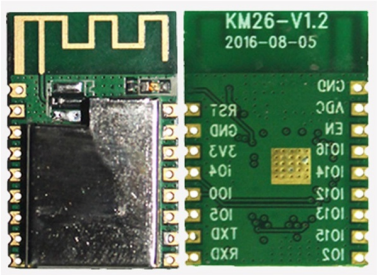
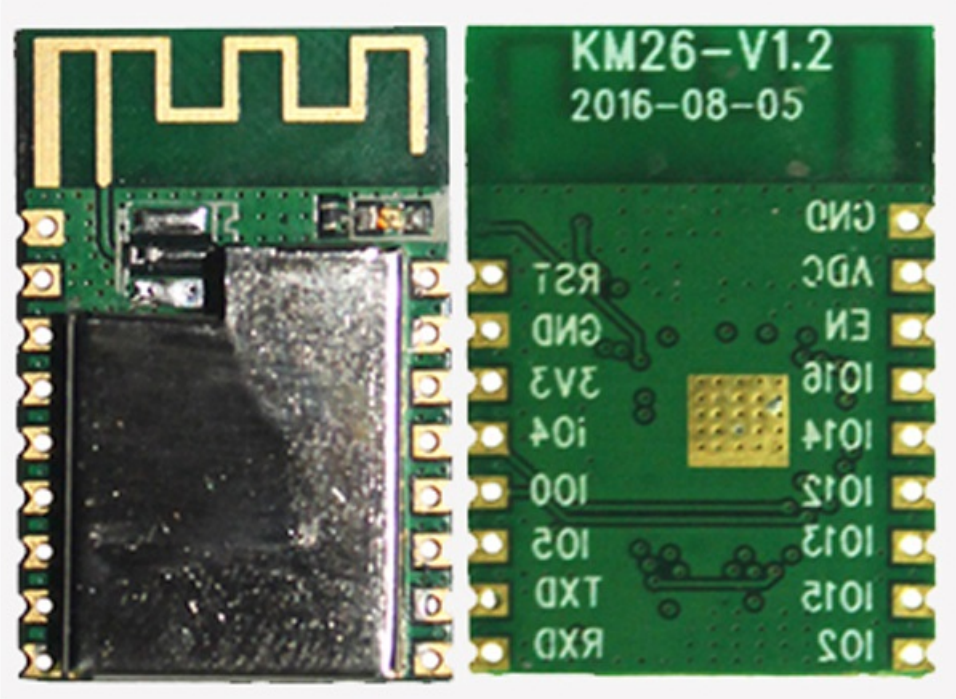


OGEMRAY GWF-KM26 UART Wi-Fi Module User Manual

OGEMRAY GWF-KM26 UART Wi-Fi Module User Manual



Contents

Product Introduction

Overview

GWF-KM26 adopted ESP8266EX platform, the chip work at 2.4G frequency. ESP8266EXisamong the most integrated Wi-Fi chips in the industry. Measuring just 5mm*5mm, ESP8266EXrequires minimal external circuitry and integrates a 32-bit Ten silica MCU, which features extra low power consumption and 16-bit RISC, the main frequency support 80MHz and 160MHz. With RTOS, it integrate Wi-Fi MAC/BB/RF/PA/LNA/on-board antenna.

GWF-KM26 support IEEE802.11 b/g/n standard. Using TCP/IP complete protocol stack, user can use the module to add Wi-Fi network function, it will also establish independent network controller.

ESP8266EX is a high-efficiency SOC, it offer the unprecedented practicality by low cost, which offer unlimited possibilities for Wi-Fi technology applied to other control system. ESP8266EX is a complete and self-contained Wi-Fi solutions, it can not only run independently, but also work when carried on other host MCU. If ESP8266EX is loaded applications the only application processor, it will be set up from external flash. Built-in with high speed buffer memory, it is conductive to enhance system performance and reduce RAM demand.

In other case, ESP8266EX take charge of accessing to Wi-Fi adapter, we can add it tony MCU design, it is easy and convenient. Just need to thorough SPI/SDIO interface or I2C/UART interface

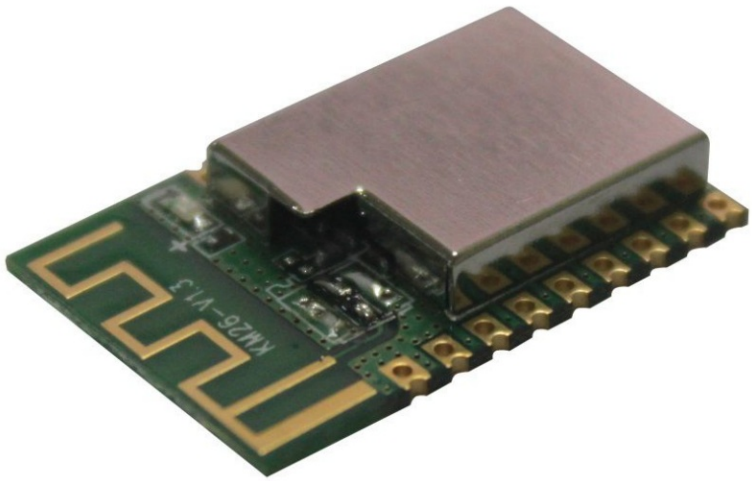
Great capacity for management and memory function make it integrate sensors or other application by GPIO, which occupy the least system resource.

With highly integrated on-chip features and minimal external discrete component count, the chip offers reliability, compactness and robustness critical in end products.

Features

- Support 2.4GHz, 802.11b/g/n
- Integrate Ten silica L106 low consumption 32-bit MCU, the main frequency support 80MHz and 160MHz. With RTOS.
- Built-in 10-bit high-precision ADC.
- TCP/IP protocol stack.
- Integrate TR switch, baling, LNA, power amplifier and matching network.
- With PLL, AVR and power management part, 20 dB output power in 802.11bmode.
- A-MPDU, A-MSDU,0.4 s protection interval.
- Support WPA/WPA2 Security mode.
- Support AT remote upgrade and OTA upgrade.
- Support STA/AP/STA+AP work mode
- Support Smart-Confit function Android& iOS device
- HSPI,UART, I2C,I2S,IR Remote Control, PWM, GPIO
- Deep sleep current is 10 μA , turn-off current is less than 5 μA .
- Wake up, connect and transfer data in 2ms.

