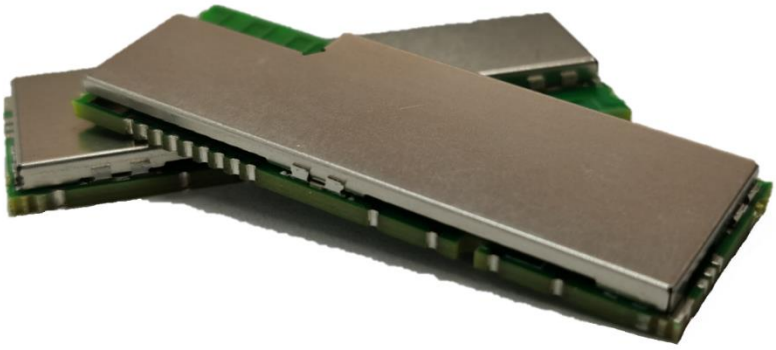
KAIFA

CX105-A RF Module



- IEEE 802.15.4g-based proprietary networking
- Smart metering
- Industrial monitoring and control
- Wireless alarm and security systems
- Municipal infrastructure
- Smart home and building

Description

The CX105-A RF module is a product that complies with the IEEE802.15.4g SUN FSK protocol and is dedicated to IEEE802.15.4g and G3 hybrid applications.

And the CX105-A is a dual mode product, which includes a sub 1G part and a Bluetooth low energy part. The sub 1G operates at 863MHz~870MHz or 902MHz~928MHz, with an output power support of up to +27dBm, while the low energy Bluetooth operates at 2400MHz~2483.5MHz, with an output power support of up to +8dBm.

When this module is used in Europe, it operates in the 863MHz~870MHz band. When this module is used in the Americas, it operates in the 902MHz~928MHz band.

Features

- Support IEEE 802.15.4g, G3 Hybrid
- Frequency bands 863MHz~870MHz or 902MHz~928MHz
- Modulation mode: FSK, GFSK
- Excellent receiver sensitivity: -104dBm@50kbps
- Maximum transmits output power: +27dBm
- Automatic output power ramping
- Automatic RX wake-up for low power listen
- Fast wake-up and AGC for low power listen
- Functions for wireless link robustness: RF channel hopping Auto-acknowledgement
- Digital RSSI and clear channel assessment for CSMA and listen-before-talk systems
- Ambient temperature range: -25℃~+70℃

Mechanical Characteristics

Size	53x19.8mm（±0.5）
Height	3.7mm
Weight	5.8g
Components	All components on one side of the PCB

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Power Consumption

The following is the power consumption test data of some typical application scenarios.

Sub 1G mode	Typical Current @3.6V (mA)
TX @27dBm	370
RX	25
IDLE	10

Absolute Maximum Ratings

Stresses above the values listed below may cause permanent device failure. Exposure to absolute maximum ratings for extended periods may affect device reliability, reducing product life time.

Item	Min	Max	Unit
Supply Voltage DC	-0.3	+3.6	V
Operating Temperature	-25	+70	℃
RF Input Level	-	+10	dBm

Electrical Characteristics

Items	Min	Typical	Max	Unit	Description
VCC Operating Voltage	3.0	3.3	3.6	V	DC Power
Operating temperature range	-25		+70	℃	
Sub 1G Specifications					
Operating frequency 1	863		870	MHz	EU
Operating frequency 2	902		928	MHz	NA
TX output power	0		+27	dBm	Programmable
Modulation deviation		±25		kHz	
Symbol rate	50		100	kbps	EU:50kbps NA:100kbps
Modulation Type		GFSK			
Unwanted Emission			-36	dBm	30MHz-1GHz
			-30	dBm	1GHz-6GHz
Receiver sensitivity		-104		dBm	@50kbps
Blocking (category 2)	-69			dBm	@2MHz
	-44			dBm	@10MHz
Communication port	SPI				
BLE Specifications					
Operating frequency	2400		2483.5	MHz	
TX output power	-14		+8	dBm	
Modulation Type		GFSK			
Receiver sensitivity				dBm	
Communication port	UART				

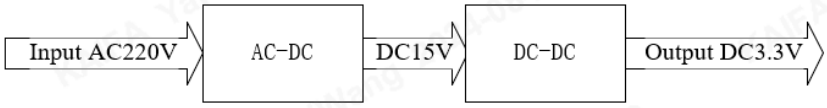
Module PIN Definition

PIN Description

Pin Number	Pin Name	Pin Description
1	GND	Ground
2	WKUP	BLE wakeup
3	RESET	Reset (Active Low)
4	GND	Ground
5	CSN	SPI CS
6	CLK	SPI CLK
7	MISO	SPI MISO
8	MOSI	SPI MISO
9~11	VCC	DC +3.6V
12	SDN	SPI SDN
13	GND	Ground
14	IRQ	SPI IRQ
15	BOOT_EN	Bootloader HW enable
16	BSL_RX	URAT RX
17	BSL_TX	UART TX
22~33	GND	Ground
38	GND	Ground
39	RF_OUT	RF output
40	GND	Ground

Description

This CX105-A module needs to work together with the terminal device, because the power supply is provided by the terminal device, and its architecture is as follows, and the module firmware is stored in the terminal device and communication is initiated by the terminal device, and the antenna of the module is also installed on the terminal device, through which the wireless signal of the module will be transmitted.



