

# GSD WL1KM1000 Low Energy lot Module User Manual

Contents

- 1 WL1KM1000 Low Energy lot Module
  - 1.1 PRODUCTS SPECIFICATION WL1KM1000
  - 1.2 Document revision history
  - 1.3 1. General Description
  - 1.4 2. Features
  - 1.5 PRODUCTS SPECIFICATION WL1KM1000
  - 1.6 3. Application Diagrams 3.1 Functional Block Diagram
  - 1.7 PRODUCTS SPECIFICATION WL1KM1000
  - 1.8 3.2 Schematic
  - 1.9 PRODUCTS SPECIFICATION WL1KM1000
  - 1.10 PRODUCTS SPECIFICATION WL1KM1000
  - 1.11 3.3 General Requirements 3.3.1 IEEE 802.11b Section
  - 1.12 FCC Radiation Exposure Statement:
  - 1.13 ISED Statement
  - 1.14 IC labeling requirement for the final end product:
- 2 Documents / Resources
  - 2.1 References
- 3 Related Posts

WL1KM1000 Low Energy lot Module

Custom Approval Section		
Custom Name		
Department		
Approval		Date

DESIGN	CHECK	APPROVAL
2022-09-09	2022-09-09	2022-09-09



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## PRODUCTS SPECIFICATION WL1KM1000

### Document revision history

Revision	Date	Approved by	Remarks
Version 1.0	2021-08-30	heng	Draft
Version 1.1	2022-09-09	heng	R7 from 10KΩ to NC

### 1. General Description

This document is to specify the product requirements for 802.11b/g/n 1T1R IOT Module. It is based on MediaTek MT7682SN that is a low power chipset ,MT7682SN is a highly integrated chipset an application processor,a low power 1×1 11n single-band Wi-Fi subsystem and a power management unit(PMU) that complied with 4MB PSRAM and 1MB flash memory.

## 2. Features

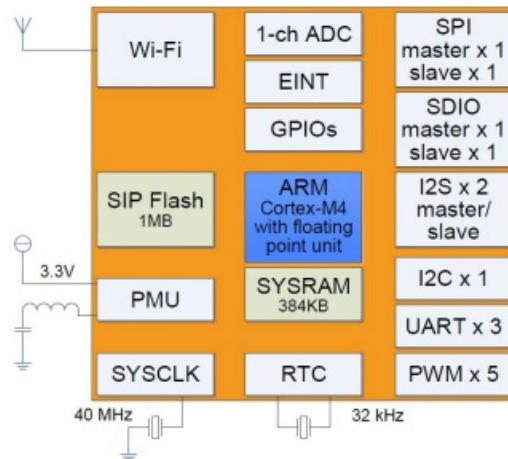
- IEEE 802.11 b/g/n (2.4GHz,1×1)
- Supports 20MHz, 40MHz bandwidth in 2.4GHz band
- Supports all data rates of 802.11g including 6, 9, 12, 18, 24, 36, 48 and 54Mbps
- Supports short GI and all data rates of 802.11n including MCS0 to MCS7
- Dynamically switching between STA and SoftAP modes at runtime
- Wi-Fi security WEP/WPA2/WPS
- Support Wi-Fi coexistence
- Supports interfaces including UART, I2C, SPI, I2S, PWM, SDIO and ADC
- RoHS compliant