Figure 1- 1 GWF-KM26

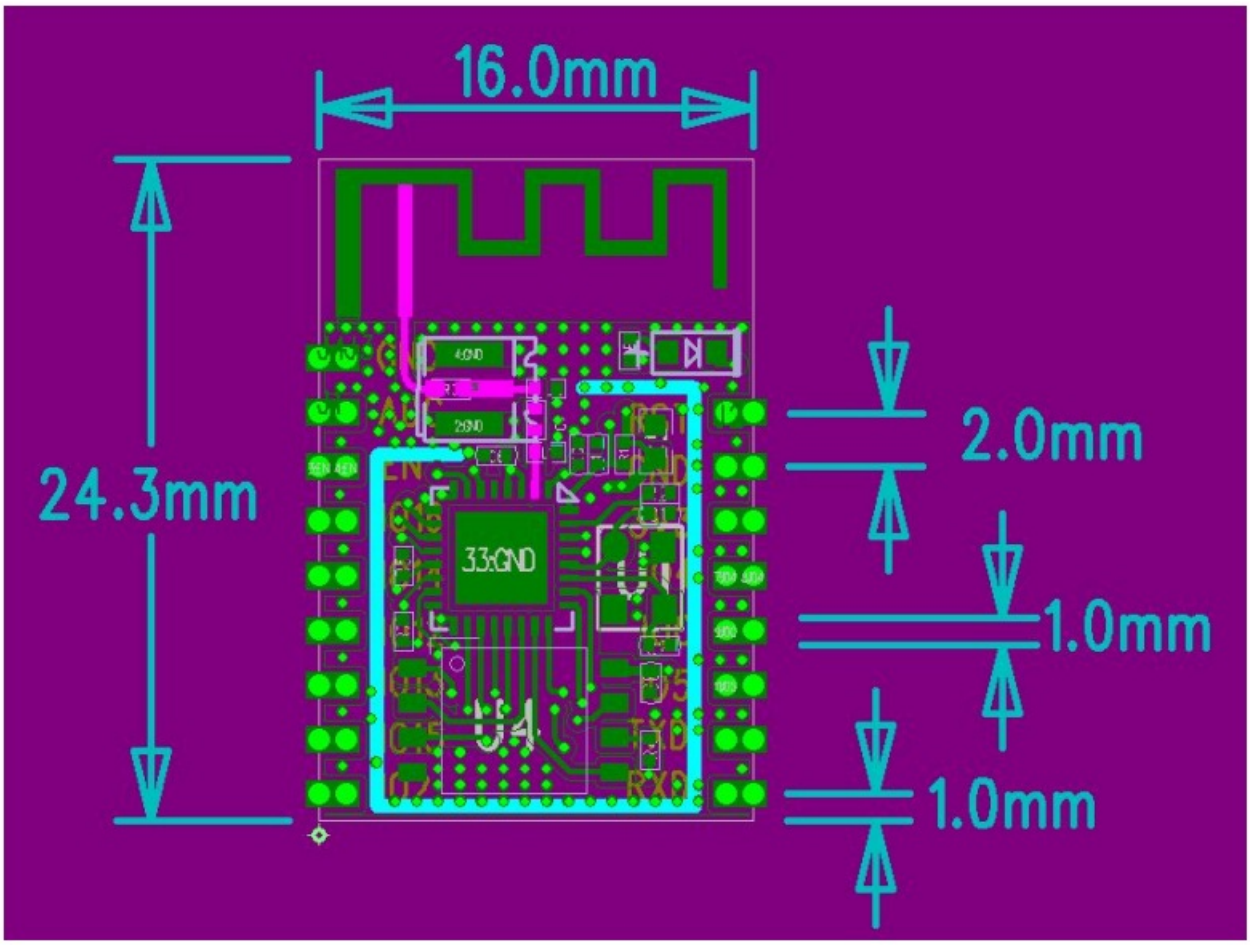


Appearance

GWF- KM26 dimension is 24.3mm*16mm*3.65mm (As shown in the figure below). The SPI flash capacity is 8 Mbit packaging SOP-208 mil.

Figure 1- 3 GWF-KM26 Front View

Figure 1- 4 Dimension



Specification

Table 1- 1 GWF-KM26 Specification

	Protocol and Interface Standard	
	WiFi Standard	IEEE 802.11b/g/n
	Data Interface	UART/HSPI/I2C/I2S/IR Remote Control
		GPIO/PWM
	I/O Interface	9 GPIO

LED	When the LED flash slow, the module is not access to WiFi. When LED is on, the module has been accessed to WiFi.
Memory	
SPI Flash	8 Mbit

WiFi Features	
WiFi work mode	STA/AP/STA+AP/Smart Config
RF Security mode	WPA WPA2
Encryption type	WEP/TKIP/AES
WiFi RF Parameter	
Frequency	2.4GHz-2.5GHz (2400M-2483.5M)
TX PWR	802.11b (CCK) 11Mbps: 20+/-1.5dBm
	802.11g (OFDM) 54Mbps: 15.5+/-1.5dBm
	802.11n(HT20@MCS7) 72.2Mbps: 14.5+/-1.5dBm
Running Current	
Power Supply	3.0~3.6V(3.3V)
Running Current	80mA (average value)
Working Condition	
Work Temperature	-10ºC to +60ºC
Storage Temperature	Normal Temperature
Work Humidity	5% to 95%(no condensing)
Physical Specification	
PCBA dimension	24.3mm*16mm*3.65mm

RF Range	
Indoor: 45m; Outdoor: 150m(To be depended on the real environment)	

