

User's Guide

YM-103C

Micro Spread Spectrum Wireless Communication Module

Note

1. Be sure to read this handing direction before using this product.
2. Please don't resolve and convert this product or you will be Published by the Radio Law.
3. The instructions and notes in usage are very important items to insure safety. Please use it correctly after reading.
4. Duplicate, copy or reprint this book without authority are forbidden by law.
5. The content of this book and the specification of the product might be changed for improvement without premonition.

Attention

1. Because the radio module works by radio wave, the communication could be cut by the surrounding or usage. Therefore we do not assume the responsibility for the collateral insult, for example, cause the injury to people and damage to equipment. In addition, we also do not assume the responsibility for the collateral insult to the performance, trust of the equipment that slot in our product.
2. Do not use it close the equipment that might be operated wrong by the radio wave of module.
3. Because the performance of communication is influenced by the surrounding, please use it after the communication test.
4. Do the wiring work after cut the power supply.
5. Because the case is connected to the GND which is in the internal circuit, do not contact the "+"side of the power supply terminal.
6. When batteries are used as the power source, do not leave it in the product for long time or the liquid escaped from it would cause trouble.
7. Do not keep or use it in wet place such as the car which the window was closed
8. Radio module is not waterproof product.
9. Keep it far away from oil and water. If water or some objects got into the case, stop using it.
10. Do not hurt it
11. DO not move it from warm place to cold place.
12. Do not use it in the surrounding where was likely be polluted by acid, alkali, corrosive gas, etc.
13. This book is a sample for estimation, it might be changed for improvement or the stoppage of production. Moreover, it is inapplicable to the special custom.

Warning

This module is designed and produced based on the Radio Law in Japan. Be sure to use it follow the rule below.

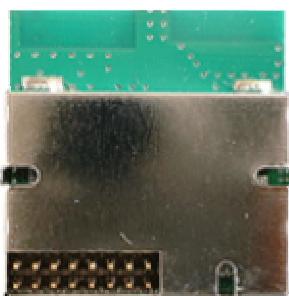
1. Do not resolve or convert this product.
2. DO not touch the part of alignment excessively.
3. Keep the power supply range between 3.2V-10V.
4. DO not make the power supply short circuit or reverse connection because the product would be destroyed.
5. We do not assume the responsibility for the illegal conversion or using.

Micro Spread Spectrum Wireless Communication Module **YM-103C Picture**

Front view



Back view



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1. Summary

1. Summary

1.1 About YM-103C

YM-103C is manufactured from the specification that accommodated to the Radio Law of Japan. It can transmit and receive with 2400MHz band easily by built-in PLL synthesizer circuit.

★ Please counsel with us separately when ships our products to foreign.

1.2 Characteristics

- i **Very small compact size(W31.3mm × H 31.9mm × T 5.5mm)<protuberance excepted>**
- ii **Low voltage operation (3.2V-10V)**
Low current consumption (transmission: 60mA/reception: 57mA)
- iii **Built-in chip antenna**

1.3 Application

Handy Terminal
Bar Code System
Data Transmission System
Telemetry System
Security System
Home Automation System
Medical System

FCC RF 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 transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

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

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions:

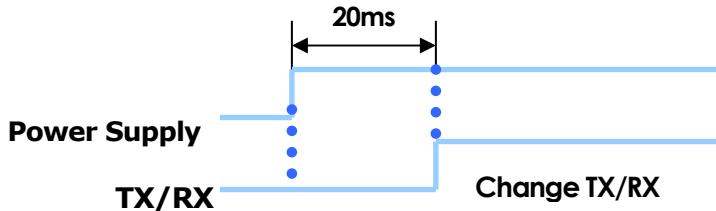
- (1) This device may not cause harmful interference, and
- (2) this device must accept any interference received, including interference that may cause undesired operation.

