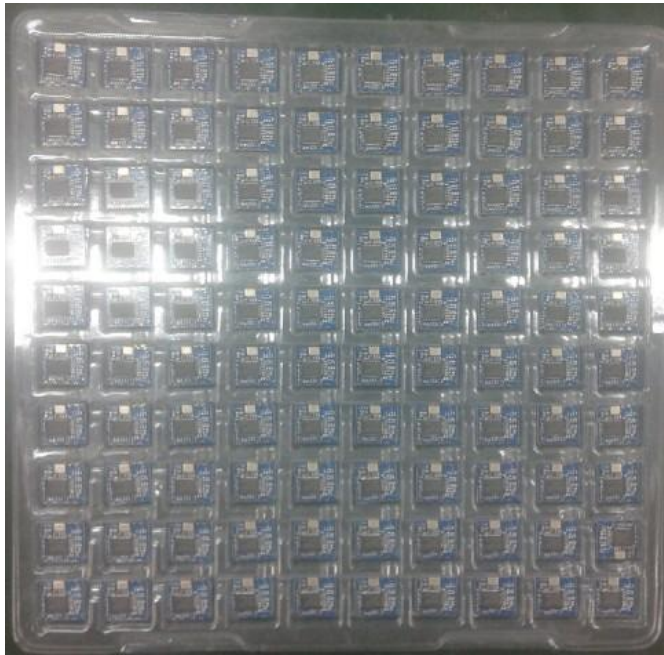
WIFI module installed note:

1. Please press 1 : 1 and then expand outward proportion to 0.7 mm, 0.12 mm thickness When open a stencil
2. Take and use the WIFI module, please insure the electrostatic protective measures.
3. Reflow soldering temperature should be according to the customer the main size of the products, such as the temperature set at $255 \pm 5^\circ\text{C}$ for the MID motherboard