Interface Definition

Figure 1- 5 Pin

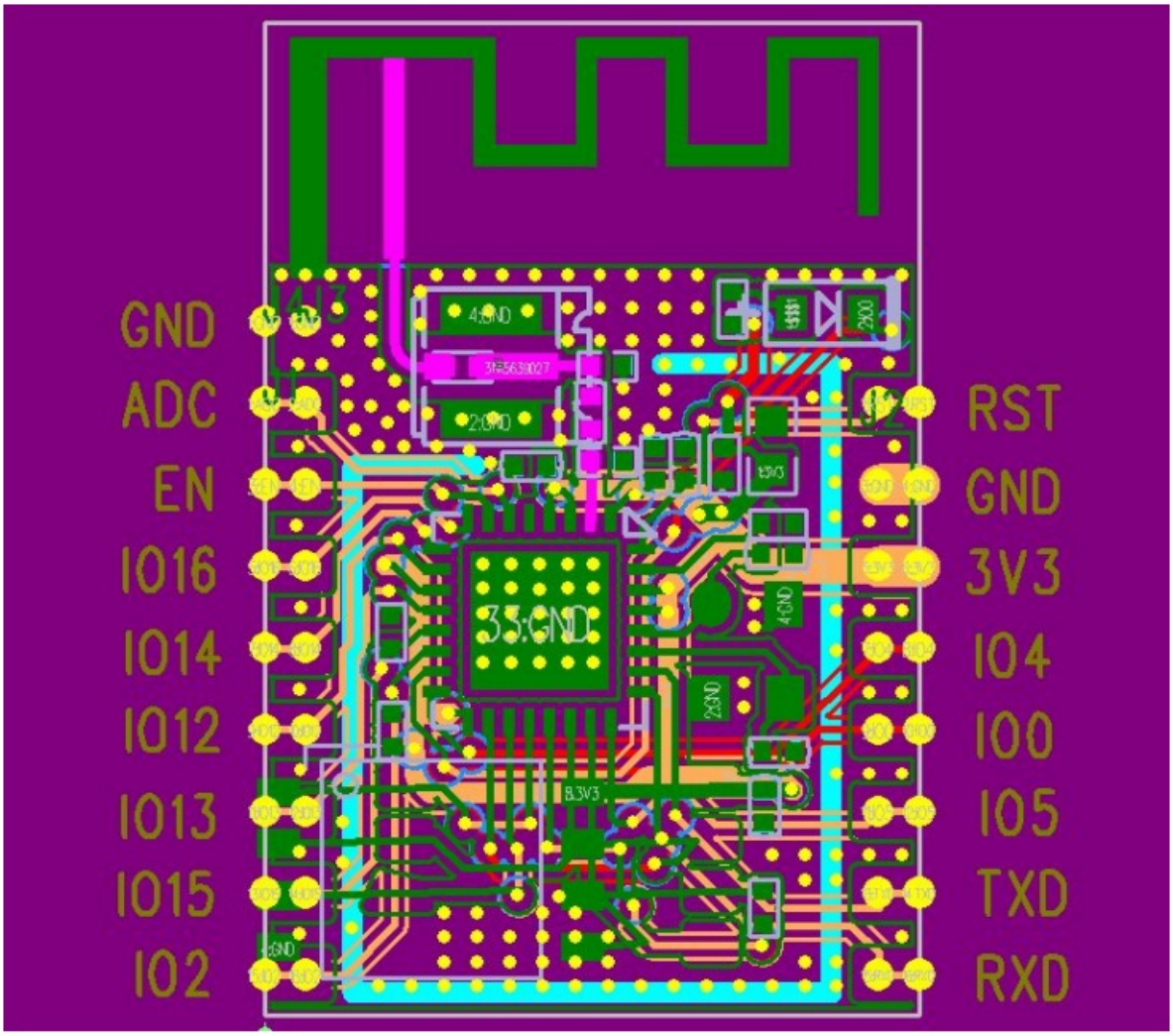


Table 1- 2 GWF-KM26 Pin Definition

No.	Pin	Function Instruction
1	GND	GND
2	ADC	A/D result, input voltage range: 0~1V, value range: 0~1024
3	EN	Chip enable interface, active high enable.
4	IO16	GPIO16; Connecting it to RST pin to wake up deep sleep mode.
5	IO14	GPIO14; HSPI_CLK
6	IO12	GPIO12; HSPI_MISO
7	IO13	GPIO13; HSPI_MOSI; UART0_CTS
8	IO15	GPIO15; MTDO; HSPICS; UART0_RTS
9	IO2	GPIO2; UART1_TXD
10	RXD	UART0_RXD; GPIO3
11	TXD	UART0_TXD; GPIO1
12	IO5	GPIO5
13	IO0	GPIO0
14	IO4	GPIO4
15	3V3	3.3V Power Supply
16	GND	GND
17	RST	Reset

Table 1- 3 Pin Mode

Mode	GPIO15	GPIO0	GPIO2
UART download mode	Low	Low	High
Flash Boot mode	Low	High	High

Table 1- 4 Pin Instruction

Interface	Pin	Function Instruction
PWM	IO12(R), (G),IO13(B)	To control color, buzzer, relay, motor and so on.
IR	IO14(IR_T), IO5(IR_R)	IR Remote Control4 interface is implemented by software, the interface use NEC coding and modem, 38KHz carrier modulation
ADC	TOUT	To detect VDD3P3 (Pin3,Pin4) power voltage an TOUT(Pin6) and input voltage(can't be use at the same time); Sensor application.
I2C	IO14(SCL), IO2(SDA)	To connect to external sensor and display.
UART	UART0: TXD(U0TXD), RXD(U0RXD), (RTS), IO13(CTS)	To connect to external device UART interface. Download U0TXD+U0RXD or GPIO2+U0RXD. Communication (UART0): U0TXD, U0RXD, MTDO(U0RTS), MTCK(U0CTS) Debug: UART1_TXD (GPIO2),it can be served as debug information print.
	UART1: IO2(TXD)	UART0 output printing information by ESP8266EX in default. Developers can user the internal exchange function of UART to interchange U0TXD, U0RXD and U0RTS U0CTS at the time of initialization, To connect MTDO and MTCK to corresponding UART of external MCU.
I2S	I2S Input:IO12 (I2SI_DATA) ; IO13 (I2SI_BCK); IO14 (I2SI_WS) ;	It is utilized for audio collection, process and transmission.
	I2S Output:IO15 (I2SO_BCK); IO3 (I2SO_DATA); IO2 (I2SO_WS).	