## PRODUCTS SPECIFICATION WL1KM1000

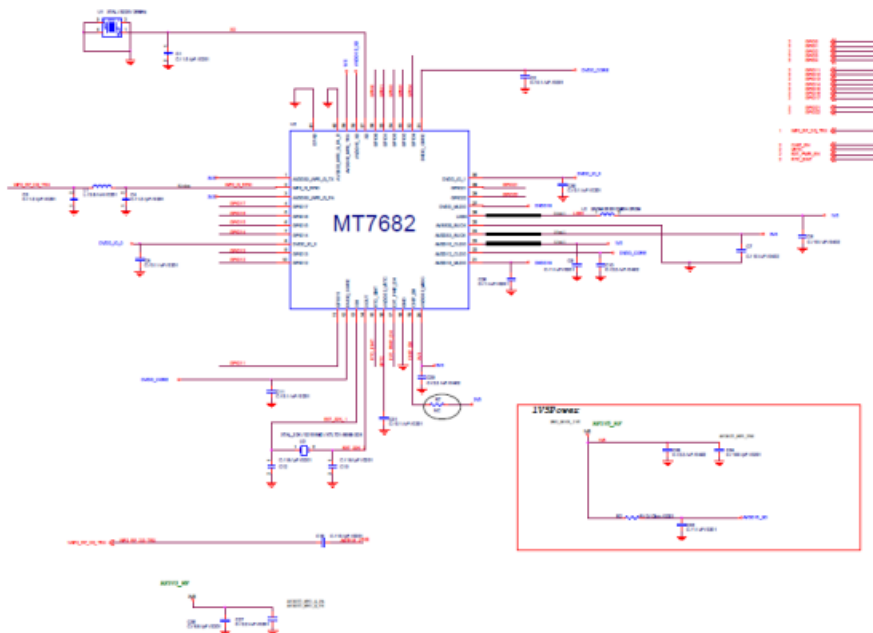
## 3. Application Diagrams

### 3.1 Functional Block Diagram



## PRODUCTS SPECIFICATION WL1KM1000

### 3.2 Schematic



## PRODUCTS SPECIFICATION WL1KM1000

### Strap Pin

#### XTAL Select

(GPIO17)  
0: 32.768K (default)  
1: 4096Ks

#### SLOW\_SRC\_B

(GPIO14)  
0: External  
1: Internal (from 26/4096Ks clock) (default)

#### Host Interface Enable

(GPIO4)  
0: Disable Host Interface at boot (default)  
1: Enable Host Interface

#### Host Interface Select(active if HIF\_EN=1)

(GPIO13)  
1: host interface via SDIO slave (default)  
0: host interface via SPI slave

#### JTAG\_FDI\_B

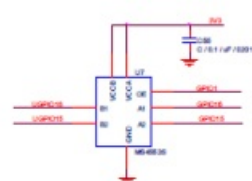
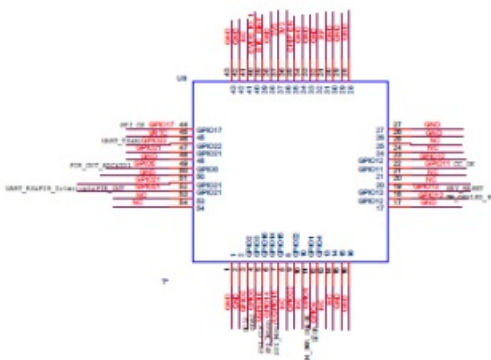
(GPIO15)  
1: JTAG pins as gpio (default)  
0: JTAG pins fixed for JTAG use

#### HIGH\_DIVIS\_B

(GPIO16)  
1: run with bootrom (default)  
0: bypass bootrom

#### DL\_MODE\_B

(GPIO12)  
1: no download (default)  
0: UART download



## PRODUCTS SPECIFICATION WL1KM1000

### 3.3 General Requirements

#### 3.3.1 IEEE 802.11b Section

WL1KM1000

	Feature	Detailed Description
3.3.1.1	Standard	<ul style="list-style-type: none"> <li>● IEEE 802.11b</li> </ul>
3.3.1.2	Radio and Modulation Schemes	<ul style="list-style-type: none"> <li>● DQPSK , DBPSK and CCK with DSSS</li> </ul>
3.3.1.3	Operating Frequency	<ul style="list-style-type: none"> <li>● 2400 2483.5MHz ISM band</li> </ul>
3.3.1.4	Channel Numbers	<ul style="list-style-type: none"> <li>● 13 channels for Worldwide</li> </ul>
3.3.1.5	Data Rate	<ul style="list-style-type: none"> <li>● at most 11Mbps</li> </ul>
3.3.1.6	Media Access Protocol	<ul style="list-style-type: none"> <li>● CSMA/CA with ACK</li> </ul>
3.3.1.7	Transmitter Output Power at Antenna Connector	<ul style="list-style-type: none"> <li>● Typical RF Output Power at each RF chain,and at room Temp. 25°C</li> <li>● 17±2 dBm at 11Mbps</li> </ul>
3.3.1.8	Receiver Sensitivity at Antenna Connector	<ul style="list-style-type: none"> <li>● Typical Sensitivity at each RF chain. @Frame (1000-byte PDUs) Error Rate&lt;8% at room Temp 25°C</li> <li>● -83 dBm for 11Mbps</li> </ul>