2. Operation Timing

2. Operation Timing

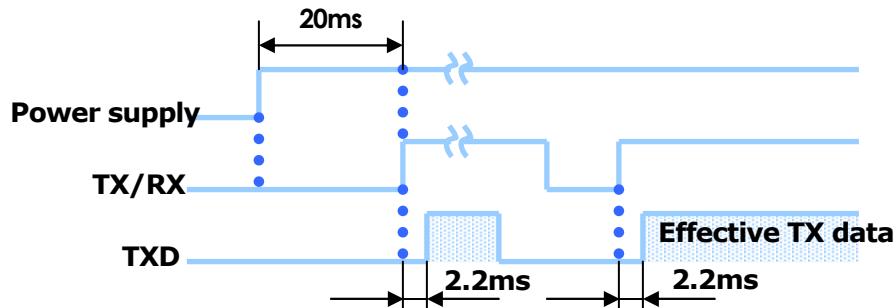
2.1 Operate time when supply is turned on

It takes about 20ms for initiation of CPU when the power supply is turned on. Moreover, operate the TX/RX ports by receiving state. If operates the TX/RX ports it is possible to send message by unnecessary frequency.



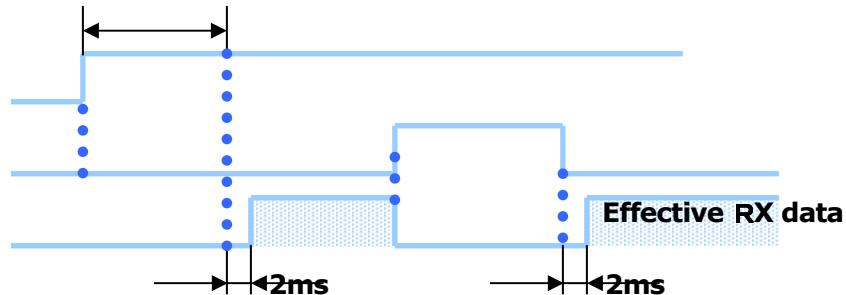
2.2 Operate time to set TX mode

- ◆ It takes about 20ms for initiation when the power supply is turned on.
- ◆ It takes about 2.2ms for switchover.
- ◆ It is possible to send normal TX data 2.2ms after switch to TX mode



2.3 Operate time to set RX mode

- ◆ Operate RX mode when the power supply is turned on.
- ◆ It takes about 2ms when switch TX to RX
- ◆ It is possible to send normal RX data 2ms after switch to RX mode.

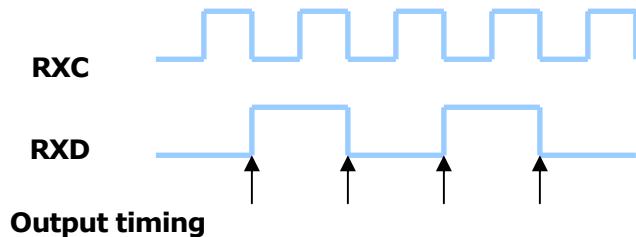


2.4 Timing to switch channels

- ◆ Switch channel is possible even if it is in RX or TX mode.
- ◆ It will operate on frequency when channel select terminal was changed

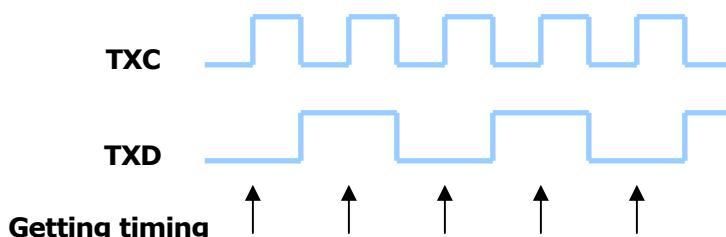
2.5 Timing to output RX data

- ◆ This module outputs data at the falling edge of RXC.
- ◆ Get data at the rising edge of RXC.



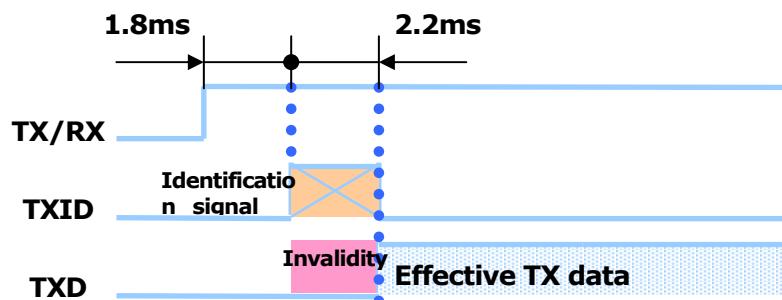
2.6 Timing to get TX data

- ◆ This module get TX data from internal when TXC was built up
- ◆ The data will be changed when TXC was trailed.