Electrical Features

Rated Value	Condition	Range	Unit
VCC	IPC/JEDEC J-STD-020	+3.0 to +3.6	V
VESD	ESD Protection (HBM)	2000	V

Digital Port Features

Table 1- 6 Data port features

Port	Typical Value	Minimum	Typical Value	Maximum	Unit
Input Logical Level Low	VIL	-0.3		0.25VDD	V
Input Logical Level High	VIH	0.75VDD		VDD+0.3	V
Output Logical Level Low	VOL	N		0.1VDD	V
Output Logical Level High	VOH	0.8VDD		N	V

Hardware Design Notice

Application Diagram

The module support general UART and network standard. Built-in TCP/IP protocol stack, user scan use the module to add network function. It also can establish independent internet controller to realize data transmission between UART and WiFi internet. Using GWF-KM26 WiFi module, traditional UART device could be connected to the WiFi network without changing any configuration, to provide complete and quick solutions for UART device. There are two methods to control external devices, the first is that external MCU control WiFi module UART. Secondly, KM26controls external devices by its self-contained UART.

The following is application diagram:

Figure 2- 1 Application Diagram

GPIO

here are 9 GPIO in the module, the minimum interrupt response time is 1ms, these GPIO could be configured by software directly like UART, LED, IR control.

Figure 2- 2 GPIO reference design

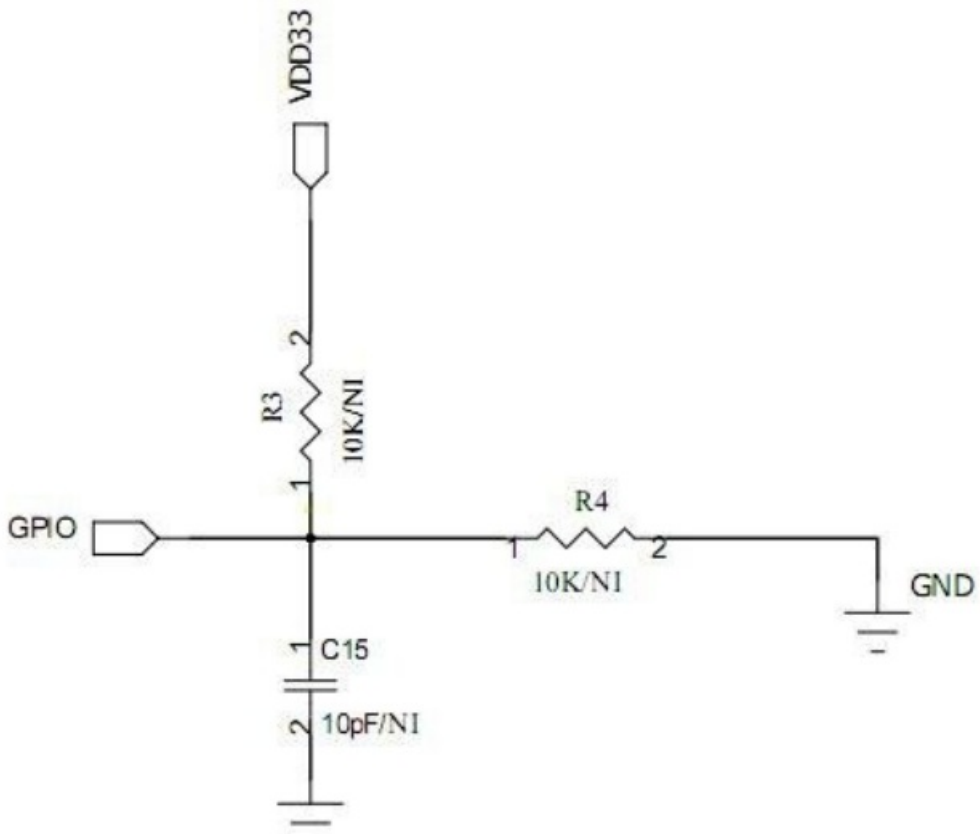
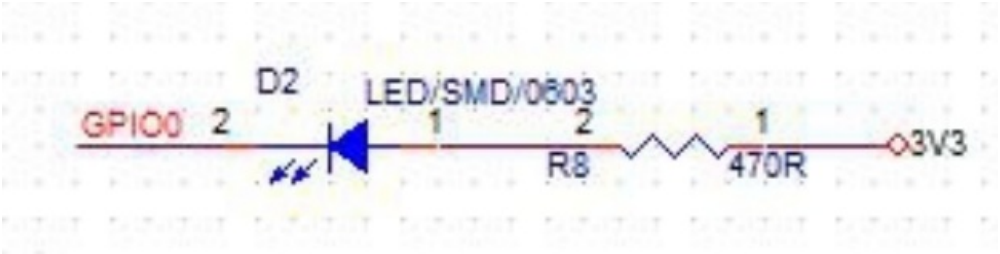


Figure 2- 3 LED reference design



To control LED brightness by adjusting resistance value of R8.
Note: If the LED is in semi-bright for a long time, please try to reset.

UART

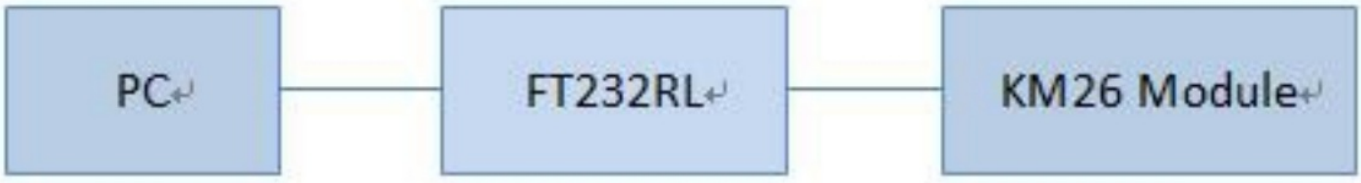
Table 2- 1 UART pin definition

UART interface			
Pin	Pin name	I/O	Instruction
10	RXD	I	UART_RXD(UART Receive Data)
11	TXD	O	UART_TXD (UART Transmit Data)

GWF-KM26 default configuration
10 pin for UART RXD
11 pin for UART TXD
Hyper terminal, Tera or Secure CRT can be regarded as communication tools for UART interface debug.
The UART setting is 115200; 8-N-1.