### 3.3.2 IEEE 802.11g Section

	Feature	Detailed Description
3.3.2.1	Standard	<ul style="list-style-type: none"> <li>● IEEE 802.11g</li> </ul>
3.3.2.2	Radio and Modulation Type	<ul style="list-style-type: none"> <li>● QPSK , BPSK , 16QAM ,64QAM with OFDM</li> </ul>
3.3.2.3	Operating Frequency	<ul style="list-style-type: none"> <li>● 2400 2483.5MHz ISM band</li> </ul>
3.3.2.4	Channel Numbers	<ul style="list-style-type: none"> <li>● 13 channels for Worldwide</li> </ul>
3.3.2.5	Data Rate	<ul style="list-style-type: none"> <li>● at most 54Mbps</li> </ul>
3.3.2.6	Media Access Protocol	<ul style="list-style-type: none"> <li>● CSMA/CA with ACK</li> </ul>
3.3.2.7	Transmitter Output Power at Antenna Connector	<ul style="list-style-type: none"> <li>● Typical RF Output Power at each RF chain, at room Temp. 25°C</li> <li>● 15±2 dBm at 54Mbps</li> </ul>
3.3.2.8	Receiver Sensitivity at Antenna Connector	<ul style="list-style-type: none"> <li>● Typical Sensitivity at each RF chain. @Frame (1000-byte PDUs) Error Rate&lt;10% at room Temp 25°C</li> <li>● -71 dBm for 54Mbps</li> </ul>

### 3.3.3 IEEE 802.11n Section

	Detailed Description	
3.3.3.1	IEEE 802.11n	
3.3.3.2	BPSK , QPSK , 16QAM ,64QAM with OFDM	
3.3.3.3	2.4GHz :2400 ~ 2483.5MHz for ISM band	
3.3.3.4	at most 150 Mbps	
3.3.3.5	● CSMA/CA with ACK	
3.3.3.6	● Typical RF Output Power at each RF chain,and at roomTemp. 25°C	
	● 2.4GHz Band/HT20 14±2dBm at MCS7	● 2.4GHz Band/HT40 14±2dBm at MCS7
3.3.3.7	Typical Sensitivity at each RF chain. @Frame(1000-byte PDUs)Error Rate=10% and at room Temp. 25 °C	
	2.4GHz Band/HT20 ● -68dBm at MCS7	2.4GHz Band/HT40 ● -66dBm at MCS7

## 4. Electrical and Thermal Characteristics 4.1 Temperature Limit Ratings

WL1KM1000

Parameter	Minimum	Maximum	Units
Storage Temperature	-55	+125	°C
Ambient Operating Temperature	-30	+85	°C
Junction Temperature	0	+125	°C

## 4.2 General Section

	Feature	Detailed Description
4.2.1	Antenna Type	● No Antenna
4.2.2	Operating Voltage	● 3.3V±10%
4.2.3	Current Consumption	<ul style="list-style-type: none"> <li>● 120mA@RX</li> <li>● 300mA@TX</li> </ul>
4.2.4	Form Factor and Interface	● UART

PAGE 9 OF 16

Version 1.1



## 5. Mechanical Characteristics

### 5.1 Mechanical Requirements







Pin	Definition	Remark	I/O
1	GND		
2	GND		
3	GPIO2		
4	GPIO3		
5	GPIO16		
6	GPIO14		
7	GPIO15		