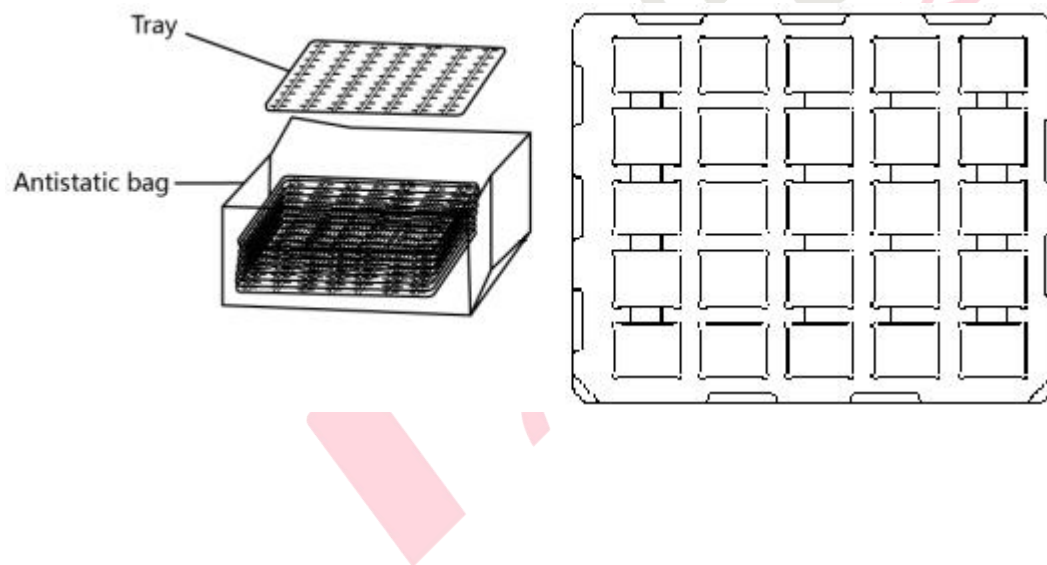
12. Package

12.1 Blister packaging

A roll of 100pcs

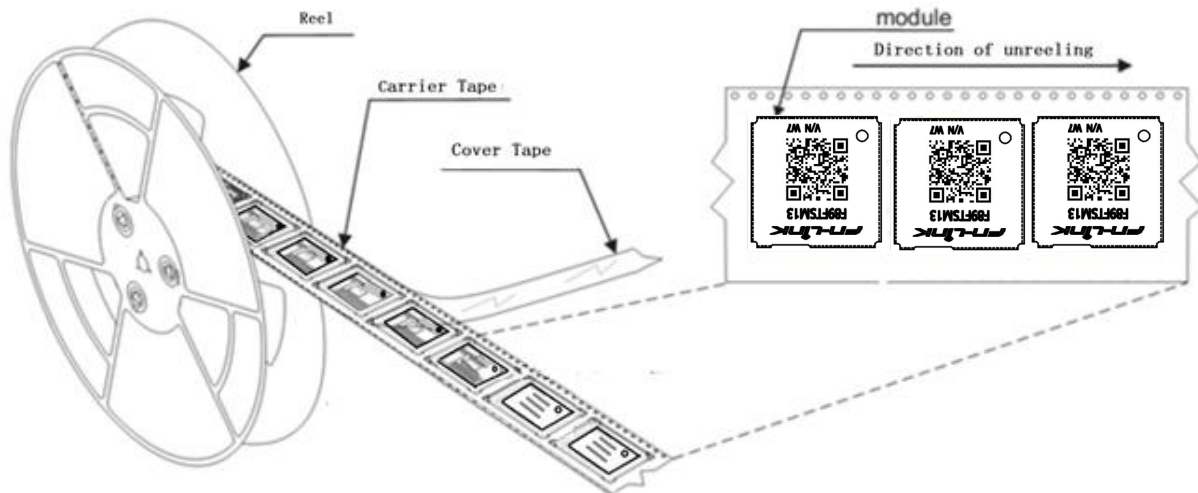


Use pallet packaging for less than 300 pieces



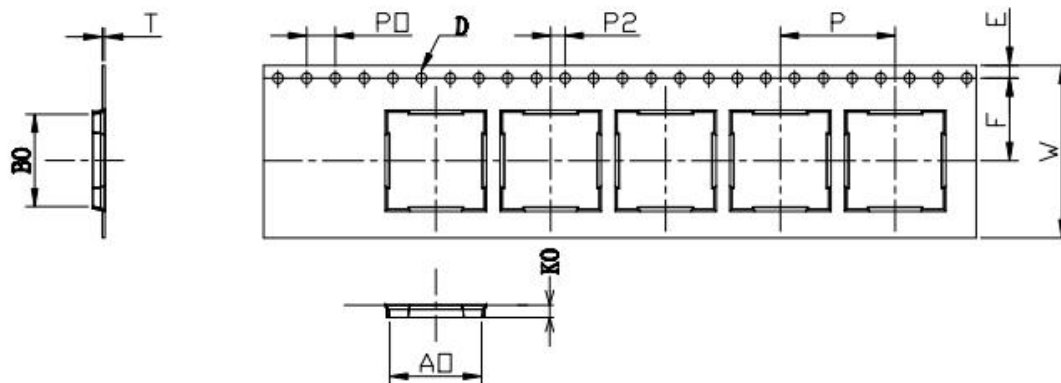
12.2 Reel

A roll of 1500pcs



12.3 Carrier Tape Detail

ITEM	W	A0	B0	D	F	E	K0	P0	P2	P	T
DIM	24	12.45	12.45	1.50	11.5	1.75	2.60	4.0	2.0	16.0	0.30
TOLE	$\begin{smallmatrix} +0.3 \\ -0.3 \end{smallmatrix}$	± 0.10	± 0.10	$\begin{smallmatrix} +0.1 \\ -0.0 \end{smallmatrix}$	$\begin{smallmatrix} +0.1 \\ -0.1 \end{smallmatrix}$	± 0.1	± 0.10	± 0.1	± 0.1	± 0.1	± 0.05



12.4 Packaging Detail

the take-up package



Using self-adhesive tape
Color of plastic disc: blue



NY bag size:460mm*385mm



size : 350*350*35mm



The packing case size:350*210*370mm

13. Moisture sensitivity

The Modules is a Moisture Sensitive Device level 3, in according with standard IPC/JEDEC J-STD-020, take care

all the relatives requirements for using this kind of components.

Moreover, the customer has to take care of the following conditions:

- a) Calculated shelf life in sealed bag: 12 months at <40°C and <90% relative humidity (RH)
- b) Environmental condition during the production: 30°C / 60% RH according to IPC/JEDEC J-STD-033A paragraph 5
- c) The maximum time between the opening of the sealed bag and the reflow process must be 168 hours if condition
- b) “IPC/JEDEC J-STD-033A paragraph 5.2” is respected
- d) Baking is required if conditions b) or c) are not respected
- e) Baking is required if the humidity indicator inside the bag indicates 10% RH or more

14. Caution:

List of applicable FCC rules

FCC Part 15.247

Specific operational use conditions

This product is a Single-modular transmitter policy independent of any host. Not applicable.

Limited module procedures

This product is a Single-modular transmitter. It is not a limited module. Not applicable.

Trace antenna designs

This product has a FPC Antenna. Not applicable.

RF exposure considerations

This equipment complies with the FCC RF radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with a minimum distance of 20cm between the radiator and any part of your body.

Antennas

No.	Antenna Type	Frequency Range	Gain	Impedance
1	FPC Antenna	2412-2462MHz	4.3dBi	50ohm

Label and compliance information

Remind end customers to add "Contain FCC ID: 2AATL-89FTSM13W7"

Information on test modes and additional testing requirements

Contact FN-LINK TECHNOLOGY LIMITED will provide stand-alone modular transmitter test mode. Additional testing and certification may be necessary when multiple modules are used in a host.