The following figure is a reference design selection

Figure 2- 4 UART reference design

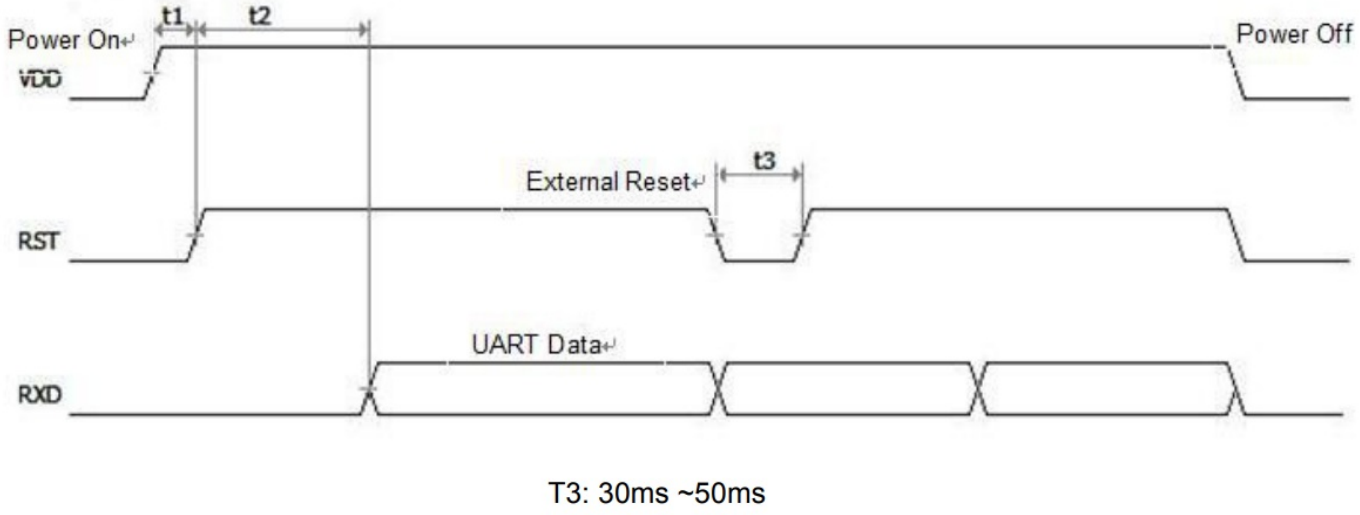


Design requirement of practical application

Reset Sequence

KM26 need to reset external reset signal (Active Low),external reset sequence as shown in the figure below:

Figure 2- 5 KM26 external reset sequence



T3: 30ms ~50ms

Power Supply Interface

Table 2- 2 Power supply pin definition

Power Supply Interface			
Pin No.	Pin	I/O	Instruction
16	GND	Power	Ground
15	VCC	Power	3.3V Input

Because module need low ripple DC power supply, please design the power module accurately, otherwise, it may lead to RF performance degradation.