PAGE 10 OF 16

Version 1.1



PRODUCTS SPECIFICATION WL1KM1000

8	NC		
9	GPIO22		
10	NC		
11	GPIO1		
12	GPIO4		
13	NC		
14	NC		

15	GND		
16	GND		
17	GND		
18	GPIO12		
19	GPIO13		
20	NC		
21	NC		
22	GPIO11		
23	GPIO12		
24	NC		
25	NC		
26	GND		
27	GND		
28	GND		
29	GND		
30	GND		
31	RF		

32	GND	GND	
33	GND		
34	GND		
35	CHIP_EN		
36	VDD3.3	3.3V	3.3V power supply
37	VDD3.3	3.3V	3.3V power supply
38	GND		
39	RTC_EINT		
40	DVDD_IO_1	3.3V	3.3V power supply
41	NC		
42	GND		
43	GND	GND	Ground
44	GPIO17		



45	VRTC		
46	GPIO22		UTXD0
47	GPIO21		URXD0
48	GND		
49	GPIO0		
50	GND		
51	GPIO21		
52	GPIO21		
53	NC		
54	NC		

#### 5.4 Product Picture



TOP VIEW BOTTOM VIEW

#### 6. BOM (Part List)

Important material information

	Material Name	Company	Using State
1	Integrated Circuit	AIROHA/MediaTek	Using
2	Capacitor	MURATA/WALSIN/TAIYO	Using
3	Inductor	MURATA /CHILISIN	Using
4	Resistor	YAGEO/TA-I/ WALSIN /RALEC	Using
5	Crystal XTAL	HARMONY/CREC/TXC	Using
6	Chip Power Inductors	CHILISIN/ TAIYO	Using
7	PCB	FZX-PCB/BXXW-PCB	Using

PAGE 12 OF 16

Version 1.1

PRODUCTS SPECIFICATION 7. Module Package

Appendix : Schematic diagram of packaging

WL1KM1000

PAGE 13 OF 16

Version 1.1

PRODUCTS SPECIFICATION WL1KM1000

Carton 426\*378\*300mm

Inner Box 411\*365\*54mm

Antistatic Vacuum Bag 450X500mm

Packing Quantity 4000PCS per box 5 boxes 800PCS per box

PAGE 14 OF 16

Version 1.1

## PRODUCTS SPECIFICATION

### 8. Note

#### 8.1 ESD

WL1KM1000

Can't get the module bare hands when needs, must we wear the gloves and static ring.

#### 8.2 Recommended Reflow Profile

Referred to IPC/JEDEC standard. Peak Temperature :  $245 \pm 5^{\circ}\text{C}$  Times :  $\leq 2\text{ s}$

PAGE 15 OF 16

Version 1.1

## PRODUCTS SPECIFICATION 8.3 Wireless module before the SMT note

WL1KM1000

1. When customers Open stencil must be sure the hole bigger to the Wireless module plate, please press 1 to 1 and 0.7 mm is widened to open outward, the thickness of 0.12 mm. 2. Can't get the wifi module bare hands when needs, must we wear the gloves and static ring. 3. The furnace temperature according to the size of the customer the mainboard, generally like to stick on a tablet standard temperature of  $250 \pm 5$ , can do  $260 \pm 5$ .

Storage and use Wifi module control should pay attention to the following matters: • Module of the storage life of vacuum packaging

1-1. Storage life: 12 months. Storage conditions:  $< 40^{\circ}\text{C}$ . Relative humidity:  $< 90\% \text{ R.H.}$  1-2. After this bag is opened, devices that will be subjected to infrared reflow, vapor-phase reflow, or equivalent processing must be:

1-3. Check the humidity card: stored at  $\leq 20\% \text{ RH}$ . If  $30\% \sim 40\%$  (pink) or greater than  $40\%$  (red). Labeling module has moisture absorption.

① Mounted within 168 hours at factory conditions of:  $t \leq 30^{\circ}\text{C} \leq 60\% \text{ R.H.}$  ② Once opened, the workshop the preservation of life for 168 hours.