2.7 Timing to send identification signal

- ◆ This module sends 24bit **※2** identification signal when change from RX to TX.
- ◆ After changes to TX, it will send identification signal after 1.8ms and takes about 150μs.
- ◆ After changed to TX, data can be send in 2.2ms.



※2 A formal identification signal becomes "1100110011111111".

2.8 Regarding Preamble Signal in the Beginning Transmission

- ◆ This machine encodes transmitted data internally using Manchester Code.
- ◆ Please send the "10101010" data of one byte (eight bits) before sending the transmission data.
- ◆ Please establish synchronization by this "10101010" pattern on the reception side.
- ◆ Please send above-mentioned "10101010" pattern when the signal of 0 or 1 is continuously sent over 1000 bits.

3. Channel Setting

3. Channel Setting

- ◆ **39 channels are set in this model with 2.4GHZ band. You can change to the channel (frequency) that you want easily.**
- ◆ **Channel setting is controlled by channel select terminal (CH1~CH6).**
- ◆ **The detailed information is showed below.**

3.1 Channel Table

• Hi=3.0V Lo=GND H=Hi Lo=L

<Channel 1-19>

Ch assignment	CH1	CH2	CH3	CH4	CH5	CH6	Frequency (MHz)
1	H	L	L	L	L	L	2404.0
2	L	H	L	L	L	L	2406.0
3	H	H	L	L	L	L	2408.0
4	L	L	H	L	L	L	2410.0
5	H	L	H	L	L	L	2412.0
6	L	H	H	L	L	L	2414.0
7	H	H	H	L	L	L	2416.0
8	L	L	L	H	L	L	2418.0
9	H	L	L	H	L	L	2420.0
10	L	H	L	H	L	L	2422.0
11	H	H	L	H	L	L	2424.0
12	L	L	H	H	L	L	2426.0
13	H	L	H	H	L	L	2428.0
14	L	H	H	H	L	L	2430.0
15	H	H	H	H	L	L	2432.0
16	L	L	L	L	H	L	2434.0
17	H	L	L	L	H	L	2436.0
18	L	H	L	L	H	L	2438.0
19	H	H	L	L	H	L	2440.0

<Channel 20-39>

Ch assignment	CH1	CH2	CH3	CH4	CH5	CH6	Frequency (MHz)
20	L	L	H	L	H	L	2442.0
21	H	L	H	L	H	L	2444.0
22	L	H	H	L	H	L	2446.0
23	H	H	H	L	H	L	2448.0
24	L	L	L	H	H	L	2450.0
25	H	L	L	H	H	L	2452.0
26	L	H	L	H	H	L	2454.0
27	H	H	L	H	H	L	2456.0
28	L	L	H	H	H	L	2458.0
29	H	L	H	H	H	L	2460.0
30	L	H	H	H	H	L	2462.0
31	H	H	H	H	H	L	2464.0
32	L	L	L	L	L	H	2466.0
33	H	L	L	L	L	H	2468.0
34	L	H	L	L	L	H	2470.0
35	H	H	L	L	L	H	2472.0
36	L	L	H	L	L	H	2474.0
37	H	L	H	L	L	H	2476.0
38	L	H	H	L	L	H	2478.0
39	H	H	H	L	L	H	2480.0

4. Attention of the Operation

4. Attention of the Operation

4.1 About power supply

- ◆ This module works on voltage from 3.2V to 10.0V.
- ◆ Do not impress more then 10.0V, device would be broke down.
- ◆ Please operate it in the regulator which the internal circuit is 3V
- ◆ When you connect the port to external circuit, be sure the high level is $3V \pm 10\%$ and the low level is $0.2V \pm 10\%$. Moreover, make sure the + - polarity is correct.
- ◆ If the polarity was connected wrong, the device would be destroyed, and cause fire at the worst.