RF Input and Output Interface

A. Using on-board antenna, we need to place 1nH inductance, remain IPEX empty

Figure 2- 6 On-board antenna

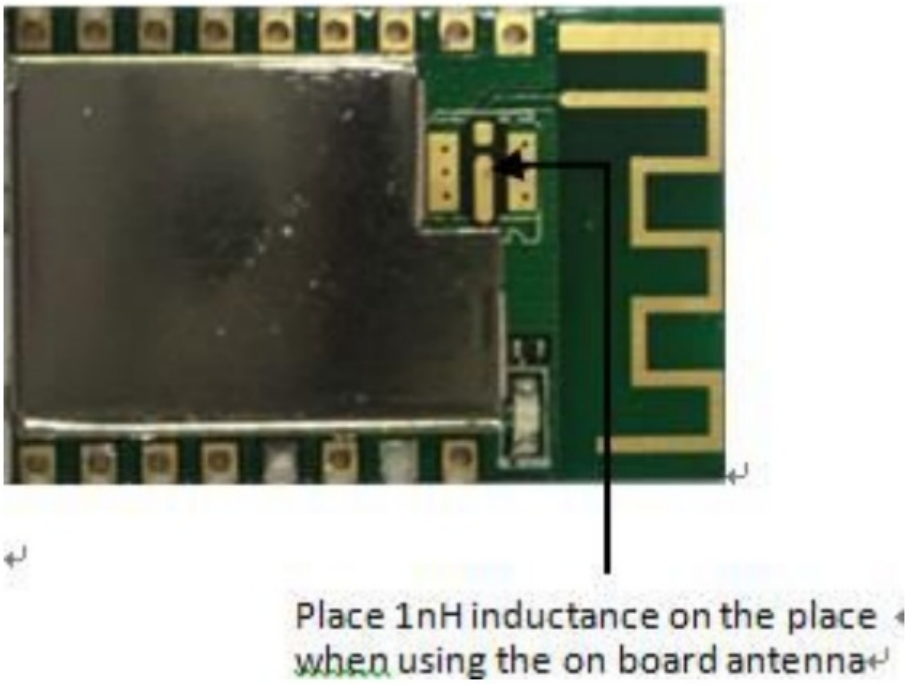
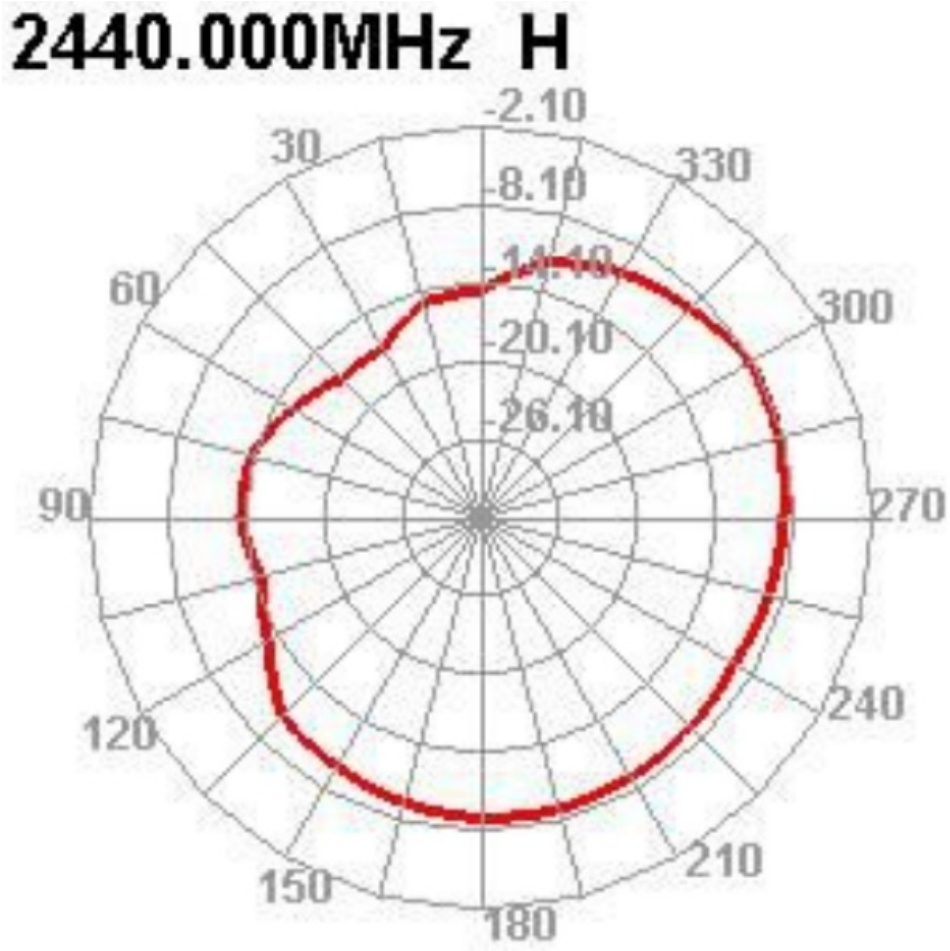