List of applicable FCC rules

This module has been tested and found to comply with part 15 requirements for Modular Approval. 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.

Manual Information to the End User

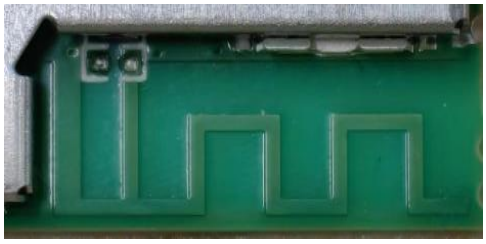
The OEM integrator has to be aware not to provide information to the end user regarding how to install or remove this RF module in the user's manual of the end product which integrates this module. The end user manual shall include all required regulatory information/warning as show in this manual.

■ Antenna

(1) The antenna must be installed such that 20 cm is maintained between the antenna and users.
(2) The transmitter module may not be co-located with any other transmitter or antenna.
In the event that these conditions cannot be met (for example certain laptop configurations or co-location with another transmitter), then the FCC authorization is no longer considered valid, and the FCC ID cannot be used on the final product. In these circumstances, the OEM integrator will be responsible for re-evaluating the end product (including the transmitter) and obtaining a separate FCC authorization.
To comply with FCC regulations limiting both maximum RF output power and human exposure to RF radiation, maximum antenna gain (including cable loss) must not exceed.

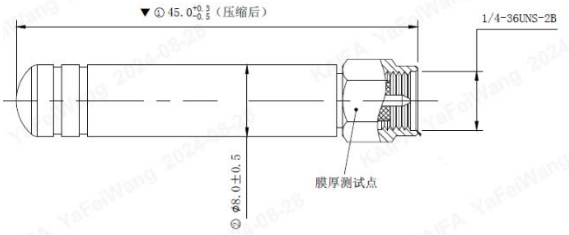
Antenna Type	Frequency Band (MHz)	TX Paths	Max Antenna Gain(dBi)	Cable Loss (dB)	Actual Antenna Gain(dBi)	Directional Gain (dBi)
Monopole Antenna	902~928	1	-2.74	0.2	-2.94	-2.94
PIFA Antenna	2402~2480	1	3.68	0	3.68	3.68

Antenna design requirements
a) RF-line need 50Ω single line impedance;
b) BLE Antenna is 2.4G Bluetooth frequency band PCB board antenna ;
c) Antenna length, width, shape(s) as follows, Company: mm;
d) PCB thickness is 1.6mm, Copper-Layer 4, Antenna is Layer1;
e) Antenna put on the edge of the PCB, Clearance around and below;

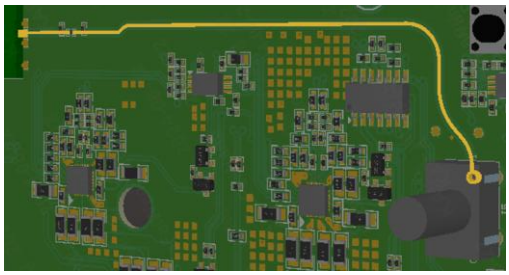


Size: L:13.8mm*W:4.8mm

f) SRD Antenna is 902-928MHz ISM frequency band;
g) Antenna length, width, shape(s) as follows, Company: mm.



h) The RF output port of the module is connected to the SMA interface through the microstrip line on the first layer of the terminal device PCB, and then connected to the SDR antenna.



OEM/Integrators Installation Manual

Important Notice to OEM integrators 1. This module is limited to OEM installation ONLY. 2. This module is limited to installation in mobile or fixed applications, according to Part 2.1091(b). 3. The separate approval is required for all other operating configurations, including portable configurations with respect to Part 2.1093 and different antenna configurations 4. For FCC Part 15.31 (h) and (k): The host manufacturer is responsible for additional testing to verify compliance as a composite system. When testing the host device for compliance with Part 15 Subpart B, the host manufacturer is required to show compliance with Part 15 Subpart B while the transmitter module(s) are installed and operating. The modules should be transmitting, and the evaluation should confirm that the module's intentional emissions are compliant (i.e. fundamental and out of band emissions). The host manufacturer must verify that there are no additional unintentional emissions other than what is permitted in Part 15 Subpart B or emissions are complaint with the transmitter(s) rule(s). The Grantee will provide guidance to the host manufacturer for Part 15 B requirements if needed.