Additional testing, Part 15 Subpart B disclaimer

To ensure compliance with all non-transmitter functions the host manufacturer is responsible for ensuring compliance with the module(s) installed and fully operational. For example, if a host was previously authorized as an unintentional radiator under the Supplier's Declaration of Conformity procedure without a transmitter certified module and a module is added, the host manufacturer is responsible for ensuring that the after the module is installed and operational the host continues to be compliant with the Part 15B unintentional radiator requirements. Since this may depend on the details of how the module is integrated with the host, FN-LINK TECHNOLOGY LIMITED shall provide guidance to the host manufacturer for compliance with the Part 15B requirements.

FCC Warning

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.

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.

NOTE 1: Any 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.

FCC Radiation Exposure Statement:

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. End users must follow the specific operating instructions for satisfying RF exposure compliance.

This module certified that complies with RF exposure requirement under mobile or fixed condition, this module is to be installed only in mobile or fixed applications.

A mobile device is defined as a transmitting device designed to be used in other than fixed locations and to generally be used in such a way that a separation distance of at least 20 centimeters is normally maintained between the transmitter's radiating structure(s) and the body of the user or nearby persons. Transmitting devices designed to be used by consumers or workers that can be easily re-located, such as wireless devices associated with a personal computer, are considered to be mobile devices if they meet the 20 centimeter separation requirement.

A fixed device is defined as a device is physically secured at one location and is not able to be easily moved to another location.

Note 2: Any modifications made to the module will void the Grant of Certification, this module is limited to OEM installation only and must not be sold to end-users, end-user has no manual instructions to remove or install the device, only software or operating procedure shall be placed in the end-user operating manual of final products.

Note 3: Additional testing and certification may be necessary when multiple modules are used.

Note 4: The module may be operated only with the antenna with which it is authorized. Any antenna that is of the same type and of equal or less directional gain as an antenna that is authorized with the intentional radiator may be marketed with, and used with, that intentional radiator.

Note 5: To ensure compliance with all non-transmitter functions the host manufacturer is responsible for ensuring compliance with the module(s) installed and fully operational. For example, if a host was previously authorized as an unintentional radiator under the Supplier's Declaration of Conformity procedure without a transmitter certified module and a module is added, the host manufacturer is responsible for ensuring that the after the module is installed and operational the host continues to be compliant with the Part 15B unintentional radiator requirements. Since this may depend on the details of how the module is integrated with the host, FN-LINK TECHNOLOGY LIMITED shall provide guidance to the host manufacturer for compliance with the Part 15B requirements.

Note 6: FCC ID label on the final system must be labeled with "Contains FCC ID: 2AATL-89FTSM13W7" or "Contains transmitter module FCC ID: 2AATL-89FTSM13W7".

Note 7: For all products market in US, OEM has to limit the operation channels in CH1 to CH11 for 2.4G band by supplied firmware programming tool. OEM shall not supply any tool or info to the end-user regarding to Regulatory Domain change.

IC WARNING

This device contains licence-exempt transmitter(s) that comply with Innovation, Science and Economic Development Canada's licence-exempt RSS(s). Operation is subject to the following two conditions:

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

L'émetteur/récepteur exempt de licence contenu dans le présent appareil est conforme aux CNR d'Innovation, Sciences et Développement économique 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'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

This radio transmitter [IC: 12425A-89FTSM13W7] has been approved by Innovation, Science and Economic Development Canada to operate with the antenna types listed below, with the maximum permissible gain indicated.

No.	Antenna Type	Gain	Impedance
1	FPC Antenna	4.3dBi	50ohm

IC Radiation Exposure Statement:

This device and its antenna(s) must not be co-located with any other transmitters except in accordance with IC multi-transmitter product procedures. Referring to the multi-transmitter policy, multiple-transmitter(s) and module(s) can be operated simultaneously without reassessment permissive change.

Cet appareil et son antenne (s) ne doit pas être co-localisés ou fonctionnement en association avec une autre antenne ou transmetteur.

This equipment complies with IC RSS-102 radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator & your body.

Cet équipement est conforme aux limites d'exposition aux rayonnements IC établies pour un environnement non contrôlé. Cet équipement doit être installé et utilisé avec un minimum de 20cm de distance entre la source de rayonnement et votre corps.

This module is limited to OEM installation only and must not be sold to end-users, end-user has no manual instructions to remove or install the device, only software or operating procedure shall be placed in the end-user operating manual of final products. Additional testing and certification may be necessary when multiple modules are used.

Any changes or modifications not expressly approved by the manufacturer could void the user's authority to operate this equipment.

The final end product must be labeled in a visible area with the following " Contains IC: 12425A-89FTSM13W7".