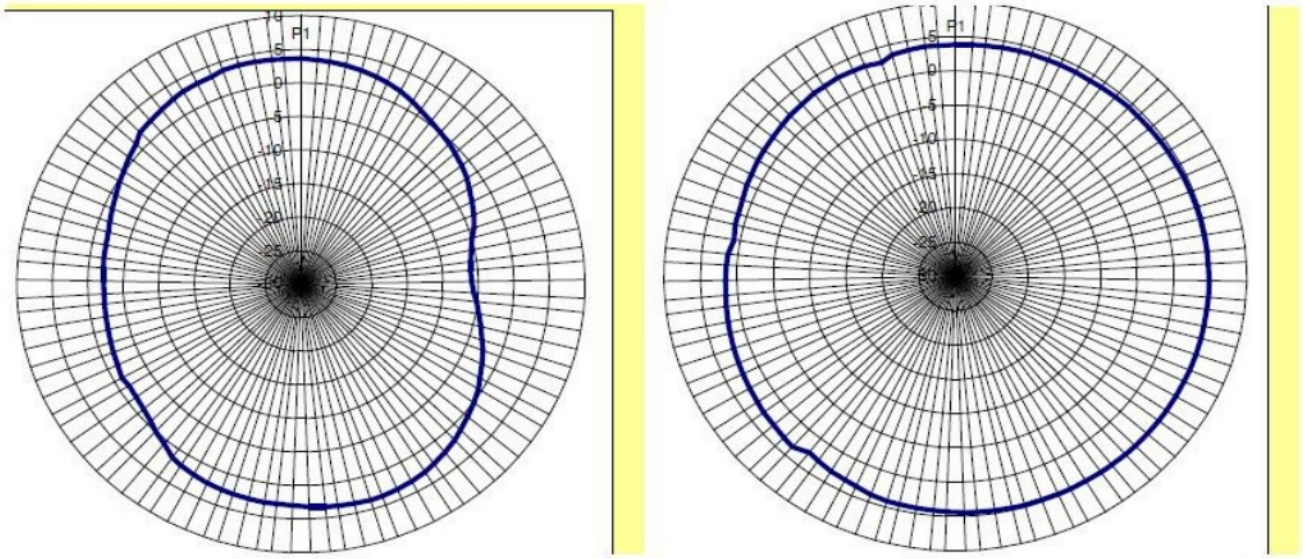
Figure 2- 7 Antenna pattern

Peak gain: 1dBi; average gain: -1dBi



B. External antenna is connected to IPEX by RF cable, we should not add inductance to the board.

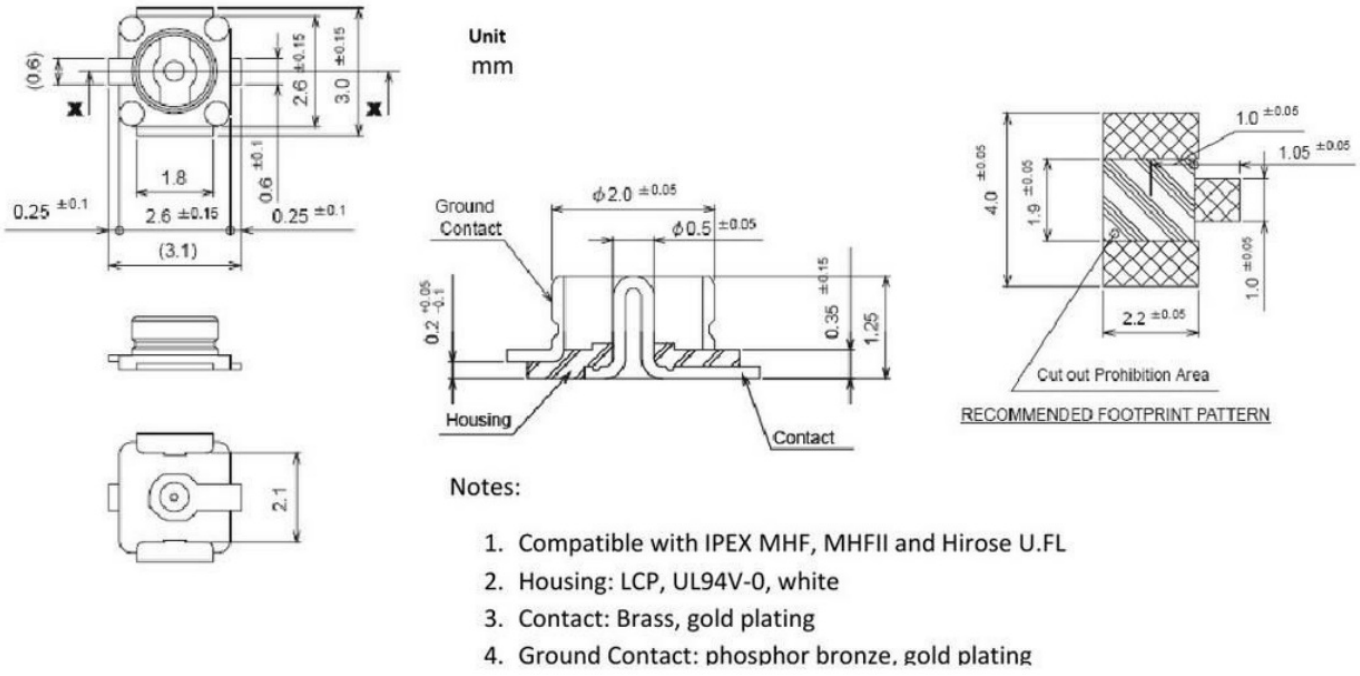
Patterns taken with Model N2420 mounted on 90mm x 90mm x 2.2mm thick,
ABS Plastic sheet using 1.6mm double sided tape.



Model N2420-65U

Measured Azimuth Radiation Pattern

Measured Elevation Radiation Pattern



Above figure is suggested antenna Airgain P / N N2420 and its antenna pattern.

Patterns taken with Model N2420 mounted on 90mm x 90mm x 2.2mm thick. ABS Plastic sheet using 1.6mm double sided tape.

Notes:

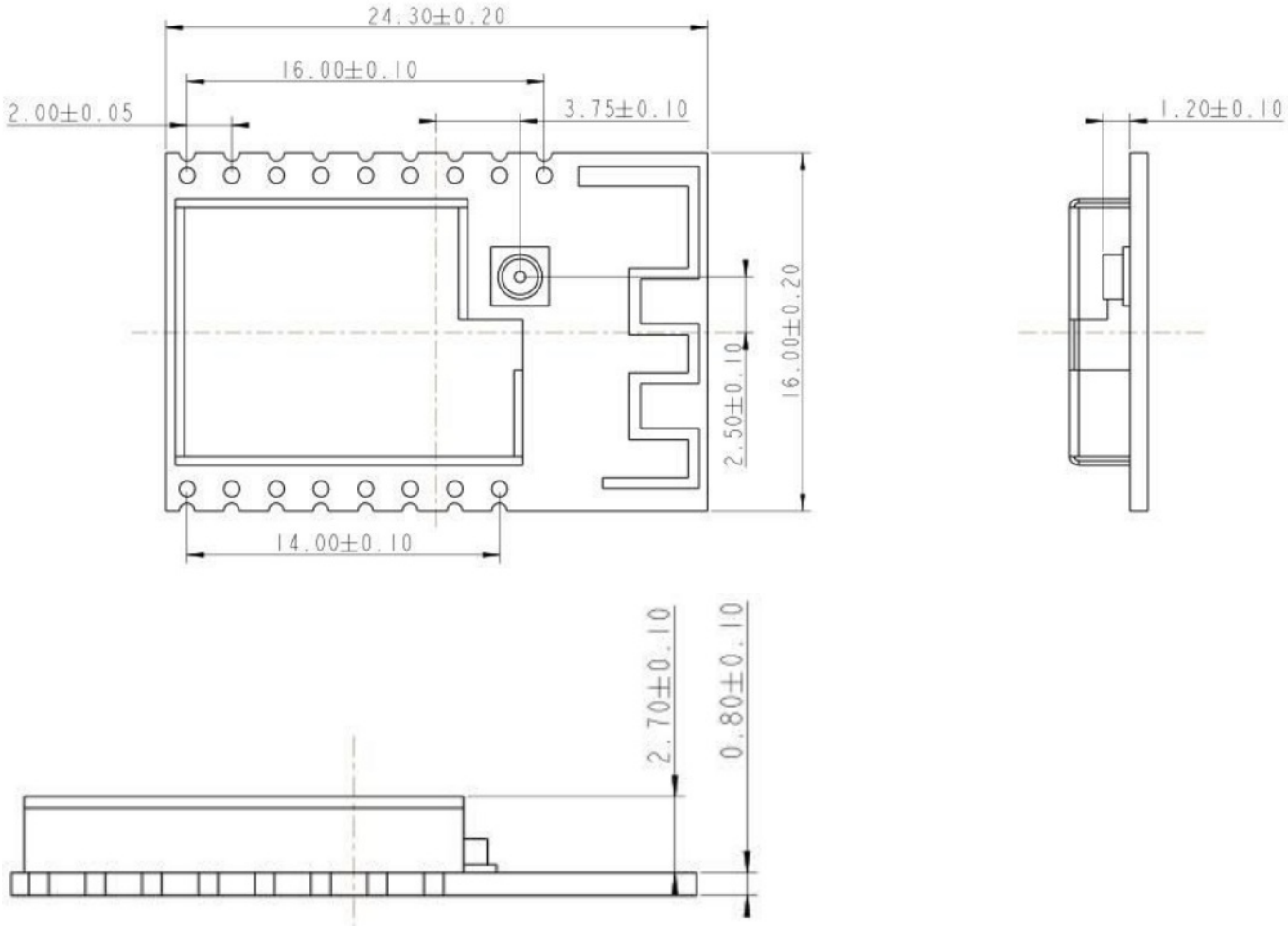
1. Compatible with IPEX MHF, MHFII and Hirose U.FL
2. Housing: LCP, UL94V-0, white

3. Contact: Brass, gold plating
4. Ground Contact: phosphor bronze, R old plating

Above figure is suggested antenna Air gain P / N N2420 and its antenna pattern.