Important Note

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

End Product Labeling

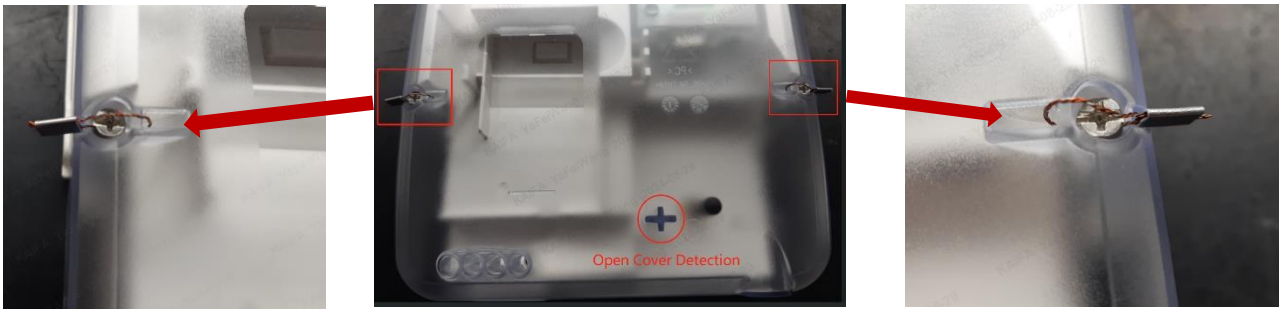
When the module is installed in the host device, the FCC/IC label must be visible through a window on the final device or it must be visible when an access panel, door or cover is easily re-moved. If not, a second label must be placed on the outside of the final device that contains the following text: “Contains FCC ID: 2ASLRCX105-A” . The FCC ID Certification Number can be used only when all FCC compliance requirements are met.

Note

1.List of applicable FCC rules. KDB 996369 D03, Section 2.2
Complies with FCC Part 15.247
2.Summarize the specific operational use conditions. KDB 996369 D03, Section 2.3
Refer to antenna information as above or the specification
3.Limited Module Procedures. KDB 996369 D03, Section 2.4
Refer to antenna information as above or the specification
4.Trace antenna designs. KDB 996369 D03, Section 2.5
Refer to antenna information as above or the specification
5.RF exposure considerations. KDB 996369 D03, Section 2.6
It will be installed in their own products only, host model name: LVM G3 Hybrid.
6.Antennas KDB 996369 D03, Section 2.7
Refer to antenna information as above or the specification
7.Label and compliance information. KDB 996369 D03, Section 2.8
Refer label file.

Professional Installation

The installation and disassembly of the terminal device must be completed by professional engineers. The SRD antenna is installed inside the tailgate cover , and once terminal device is installed, users cannot open the tailgate cover at will. Because the tailgate cover will be installed with screws and special seals, if the tailgate cover is forcibly opened, the terminal device will generate a tailgate cover opening event and report the alarm event to the management system through Network.



Warning

To assure continued compliance, any changes or modifications not expressly approved by the party. Responsible for compliance could void the user's authority to operate this equipment.

FCC Statement
This equipment 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.

FCC Radiation Exposure Statement:
The equipment complies with FCC Radiation exposure limits set forth for uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator and your body.

Test Plan

According to KDB 996369 D01 Module Certification Guide v04, restrictive modules need to develop a testing plan that complies with FCC regulations for terminal hosts to address their own restrictive defects.
Compared to a complete RF transmission assembly, this module is a restrictive module with the following limitations:
1. Modular transmitters cannot be powered independently. 2. Modular transmitters cannot be tested in independent configurations.
For restricted modules that cannot be independently powered, according to the 996369 D01 Module Certification Guide v04 and 15.31e, for intentional radiation sources, the change in input power or the radiation signal level of the emitted fundamental frequency component should be measured when the power supply voltage varies between 85% and 115% of the nominal rated power supply voltage.
For modular transmitters that cannot be tested in an independent configuration, the terminal host with the installed local module should be used to test and record the test results.

The designated testing plan is as follows:
A. The worst-case modulation mode (GFSK) tested includes BLE and SRD.
B. The frequency points for testing include: BLE needs to test three frequency: 2402MHz, 2440MHz, and 2480MHz, SRD needs to test three frequency: 902.2MHz, 915MHz, and 927.8MHz.
C. The testing items need to include but are not limited to MAXIMUM PEAK DUCTED OUTPUT POWER (The change in input power should be measured when the power supply voltage varies between 85% and 115% of the nominal rated power supply voltage) ;
20dB OBW for SRD, DTS 6DB BANDWIDTH for BLE,
Include radiated spurious emissions with the antenna connected,
UNWANTED EMISSIONS IN NON-RESTRICTED FREQUENCY BANDS,
RADIATED SPURIOUS EMISSION.
D. Corresponding to the testing of including radiated spurious emissions with the antenna connected, the testing frequency range is the tenth harmonic of the highest fundamental frequency or 40 GHz, whichever is lower, as the wireless frequency is less than 10 GHz.
E. When testing the terminal host, it is necessary to confirm and prove through radiation testing that there is no additional parasitic or non compliant radiation caused by intrusion (parasitic oscillation, stray signal radiation inside the host, etc.). Therefore, it is necessary to follow the guidance of C63.10 and C63.26 to test the radiation of 9K-30MHz, 30MHz-1GHz, 1GHz-18GHz respectively, to ensure that there is no additional parasitic or non compliant radiation caused by intrusion (parasitic oscillation, stray signal radiation inside the host, etc.).
F. The above tests are based on C63.10 and C63.26 as guidance.
G. The above tests need to be conducted on the terminal machine.