4.2 About PCB and layout

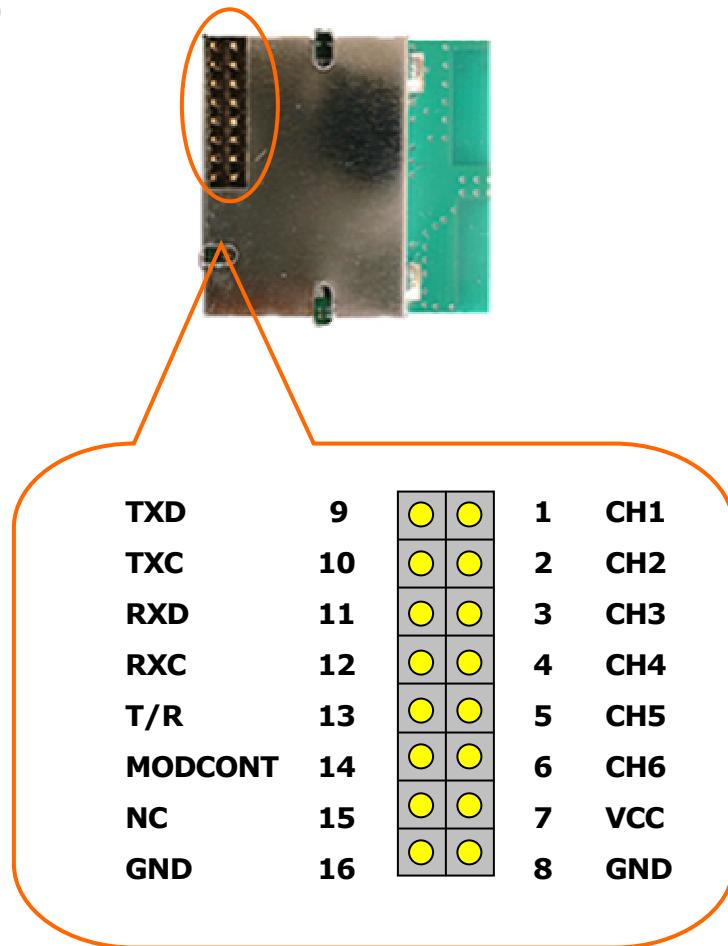
When you install this module in PCB, follow the point below.

- ◆ To keep the impedance low enough, use the power supply line with the pattern as thick as possible
- ◆ Put the pass condenser near the module and IC's terminal, and use electrolytic condenser for low frequency and ceramic condenser for high frequency
- ◆ Supply the power supply and ground line from one point and do not use the same impedance.
- ◆ Insert resistance that to cut RF or inductor to the signal line that between the port and external as possible as enough.

5. Data

5. Data

5.1 Terminal Direction (Picture)



The connector of this module is "A3C-16P-2DSA," produced by Hirose Electric. Receptacle for reception side should be "A3D-16DA-2DSE" or "A3C-16DA-2DSA"

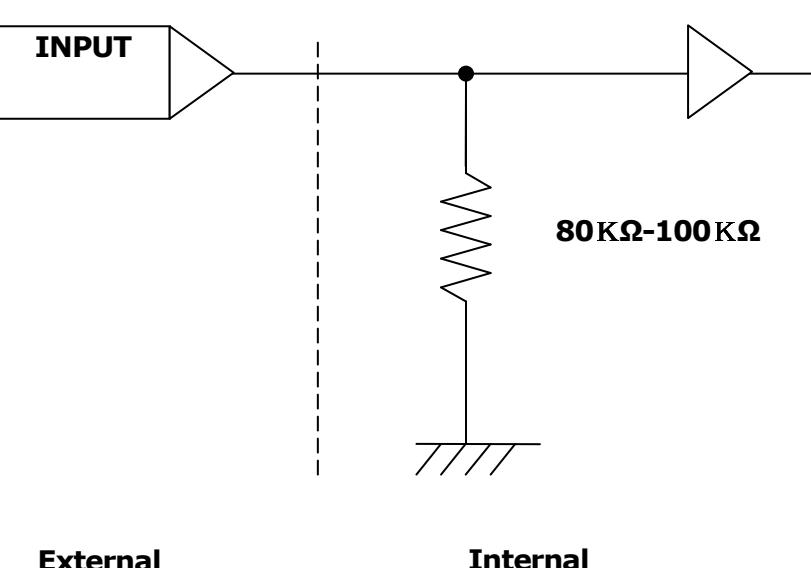
 The detailed information is showed below.