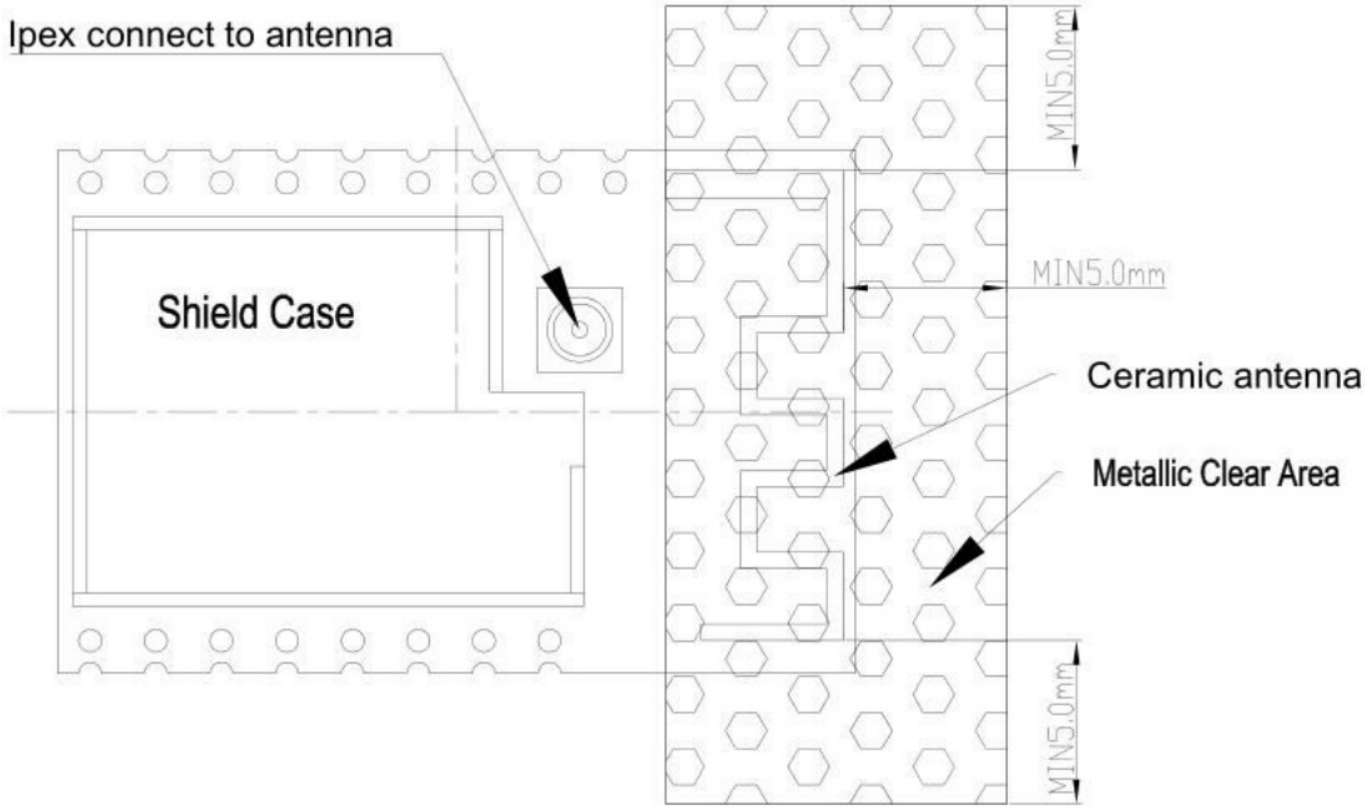
Dimension

Figure 2- 8 Dimens



No wiring area

Figure 2- 9 No wiring area



Approval and Certification

Table 3- 1 Approval and Certification

Certification	Approval
FCC part15	Ongoing
CE	Ongoing
RoHS	Pass

Disclaimer

These material and information are provided “as is” without warranty of any kind, either express of implied, including but not limited to, the implied warranties of merchantability, fitness for particular purpose or non-infringement.

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FCC Statements

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

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

This device and its antenna(s) must not be co-located or operating in conjunction with any other antenna or transmitter. 15.105 Information to the user.

For a Class B digital device or peripheral, the instructions furnished the user shall include the following or similar statement, placed in a prominent location in the text of the manual:

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 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 and your body.

Radiation Exposure Statement:
This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter. The module should not be installed and operated simultaneously with other radios except additional RF exposure was evaluated for simultaneously transmission. The availability of some specific channels and/or operational frequency bands are country dependent and are firmware programmed at the factory to match the intended destination. The firmware setting is not accessible by the end user.
The final end product must be labelled in a visible area with the following: Contains Transmitter Module **FCC ID: 2AWY7GWF-KM26**

Requirement per KDB996369 D03

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)

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.

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.

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);

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.

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.**

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.

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: 2AWY7GWF-KM26**

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

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 should be evaluated by the FCC Subpart B.

Documents / Resources

	OGEMRAY GWF-KM26 UART Wi-Fi Module [pdf] User Manual GWF-KM26, GWFKM26, 2AWY7GWF-KM26, 2AWY7GWFKM26, GWF-KM26 UART Wi-Fi Module, UART Wi-Fi Module, Wi-Fi Module