1-4. If baking is required, devices may be baked for:

① Modules must be to remove module moisture problem.

② Baking temperature:  $125^{\circ}\text{C}$ , 8 hours.



③ After baking, put proper amount of desiccant to seal packages.

1-5. The actual number of module vacuum packing which is based on the actual number of packages to the customer requirements,

2. Module reel packaging items as follows.

2-1. Storage life: 12 months. Storage conditions: <40°C. Relative humidity: <90% R.H. 2-2. Module apart packing after 168 hours To launch patch need to bake, to remove the module hygroscopic, baking temperature conditions 125°C, 8 hours.

2-3. The actual number of module reel packing which is based on the actual number of packages to the customer requirements,

3. Module pallet packaging items as follows

3-1. Storage life 3 months. Storage conditions: <40°C. Relative humidity: <90% R.H. 3-2. Module if not used within 48 hours, before launch the need for baking, baking temperature: 125 °C, 8 hours.

3-3. Pallet packaging each plate is 100 PCS. The actual number of module pallet packing which is based on the actual number of packages to the customer requirements.

PAGE 16 OF 16

Version 1.1

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.<sup>3</sup>

Explanation: This module meets the requirements of FCC part 15C(15.247).

## 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 EUT has a FPC Antenna, and the antenna use a permanently attached antenna which is not replaceable.

## 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 not a limited 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 is: 2AYHE-2403C

## 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 FPC Antenna, and the antenna use a permanently attached antenna which is unique.

## 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: 2AYHE-2403C, Contains IC: 26839-2403C"

## 2.9 Information on test modes and additional testing requirements

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: Top band 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 circuitry), 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 circuitry, so the module does not require an evaluation by FCC Part 15 Subpart B. The host should be evaluated by the FCC Subpart B.

### FCC STATEMENT :

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.

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

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 radiocommunications. 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 Radiation Exposure Statement:**

This equipment complies with FCC 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.

### **ISED Statement**

This device complies with Industry Canada license-exempt RSS standard(s). 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.”

This equipment should be installed and operated with a minimum distance of 20 cm between the radiator and your body.

**MODIFICATION:** Any changes or modifications not expressly approved by the grantee of this device could void the user's authority to operate the device.

Toute modification non approuvée explicitement par le fournisseur de licence de l'appareil peut entraîner l'annulation du droit de l'utilisateur à utiliser l'appareil.

This Class B digital apparatus complies with Canadian ICES-003.

Cet appareil numérique de la classe B est conforme à la norme NMB-003 du Canada

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: 2AYHE-2403C". 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 includethe integrated Module. Additional measurements (15B) and/or equipment authorizations (e.g. Verification) may need to be addressed depending on co-location or simultaneous transmissionissues if applicable. (OEM) Integrator is reminded to assure that these installation instructions will not be made available to the end user

IC labeling requirement for the final end product:


The final end product must be labeled in a visible area with the following “Contains IC: 26839-2403C”

The Host Marketing Name (HMN) must be indicated at any location on the exterior of thehost product or product packaging or product literature, which shall be available withthehost product or online.

This radio transmitter [ IC:26839-2403C] has been approved by Innovation, Scienceand Economic Development Canada to operate with the antenna types listed below, with the maximum permissible gain indicated. Antenna types not included in this list that have a gain greater than the maximum gain indicated for any type listedarestrictly prohibited for use with this device.

Frequency	range Manufacturer	Peak	gain Impedance	Antenna
2412~2462MHz	Shenzhen Comfortable Technology Co. Ltd	Be- 4.11dBi	50Ω	FPC Antenna

Documents / Resources

	<p><a href="#">GSD WL1KM1000 Low Energy lot Module</a> [pdf] User Manual</p> <p>WL1KM1000 Low Energy lot Module, WL1KM1000, Low Energy lot Module, Energy lot Module, lot Module</p>
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References

- [User Manual](#)

[Manuals+.](#) [Privacy Policy](#)

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