※Internal circuit operates on 3.0V. Design the interface circuit also on 3.0V

Pin NO.	Name of terminal	I/O	Contents
1	CH1	I	TX/RX channels are set by CH1~CH6 The port's input level is CMOS Hi=3V Lo=0V See the other table about the channel setting and frequency
2	CH2		
3	CH3		
4	CH4		
5	CH5		
6	CH6		
9	TXD	I	Input terminal of TX data. Input level is CMOS Hi=3V Lo=0V
10	TXC	O	Timing clock to get TX data. Sending component takes the TX data into internal circuit as the time as the clock build up. Input level is CMOS Hi=3V Lo=0V
11	RXD	O	Output terminal of RX data. Input level is CMOS HI=3V LO=0V The data will be outputted as the time as RX clock is at the trailing edge.
12	RXC	O	Output terminal of RX clock. Input level is CMOS Hi=3V Lo=0V As the time that this clock falls, RX data will be set. Get the RX data when this clock is at the trailing edge.
13	T / R	I	TX/RX switch terminal Output level is CMOS Hi=3V Lo=0V Hi is TX mode and Lo is RX mode.
14	MODCONT	I	Diffusion ON/OFF switch terminal. Normal, (when diffusion ON) Hi=3V and (when diffusion off) Lo=0V. (it can be used for technical test)
15	NC	I	Not used
7	VCC	VCC	Terminal of power supply plus. Supply the voltage between the range of +3.2V to +10.0V
8·16	GND	GND	Ground terminal. Connect it to the "-" side of power supply.

※ All input circuits are pulled down at 80–100KΩ

■ Reference picture



5.2 Specification

i) General Characteristics

Item	Rating	Note
Communication Method	Semi-duplex	
Frequency Method	FSK	
Oscillation Method	PLL Controlled VCO	
Frequency Range	2404.0~2480.0MHz	Reception
	2404.0~2480.0MHz	Transmission
Channel Step	2.0MHz	
Number of Channel	39 channels	
Transmission Speed	400Kbps	At Radio circuit (800Kbps)
Rise Time (when power supply is turned on)	Within 20ms	Regular :15ms
TX/RX switching time	2ms	
RX/TX switching time	2.2ms	
Antenna Impedance	50Ω	
1st IF	11.0MHz	
Operating Temperature	− 10~55°C	
Operating Supply Voltage	3.2~10.0V	
Current consumption	TX: 60mA	TX(at 25°C/ 3.2V)
	RX: 55mA	RX (at 25°C/ 3.2V)
Size	31.3mm×31.9mm×5.5mm	
Weight	About 6.7g	

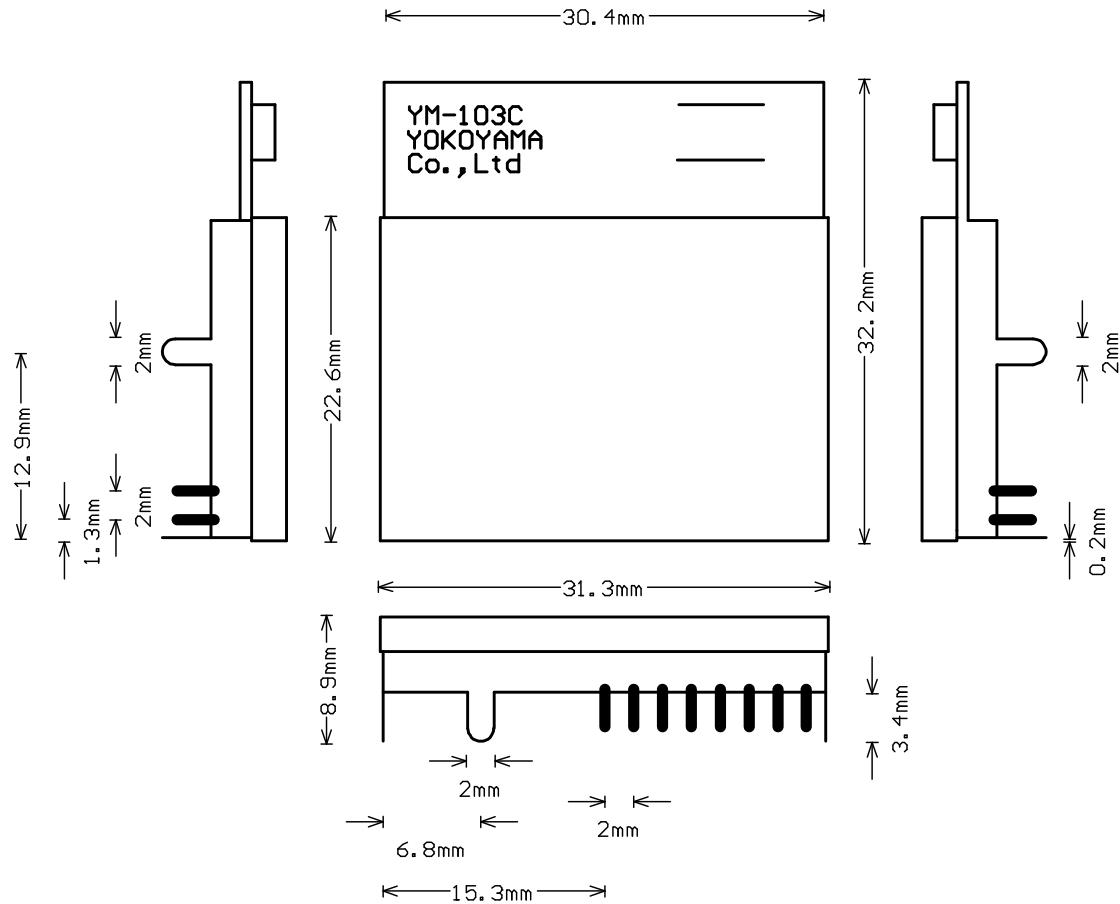
ii) Characteristics of sending component

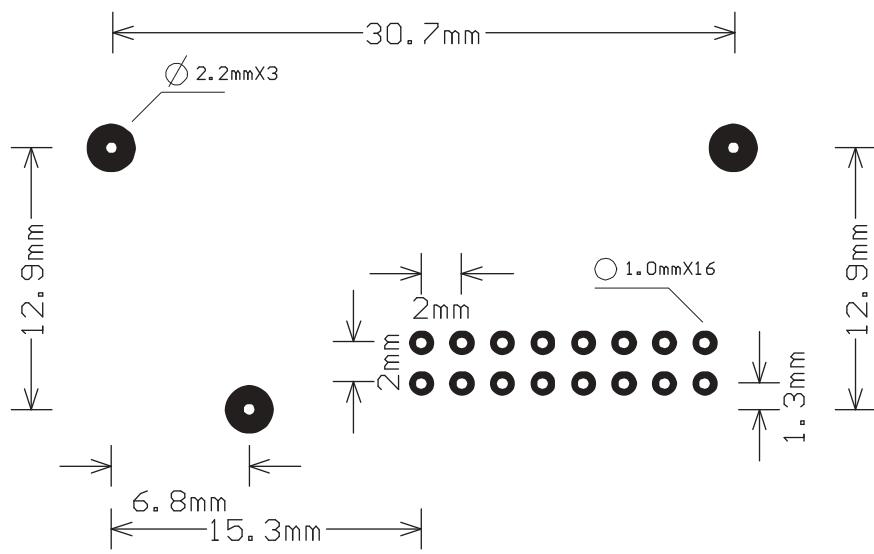
Item	Rating	Condition
TX method	PLL Synthesizer	
TX output	9.0mw±1.0mw/MHz	
Chip Rate of Diffusion	5	
The Stability of Frequency	±30ppm	0~+55°C
Spurious launching strength	25μW	2,387MHz ≤ f < 2,400 MHz 2,483.5 MHz < f ≤ 2,496.5 MHz
	2.5μW	2,387 MHz > f 2,496.5 MHz < f
Transmitter Rise Time	Within 2.2ms	
Channel Transit Time	Within 2ms	

iii) characteristics of receiving component

Item	Rating	Condition
RX method	Super Heterodyne	
Adjacent Channel selection	More than 30dB	±4MHz
Local Oscillator Frequency Stability	30ppm	0 ~+55°C
Secondary	Below -54dBm	Below 1GHz
	Below -47dBm	More than 1GHz
Channel Transit Time	Within 2ms	
Bit Error Rate	1×10^{-3}	Below -80dBm

5.3 appearance size and hole size pictures





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